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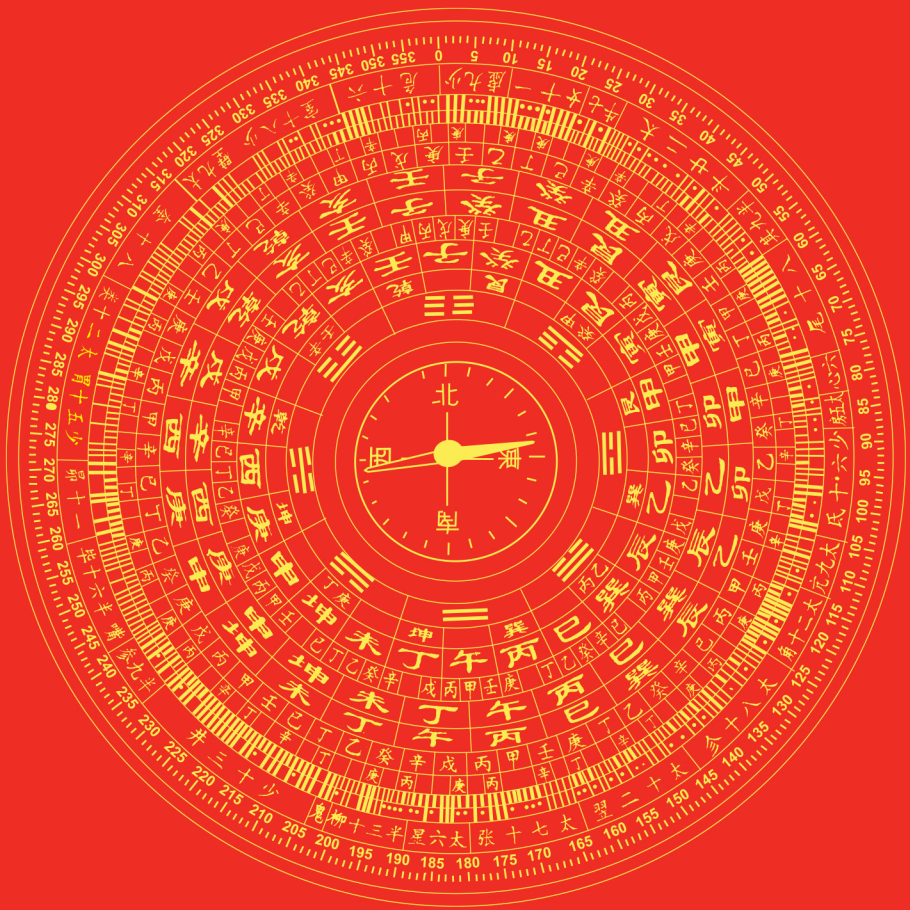
China's Evolving Surface Fleet



Peter A. Dutton and Ryan D. Martinson, Editors

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CHAPTER ONE

The PLA Navy's Yin and Yang

China's Advancing Amphibious Force and Missile Craft

Dennis J. Blasko

> *From a military perspective, the best way to avoid war is to prepare for it.*
>
> GEN. MARTIN E. DEMPSEY, CHAIRMAN OF THE U.S. JOINT CHIEFS OF STAFF

The missile fast-attack craft and amphibious fleets of the People's Liberation Army (PLA) Navy (PLAN) have undergone significant modernization over the past fifteen years. The capabilities of both categories of vessels have improved even if their actual numbers have not increased dramatically. Examined from the perspective of PLA doctrine and training, the missions of these forces represent the PLAN's past, present, and future.

Taken together, these two categories of ships and boats enhance China's deterrence posture, help defend its coastal waters, warn Taiwan of the dangers of further moves toward independence, add to China's long-range sealift capacity, and assist in the PLA's ability to conduct nontraditional security tasks. In the newer ships entering the inventory, we see both capabilities to conduct the PLA's traditional mission of defense of China's 18,000-kilometer coastline and 6,500 islands and hints of the missions of the future. These two fleets represent the yin and yang of the PLAN: its enduring "offshore operations" missions and its future "blue-water" or "far-seas" tasks.

The Missile-Craft Fleet

China's naval missile-craft force consists of a variety of small vessels, each displacing about five hundred tons or less. They usually are called *daodan kuaiting* (导弹快艇), *daodanting,* or just *kuaiting*. These terms are translated variously as "patrol boat," "patrol craft," "missile fast-attack craft," "fast-attack craft," "missile escort boat," "missile speedboat," "missile boat," or "fast boat." Some vessels of this size are called *huweiting* (护卫艇), sometimes imprecisely translated as "corvette."[1] This paper focuses on fast, small vessels equipped with antiship cruise missiles (ASCMs), and uses the abbreviation FAC (for "fast-attack craft") to refer to the various types of missile speedboats in the PLAN.

In addition to FACs armed with ASCMs, *The Military Balance 2013* lists three types of coastal-patrol craft and one type of patrol boat in the PLAN that are not equipped with missiles and perform antisubmarine or other missions. These will not be discussed in this treatment.[2]

The first missile FACs in the PLAN, the Type 021 Huangfeng and Type 024 Houku classes, were based on Soviet designs (the *Osa*/*Komar* class). Because of their small size and lack of seaworthiness, these early FACs were employed relatively close to shore. They took advantage of their speed, but were limited in the length of time they could stay at sea and by adverse weather. Two versions of a more modern FAC (based on the Type 037 submarine chaser), the Type 037II Houjian class and Type 037IG Houxin class (often called corvettes, but displacing only slightly more than five hundred tons), were introduced in the early 1990s. About a decade later the stealthy, 220-ton Type 022 Houbei-class catamaran entered the force.[3]

The Military Balance 1996/97 estimated there were "about 185" missile craft in the PLAN. These numbers included "some 100" Type 021 Huangfeng-class, "about 75" Type 024 Houku-class, nine Type 037IG Houxin-class, and one "Huang-class [*sic*]" FAC.[4] In the subsequent fifteen years, nearly all those craft were retired and replaced by a smaller number of more-modern, more–technologically advanced, and more-capable vessels.

Current estimates of the size of the missile FAC fleet vary among sources. The Pentagon reports a total of "roughly" eighty-five "coastal-patrol (missile)" craft. It counts sixty Type 022s, but does not specify the other types of FAC in service. It also states that the new Type 056 Jiangdao-class corvettes will "augment" the Type 022s in the fleet.[5] The new Type 056 corvettes provide the PLAN the capability to patrol China's littoral waters for several days or weeks, while the Type 022s are optimized for fast attack at high speeds for shorter periods.

The Military Balance 2013 lists four types of FAC in the inventory, totaling over one hundred vessels; however, its count of sixty-five Type 022s is higher than the Pentagon's and its figures do not account for the likely retirement of the older Type 021 from the active inventory.[6]

Table 1. *FACs in the PLAN*

Type	Number	Missile
Type 022 Houbei	65+ (60 reported by U.S. Department of Defense)	two quad YJ-83 launchers
Type 021 Huangfeng	11 (likely no longer in the fleet)	two twin HY-2 launchers
Type 037II Houjian	6	two triple YJ-8 launchers
Type 037IG Houxin	20	two twin YJ-8 launchers

With about eighty-six vessels, the PLAN FAC fleet has a higher percentage of modern boats (Type 022) in operation (about 70 percent) than the percentage of modern equipment in most other units and services. In 2011, the Pentagon reported that, as of 2010, only about 26 percent of the PLAN surface fleet was considered "modern," compared with about 56 percent of the submarine force, 25 percent of the air forces, and 40 percent of the air-defense forces.[7] The percentages of modern systems in the PLA have increased in recent years as newer equipment is commissioned and older weapons are retired, but the FAC force is better off than most units, and its equipment is better than most sectors', in the PLA. Throughout the PLA, advanced systems must operate in conjunction with legacy platforms, logistics must support both old and new, and doctrine and tactical techniques must be developed that incorporate all existing capabilities and units.

The PLAN's FACs are distributed to units in all three fleets. Five division leader–grade FAC units (*kuaiting zhidui,* 快艇支队), often called flotillas, have been identified. Each flotilla is composed of multiple (probably up to three) regiment leader–grade *dadui,* variously translated as squadrons or groups, each with six to twelve vessels. A FAC flotilla may command sub chasers, patrol boats, and amphibious vessels in addition to its missile boats. Each FAC flotilla probably commands twelve to eighteen FACs.[8] Both Type 022 and Type 037IG FACs are found in each of the three fleets. The five FAC *zhidui* and the locations of their FAC squadrons are listed in table 2. Two additional FAC squadrons have been identified subordinate to the Shantou Naval Garrison.[9]

Table 2. *FAC Units*

Unit	Designator	Fleet	Location of FAC Squadrons *(dadui)*
1st FAC *zhidui*	91208 *budui*	North Sea Fleet	Qingdao, Shandong
16th FAC *zhidui*	91765 *budui*	East Sea Fleet	Ningbo-Shipu, Zhejiang
21st FAC *zhidui*	91792 *budui*	East Sea Fleet	Fuding, Fujian
11th FAC *zhidui*	91367 *budui*	South Sea Fleet	Sanya-Yulin, Hainan
26th FAC *zhidui*	92962 *budui*	South Sea Fleet	Shangchuandao, Guangdong
Shantou Naval Garrison	91960 *budui*	South Sea Fleet	Shantou, Guangdong (two squadrons)

Type 037IG Houxins have three-digit pennant numbers (images show them ranging from the 750s through the 760s), indicating they are battalion leader–grade vessels, and are named after counties in China, such as Fuqing or Dong'an.[10] Four Type 037II Houjians are assigned to the naval component of the Hong Kong garrison, with pennant numbers 770 through 773.[11]

Type 022 Houbeis have four-digit hull numbers, indicating they are company leader–grade units.[12] Boat number 2208 (2208艇) was the first Type 022 to enter service; it was

delivered to the East Sea Fleet (ESF) in 2004.[13] Hull numbers for other boats of this type begin with 21 for North Sea Fleet (NSF) vessels and 23 for South Sea Fleet (SSF) craft.

In a 2009 report, the Office of Naval Intelligence issued what is perhaps the most succinct description of the mission of the FAC fleet: "[T]he Houbei's ability to patrol coastal and littoral waters and react at short notice allows the PLAN's larger combatants to focus on offshore defense and out-of-area missions without leaving a security gap along China's coastline."[14] The Pentagon concludes, "These boats have increased the PLA Navy's littoral warfare capabilities."[15] Andrew Erickson observes: "The *Houbei*'s impressive anti-surface weapons system, consisting of 8 YJ-8A ASCMs fired from stern-mounted canisters, each with a range of approximately 50 nautical miles, would be highly effective in attacking surface warships in the waters around China, though the catamaran's limited endurance (300 nautical miles) would not allow it to operate for extended periods at much greater distances."[16]

These statements all point to the role of the PLAN's FAC fleet in offshore defense (近海防御), the naval component of the PLA's "military strategy" or "military strategic guideline" of Active Defense (积极防御). In 2000, China's defense white paper announced the PLAN had "acquired the capability of offshore defensive operations."[17] The 2013 white paper stated that as "the PLAN endeavors to accelerate the modernization of its forces for comprehensive offshore operations," it is developing "blue-water capabilities of conducting mobile operations, carrying out international cooperation, and countering nontraditional security threats."[18] Owing to the requirement to operate relatively near the coast (at most a couple of hundred miles from shore) and probably only in relatively good weather, the PLAN FAC fleet therefore will be employed mainly to conduct "offshore operations," while other PLAN ships and aircraft operate farther out at sea in "blue-water" or "far-seas" operations.

According to doctrine, offshore defensive operations will include surface, subsurface, air (fixed- and rotary-wing), cruise- and ballistic-missile, and electronic-warfare capabilities and units, supported by People's Armed Police, militia, and civilian assets. PLAN FACs are expected to work in groups, operating on multiple vectors, in conjunction with other forces, taking advantage of the range of their missiles. Their effectiveness will depend on the ability of other Chinese assets to provide them accurate and timely intelligence and targeting data for enemy warships beyond the horizon. Throughout their operations at sea, the PLAN FAC fleet will be vulnerable to enemy air forces and electronic-warfare operations. Chinese FACs have some short-range air-defense and electronic countermeasures capabilities of their own; for example, the Type 022 mounts a 30 mm close-in weapons system and two four-cell launch tubes for smoke and chaff. However, the key to their survivability and success is realistic training.

PLAN FAC training has been reported widely in the Chinese civilian and military media, including several television reports about the telegenic Type 022 as well as the older Type 037IG. Exercise reports usually reveal FACs operating with other surface vessels, such as minesweepers and frigates. The FACs perform both offensive and defensive tasks and are themselves frequently the target of "enemy" air and electronic-warfare attacks. Exercises reportedly take place both during the day (including in light fog) and at night, although exactly how much time is spent in night training is not specified. Live-missile launches and live-ammunition antiaircraft drills using drones as targets are reported frequently.[19] Coordinated attacks by FACs and PLAN aviation units on enemy forces also have been reported. One report describes a naval aviation and FAC attack following a first wave of attacks performed by other surface and air forces. Helicopters provided targeting information for enemies beyond visual range; however, details of exactly how that information was passed and processed among units were not provided. Another report indicates coordination for a missile attack in conjunction with an aviation unit while experiencing enemy jamming within the context of a larger ESF exercise.[20]

It should come as no surprise that the first Type 022 FAC, Boat 2208 of the ESF, has been the subject of numerous media reports. According to one article, Boat 2208 conducted its first missile live fire in the Yellow Sea in the winter of 2006—approximately two years after it entered the fleet.[21] Another report, from Xinhua, noted that when the first "new type missile fast boat squadron" was formed, it faced many issues, particularly concerning the complex technology of the new equipment. As a result, the unit underwent a two-year training period, which included sending personnel to the shipyard that produced the boats (a technique used by many PLA units that have received new equipment).[22] In the ten years it has been in the force, Boat 2208 has participated in more than twenty exercises and has developed "more than fifty combat methods and training methods," something one might expect the first vessel of its type to do. It has been named "'first sharp sword' (第一利剑) of the Chinese Navy's fast-attack craft forces."[23] While this seems like a lot of training, the numbers reported average out to two or three exercises per year.

It is difficult to judge the quality of FAC training, exercise realism, and crew proficiencies on the basis of Chinese media reporting. But since these units mainly will operate relatively close to shore, it would seem possible that they could practice many of their tasks in short exercises and drills that last no more than a day or two. These units are focused on protection of China's littoral; other units look more toward the far seas.

The Amphibious Ship Fleet

The PLAN amphibious or landing ship (登陆舰) fleet has undergone significant modernization over the past fifteen years, but these efforts have not resulted in as much of an

increase in sealift capacity as might be expected. The force also has been active in training exercises and has begun to be used in operations far from China's coasts.

Estimates of the size of the amphibious ship fleet vary among sources. Estimates are complicated further by inconsistency in what exactly should be reported. In 2013, the Pentagon listed fifty-five medium and large amphibious ships, consisting of three amphibious transport docks (LPDs), twenty-six tank landing ships (LSTs), and twenty-six medium landing ships (LSMs), but did not break them down by class.[24] *The Military Balance 2013* counted two LPDs, twenty-six LSTs, and fifty-nine LSMs, for a total of eighty-seven large and medium amphibious ships.[25] Most of the twenty-eight Type 079 Yulian-class LSMs included in *The Military Balance* have been retired, leaving only about five in service.[26] When these twenty-three ships are subtracted, the numbers from *The Military Balance* and the Pentagon are much closer. Table 3 compares the numbers found in *The Military Balance* from 1996 with those from various sources in 2013.

Table 3. *PLAN Amphibious Fleet, 1996 and 2013*

Ship	Type	Number 1996	Number 2013	Capacity
Type 071 Yuzhao	LPD	0	3	500–800 troops, 15–20 amphibious vehicles, 4 landing craft
Type 072 Yukan	LST	7	7	200 troops, 10 tanks
Type 072-II Yuting	LST	4	9	250 troops, 10 tanks
Type 072-III Yuting II	LST	0	10	250 troops, 10 tanks
US LST-1 Shan	LST	13	0	150 troops, 16 tanks
Type 073 Yudeng	LSM	1	0	180 troops, 6 tanks
Type 073A Yunshu	LSM	0	10	180 troops, 6 tanks
Type 074 Yuhai	LSM	0	11	250 troops, 2 tanks
Type 074A Yubei	LSM	0	10	150 troops or 10 tanks
Type 079 Yulian/Yuling	LSM	32	5	250 troops, 5 tanks

Sources: IISS, *The Military Balance 1996/97,* p. 180, and *The Military Balance 2013,* p. 290, with the number of LPDs found in U.S. Defense Dept., *Military and Security Developments 2013,* p. 6. Information on the numbers of Type 074 and Type 079 comes from Graae e-mail, May 20, 2013. Also used in compiling this table was the "Naval Vessels" page of the website SinoDefence.com, available at www.sinodefence.com/navy/vessel.asp.

Calculating the maximum troop capacity for the ships in 2013 yields a result of fifteen to sixteen thousand personnel, although the number would vary according to the amount of equipment transported in addition to personnel. This total (fifteen to sixteen thousand personnel) represents at least a 50 percent increase from the Pentagon's judgment from 2000 through the following decade that the PLA is capable of sealift of one infantry division of approximately ten thousand troops and equipment at a time.[27] Current PLAN amphibious lift capacity would be sufficient to lift the PLAN's two marine brigades (ten

to twelve thousand personnel) assigned to the SSF or one Army infantry division, but not much more—not enough for a major cross-strait operation.[28]

The PLAN has two landing ship flotillas (登陆舰支队), one in the SSF and the other in the ESF, and a landing ship squadron (登陆舰大队) in the NSF subordinate to the 1st FAC Flotilla.[29] Each flotilla has two or three subordinate squadrons, with the SSF flotilla being larger than the ESF's. The 16th FAC Flotilla in the ESF and the 11th FAC Flotilla in the SSF each command a landing ship squadron. Each landing ship squadron in the SSF and ESF probably commands about six large or medium landing ships, while the NSF squadron has two LSTs and eight LSMs.[30] Major PLAN amphibious units and their locations are listed in table 4.

Table 4. *PLAN Amphibious Units*

Unit	Designator	Fleet	Location	Comments
1st Amphibious Ship *dadui*	Not known	NSF	Qingdao, Shandong	Subordinate to the 1st FAC *zhidui*
5th Amphibious Ship *zhidui*	91860 *budui*	ESF	Shanghai (Qiujiang wharf)	Two *dadui*
3rd Amphibious Ship *dadui*	92529 *budui*	ESF	Ningbo-Shipu	Subordinate to the 16th FAC *zhidui*
6th Amphibious Ship *zhidui*	92692 *budui*	SSF	Zhanjiang and Guangzhou, Guangdong	Three *dadui*
4th Amphibious Ship *dadui*	91782 *budui*	SSF	Haikou, Hainan	Subordinate to the 11th FAC *zhidui*

Sources: Directory of PRC Military Personalities, October 2011, pp. 41, 47, 53, and 54; Graae e-mail, May 18, 2013.

A variety of smaller landing craft are used to transfer personnel and equipment from ship to shore. These include many small ten-man boats with outboard motors and a few small and medium-sized air-cushioned craft. In April 2013, the PLAN received (in Feodosiya, Ukraine) the first of four Zubr air-cushioned landing craft to be built (two in China and two in Ukraine). These large craft can carry up to three tanks or five hundred troops at more than sixty knots over land and water.[31]

Most large PLAN amphibious ships and some medium-sized landing ships have three-digit pennant numbers beginning with the numeral 9, indicating they are battalion leader–grade vessels; they are named after mountains *(shan)*. However, the three Type 071 LPDs are regiment leader–grade ships. Some medium-sized landing ships (Type 074 and Type 074A) and smaller vessels, including air-cushioned craft, have four-digit bow numbers, indicating company leader–grade vessels.

The three Type 071 Yuzhao-class amphibious transport docks, *Kunlunshan* (No. 998), *Jinggangshan* (No. 999), and *Changbaishan* (No. 989), represent the most significant

upgrade to the PLAN's amphibious fleet.[32] In addition to their troop and vehicle capacity, these ships are capable of supporting flight operations for four medium helicopters and launching up to four air-cushioned craft.[33] All are assigned to the SSF and, as the Office of Naval Intelligence has noted, they signal "a developing capability for expeditionary warfare and over-the-horizon amphibious assault."[34] They also have the potential for use in nontraditional security missions, such as international disaster relief. Unlike the LST fleet, these ships give the PLAN the capacity to perform missions requiring extended periods at sea (months instead of weeks) far from China's shores. *Kunlunshan* was deployed on antipiracy patrol in the Gulf of Aden in 2010. *Jinggangshan,* along with three other surface combatants, was involved in a high-profile exercise to the southern limits of the South China Sea (James Shoal) in March/April 2013, which included both amphibious operations and nontraditional security tasks.[35]

SSF amphibious ships train mostly with the two marine brigades, but also can support army training. PLAN amphibious units in the ESF and NSF train more with army units, because no marine units are assigned to those fleets. Amphibious training usually begins in the spring and continues through the fall. The Chinese media frequently highlight this training, which can be exploited, as necessary, for its propaganda and deterrence value.[36]

The PLA ground forces have approximately fifteen transport ship squadrons or groups (船运大队), each with from five to twenty landing craft assigned to two or three smaller units (中队). These units appear to be equipped mostly with Type 271–series and Type 068 (Yuqing-class) landing craft and are found in the army coastal-defense force, some joint logistics subdepartments, and the Nanjing Military Region Army Reserve Logistics Support Brigade. Additionally, a ship group (船艇大队) is located at the Dongshan Island training area and provides support to army amphibious training. These units potentially add about another two hundred small landing craft for amphibious operations in coastal waters. Army landing craft can be identified by bow numbers that start with the Roman letter for the military region to which they are assigned (B, G, N, J, or S), followed by another letter and three numbers.[37]

PLAN amphibious assets may be augmented by incorporating civilian vessels into operations. Maritime militia units have organized ship units, and civilian fishing and transport vessels also may be mobilized. In many cases civilian ships require modifications to transport military equipment. Civilian ships also could secure artillery and rocket launchers to their decks to provide fire support for landing operations. Under most conditions, civilian shipping would not be suitable for conducting amphibious assaults; they would be more appropriate for landing in ports or at piers captured in the early phase of an operation. In 2012, the first civilian roll-on/roll-off (RO/RO) ship designed to national defense specifications made its maiden voyage out of Yantai, Shandong. The

36,000-ton *Bohai Emerald Bead* is the first of four such ships to be built. Each can carry over two thousand personnel and more than three hundred vehicles.[38] Perhaps a dozen or more smaller civilian RO/RO ships could be made available to the PLA. While these ships were not designed specifically to transport military vehicles, they could add significantly to the PLA's lift capacity if a port was available for off-loading.[39]

Analysis

The Science of Military Strategy, published by the Academy of Military Science, states, "Warfighting and deterrence are two major functions of the armed forces."[40] The PLAN FAC and amphibious fleets have important roles in China's war-fighting and deterrence posture. Both fleets demonstrate the continuing relevance of People's War theory to the PLA. More than the FAC fleet, the amphibious force, particularly the Type 071 LPDs, also has a role in nontraditional security missions, such as sea-lane protection (as demonstrated in *Kunlunshan*'s antipiracy deployment), and potentially in international disaster relief or civilian evacuation missions.

Although most foreign analysis that addresses China's deterrence posture focuses on its nuclear dimension, the Chinese doctrine subsumes many more deterrence objectives than simply deterring nuclear war, including deterring a land or sea invasion of China; protecting China's sovereignty and territorial integrity; deterring further steps toward Taiwan independence, along with the related mission of deterring U.S. military support to Taiwan in the event of conflict; and deterring "terrorism, separatism, and extremism." Deterrence is based on possessing an "adequate deterrent force," having the will to use that force, and ensuring the opponent understands China's capabilities and will. *The Science of Military Strategy* states that "[t]he more powerful the warfighting capability, the more effective the deterrence." Military forces must be capable and well prepared; "those making purely bluffing threats and intimidations hardly can afford deterrence."[41]

The modernization of the FAC and amphibious fleets meets all three requirements for deterrence. An "adequate force" has been built, and China's will to use it has been publicized through the Chinese media. There is little doubt that those China seeks to deter have understood the war-fighting potential these forces represent.

The Science of Military Strategy states that deterrence is considered a means of attaining both military and political objectives, but war fighting is to be used "only when deterrence fails and there is no alternative."[42] Moreover, caution is emphasized in making the decision to go to war: "Therefore, imprudent decision to use force is never permitted. . . . The reason for the existence of the army is to prevent and win a war. . . . We may not launch a war in a hundred years but we can never be unprepared for war for even one day. . . .

Only when an army is fully prepared for war, can it be prudent to start a war and react quickly in war."[43]

People's War is closely related to China's deterrence posture. *The Science of Military Strategy* states that China has a "massive capability" for deterrence through People's War.[44] The book's final chapter on guidance for future high-technology wars describes "five combinations" of People's War that mix (1) regular troops with the masses, emphasizing China's inland and coastal border regions; (2) regular naval warfare with guerrilla warfare on the sea, developing the strategy and tactics of People's War on the Sea (海上人民战争); (3) "trump card" (杀手锏) weapons with flexible strategy and tactics, especially in playing "hide and seek" with the enemy; (4) high-tech weapons with legacy weapons, understanding the "phenomenon that several generations of weapons and equipment" will "coexist" for a long time; and (5) military warfare with political and economic warfare to present the widest front possible to the enemy.[45] Both the FAC and amphibious fleets display these elements of People's War as adapted for the twenty-first century.

The PLA FAC and amphibious forces are "regular troops" that would be supported by the militia and civilian forces in their operations. FAC units especially would be involved in "guerrilla warfare on the sea" using hit-and-run, ambush-style tactics. The Type 022 Houbei force, with its stealth and missile capabilities, can be considered a "trump card" weapon, which demonstrates that the "concept of People's War is not confined to the war of low technology."[46] As with nearly all other PLA units, both fleets also illustrate how more-advanced weapons are integrated with older legacy systems.

But the FAC fleet will be used primarily in China's coastal waters as an essential element of offshore defensive operations. While the amphibious fleet can be used in offshore operations, its newest additions, the Type 071 Yuzhao LPDs, are joining other surface combatants in operations and training in distant waters. These ships, along with the civilian RO/RO ships and other transport capacity, are an important development in overcoming the PLA's well-recognized shortcoming in long-distance sealift capacity.

In coming years, we can expect to see more far-seas training, with the Type 071s being active participants. At the end of 2012, ESF deputy commander Qiu Yanpeng noted that the PLAN had conducted seven "open-sea training" exercises that year.[47] This doubled the operations tempo that PLA Navy commander Wu Shengli described in 2009 of more than thirty combat group operational/campaign exercises (作战集团战役演习) over the previous ten years.[48] The earlier numbers equated to an average of one such exercise per fleet per year—a tempo that now has more than doubled.

This increase in training is necessary, however, because the PLA and PLAN leadership sees PLAN capabilities as falling short of those displayed by other modern navies. Qiu

Yanpeng said so directly at the same time he noted the increase in training for 2012: "There is still a considerable [*sic*] room for improvement in the intensity and effectiveness of our open-sea training, whether it is compared to the naval forces of other countries or concerned with the requirements of Chinese navy building and development."[49]

That same day, the Chinese-language *PLA Daily* newspaper carried an article stating that the level of naval training is incompatible with the requirements of winning naval battles in a local war under informationized conditions (海军军事训练水平与打赢信息化条件下海战的要求不相适应). The article stressed the need to improve navy training through the "2015 Naval Military Training Reform Implementation Program" (《2015年前海军军事训练改革实施方案》).[50]

The need for more training, along with the size of the amphibious fleet, suggests that the PLAN still sees itself preferring to play its deterrent role and participating in nontraditional security missions in the near future. Nonetheless, as a loyal servant of the Chinese Communist Party, the PLA will obey the orders of the Party leadership and seek to conduct any assigned mission to the maximum extent possible with the forces and capabilities at hand.

The 2004 white paper described the Chinese government's general intentions for PLAN modernization:

> In accordance with the principle of smaller but more efficient troops, the PLA Navy compresses [i.e., reduces or flattens] the chain of command and reorganizes the combat forces in a more scientific way while giving prominence to the building of maritime combat forces, especially amphibious combat forces. It also speeds up the process of updating its weaponry and equipment with priority given to the development of new combat ships as well as various kinds of special-purpose aircraft and relevant equipment.[51]

That statement was consistent with the general policy of making the PLA smaller and more technologically advanced, and specifically identified the aim of improving amphibious capabilities and developing new combat ships, although it did not mention the FAC fleet. Over the past decade, the PLAN has done what the white paper stated it would do.

The modernization of the PLAN's FAC and amphibious fleets has resulted in an increase in the PLA's lethal and assault capabilities in China's immediate offshore regions and at greater distances from the Chinese coast. The two forces, which will be used in coordination with other naval units and civilian assets, add to China's capabilities for both deterrence and war fighting. However, the PLA leadership understands that more needs to be accomplished, especially in both the quality and quantity of training, before these forces are on par with those of other advanced navies.

The introduction of the Type 022 Houbei FAC has improved China's coastal-defense capabilities greatly, making it more dangerous for enemy surface vessels to conduct combat operations within a few hundred miles of China. But for these craft to be effective they must be integrated with other PLA capabilities, particularly intelligence, command-and-control, and air-defense units. These boats illustrate the Chinese leadership's continued concern for defense of the mainland. It therefore is not surprising that more Type 022s have been built than any other single naval ship or craft. The Houbei exemplifies the adaptation of People's War to twenty-first-century requirements.

The existing amphibious fleet apparently is considered sufficient for China's deterrence requirements. It is too small for a major campaign across the Taiwan Strait unless augmented by large numbers of civilian ships and other craft. The distribution of the force along the entire coast minimizes the chance for strategic surprise, as units would have to be assembled from all over the country to prepare for a large-scale amphibious operation. Chinese shipyards could surge amphibious craft production, but that too would be discovered easily. The size of the force is sufficient for smaller operations along China's east coast or in parts of the South China Sea. The Pentagon concludes: "With few overt military preparations beyond routine training, the [People's Republic of China] could launch an invasion of small, Taiwan-held islands such as Pratas Reef or Itu Aba. A PLA invasion of a medium-sized, defended, offshore island such as Mazu or Jinmen is within the mainland's capabilities."[52]

Currently, major PLAN amphibious operations are constrained by the requirement to stay within the range of land-based air support. The range of such operations will increase when an amphibious task force can operate under the cover of carrier-based aircraft.

While the Type 071 Yuzhao has some utility in a Taiwan scenario, it better represents the PLA's vision for longer-range operations in far seas. The appearance of *Jinggangshan* at the southernmost extent of the South China Sea in March 2013 demonstrated these new capabilities, although the Chinese leadership recognizes the need for more training before the PLAN is ready to tackle the full scope of its potential future missions. The PLA has announced that there will be more far-seas training, which is expected to increase PLAN readiness levels and also contribute to the PLAN's deterrence posture and the pursuit of other national security objectives.

The PLAN FAC and amphibious fleets are likely to continue to modernize and improve their capabilities. They will focus on operations in both the near seas and more-distant waters. They constitute both soft (deterrence and nontraditional security) and hard (war-fighting) elements of Chinese military power.

Notes

Birger Graae, a former NATO country intelligence officer who follows PLA developments, reviewed the first draft of this paper and made substantial contributions improving its content, for which I am extremely grateful. The epigraph comes from Karen Parrish, "Dempsey Visits South Korea, China on Weeklong Asia Trip," American Forces Press Service, April 21, 2013, available at www.defense.gov/news/newsarticle.aspx?id=119830.

1. "Corvettes" fall between "fast-attack craft" and "frigates" in displacement. Corvettes usually displace one thousand tons or more and are larger than the FACs addressed in this paper. Chinese sources use the term *huweiting* for the Type 037II Houjian and Type 037IG Houxin, both of which the U.S. Navy classifies as "fast-attack craft."
2. International Institute for Strategic Studies [hereafter IISS], *The Military Balance 2013,* ed. James Hackett (London: 2013), p. 290, lists seventy-five coastal patrol craft and thirty-four-plus patrol boats. The PLA ground forces also have several patrol craft groups (巡逻艇大队) that patrol inland waters, lakes, and rivers in border regions.
3. Bernard D. Cole, *The Great Wall at Sea: China's Navy Enters the Twenty-First Century,* 2nd ed. (Annapolis, MD: Naval Institute Press, 2010), p. 104; Gao Xiaoxing, *The PLA Navy* (Beijing: China Intercontinental, 2012), p. 116.
4. IISS, *The Military Balance 1996/97* (London: 1996), p. 180.
5. U.S. Defense Dept., *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2013* (Washington, DC: Office of the Secretary of Defense, 2013), pp. 7 and 76. The Type 056 corvette is not considered a "fast-attack craft."
6. IISS, *The Military Balance 2013,* p. 290. David Axe, "China Builds Fleet of Small Warships While U.S. Drifts," *Wired Danger Room,* August 4, 2011, www.wired.com/dangerroom/2011/08/china-builds-warships/all/, states that eighty-three Type 022s have been built at a cost of forty million dollars per boat.
7. U.S. Defense Dept., *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2011* (Washington, DC: Office of the Secretary of Defense, 2011), p. 43.
8. The number of boats per flotilla is extrapolated from numbers found in Office of Naval Intelligence, *The People's Liberation Army Navy: A Modern Navy with Chinese Characteristics* (Suitland, MD: 2009), p. 13, with fifteen FACs in the NSF, thirty-two in the ESF, and thirty-three in the SSF.
9. The designators (*budui,* 部队) for each *zhidui* are from the *Directory of PRC Military Personalities,* October 2011, pp. 41, 47, 53, and 54, and Birger Graae, e-mail to author, May 18, 2013. FAC squadron locations have been identified using Google Earth and may be found at installations other than their *zhidui* headquarters. Each squadron has a separate five-digit unit designator different from its *zhidui*'s designator.
10. Office of Naval Intelligence, *China's Navy 2007* (Suitland, MD: 2007), p. 40; Gao, *The PLA Navy,* p. 117.
11. "Type 037-II (Houjian Class) Missile Corvette," SinoDefence.com, March 1, 2009, available at www.sinodefence.com/navy/littoral/type037ii_houjian.asp.
12. Office of Naval Intelligence, *China's Navy 2007,* p. 40.
13. 英媒:中国海军隐身舰 现代海军史上的突破 ["British Media: PLAN Stealth Ship Breakthrough in Modern Naval History"], 中国军网 [*China Military Online*], April 13, 2008, available at pic.chinamil.com.cn/news/2008-04/13/content_1229764.htm.
14. Office of Naval Intelligence, *The People's Liberation Army Navy,* p. 20.
15. U.S. Defense Dept., *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2012* (Washington, DC: Office of the Secretary of Defense, 2012), p. 23.
16. Andrew S. Erickson, "Chinese Anti-ship Cruise Missile Firing as Part of Combined Arms Anti-carrier Exercises in East China Sea, 30 June–5 July," *Andrew S. Erickson,* July 6, 2010, www.andrewerickson.com/2010/07/combined-arms-anti-ship-exercise-in-east-china-sea-30-june-5-july/. The reported range of the YJ-83 varies from 180 kilometers (about 97 nautical miles) for the surface-launched version to 225 to 250 kilometers (about 121 to 135 nautical miles) for the air-launched variant. See Christopher Carlson, "China's Eagle Strike-8 Anti-ship Cruise Missiles," *Clash of Arms,* February 2013, www.clashofarms.com/files/Eagle_Strike_8.pdf. For additional discussion of the Type 022's capabilities, see Axe, "China Builds Fleet of Small Warships," and John Patch, "A Thoroughbred Ship-Killer," U.S. Naval Institute *Proceedings*

136/4/1,286 (April 2010), available at www.usni.org/magazines/proceedings/2010-04/thoroughbred-ship-killer.

17. Information Office of the State Council, *China's National Defense in 2000* (Beijing: September 2000), available at english.gov.cn/official/2005-07/27/content_17524.htm.
18. Information Office of the State Council of the People's Republic of China,"The Diversified Employment of China's Armed Forces," April 16, 2013, available at eng.chinamil.com.cn/news-channels/china-military-news/2013-04/16/content_5301637.htm.
19. A few examples of FAC exercise reporting include 南海舰队新型导弹快艇演练 隐身战法曝光 ["SSF New Missile Fast Boat Exercise Exposes Stealth Tactics"], *CCTV,* December 29, 2009, available at news.cntv.cn/china/20091229/104394.shtml; 海军:新型导弹快艇进行编队攻防训练 ["Navy: New Missile Fast Boats Conduct Formation Offense and Defense Training"], *CNTV,* January 18, 2013, available at news.cntv.cn/2013/01/18/VIDE1358469921190917.shtml; 军事报道 [*Military Report*], *CCTV-7,* February 16, 2013, available at military.cntv.cn/program/jsbd/20130216/105165.shtml; "PRC: JFJB Details Tri-service Exercises Aiming at Defending National Sovereignty," *Jiefangjun Bao,* September 12, 2012, Open Source Center [hereafter OSC] CPP20120912787012; and "CCTV-Xinwen: PLA Navy SSF Missile Corvettes Formation Conduct Maritime Drills," *CCTV-Xinwen,* March 29, 2013, OSC CPP20130401075001.
20. "PRC: Air Force, Navy, 2nd Artillery Corps Conduct Live-Fire, Simulated Drills," *Jiefangjun Bao,* September 15, 2012, OSC CPP20120915704006; "East Sea Fleet Holds Joint Exercise to Test New Information Warfare Tactics," *Jiefangjun Bao,* September 26, 2012, OSC CPP20120926787022.
21. "PLA East Sea Fleet Missile Speedboat Explores Covert Navigation Ability," *Zhongguo Qingnian Bao,* September 14, 2012, OSC CPP20120914787016.
22. "Xinhua: PLA Carries Out Exercise with 1st New Missile Speedboat Regiment," Xinhua, April 9, 2009, OSC CPP20090409136012.
23. "PRC: JFJB on Combat Effectiveness of PLA Navy's New-Generation Missile Speedboat," *Jiefangjun Bao,* September 13, 2012, OSC CPP20120913787007.
24. U.S. Defense Dept., *Military and Security Developments 2013,* pp. 4, 7, and 74.
25. IISS, *The Military Balance 2013,* p. 290.
26. The Type 079 Yulian-class LSM has variously been called Yuliang, Yuling, or Yulin. Numbers from Birger Graae, e-mail to author, May 20, 2013.
27. U.S. Defense Dept., *Annual Report to Congress: Military Power of the People's Republic of China 2009* (Washington, DC: Office of the Secretary of Defense, 2009), pp. VIII and 38. The Pentagon's very first report to Congress, in 1997, contained the same judgment.
28. Over the past fifteen years, the PLA ground forces have created two amphibious mechanized infantry divisions, one in the Nanjing Military Region (MR) and one in the Guangzhou MR, in addition to the previously existing single amphibious armored brigade in the Nanjing MR, for a total of about twenty-five thousand personnel. In addition to army amphibious units, which consistently train each year for landing operations, many other army units have trained to some extent, but less frequently, in landing operations.
29. 北海舰队某部官兵住上了舒适温馨的"水兵之家" ["NSF Sailors Live in a Comfortable Home"], *China Military Online,* January 27, 2012, navy.81.cn/content/2012-01/27/content_4775324.htm.
30. These numbers are derived from U.S. Defense Dept., *Annual Report to Congress 2012,* p. 28. Office of Naval Intelligence, *The People's Liberation Army Navy,* p. 13, counts nine amphibious ships in the NSF, nineteen in the ESF, and thirty in the SSF; updated in Graae e-mail, May 20, 2013.
31. "Ukraine Delivers First Air-Cushioned Landing Craft to Chinese Navy," *Interfax News Wire,* April 19, 2013, www.interfax.co.uk/russia-military-news/ukraine-delivers-first-air-cushioned-landing-craft-to-chinese-navy/.
32. The name of the third LPD is found at the webpage www.freewebs.com/riverman/flottaplan.htm. The Chinese defense industries are believed also to be working on helicopter landing dock (LHA/LHD) amphibious assault ships. However, none have been reported launched yet.
33. Birger Graae estimates the Type 071 can accommodate about seventy amphibious vehicles, considerably more than other estimates of the ship's capacity. Graae e-mail, May 20, 2013.
34. Office of Naval Intelligence, *The People's Liberation Army Navy,* p. 20.
35. Qian Xiaohu et al., "Chinese Naval Taskforce in Beach-Seizing and Landing Training," *China Military Online,* March 22, 2013,

eng.chinamil.com.cn/news-channels/photo-reports/2013-03/22/content_5274829.htm; Qian Xiaohu and Song Xin, "Chinese Naval Task Force Patrols Meiji Reef," *China Military Online,* March 29, 2013, eng.chinamil.com.cn/news-channels/photo-reports/2013-03/29/content_5282808_5.htm; Gan Jun, "'Jinggangshan' Ship Force Group in Maritime Right-Safeguarding-Oriented Training," *China Military Online,* April 2, 2013, eng.chinamil.com.cn/news-channels/photo-reports/2013-04/02/content_5287519.htm; Calum MacLeod and Oren Dorell, "Chinese Navy Makes Waves in South China Sea," *USA Today,* March 27, 2013, available at www.usatoday.com/story/news/world/2013/03/27/china-military-south-china-sea/2023947/.

36. Dennis J. Blasko, *The Chinese Army Today: Tradition and Transformation for the 21st Century,* 2nd ed. (London: Routledge, 2012), pp. 185–90.
37. Dennis J. Blasko, "PLA Amphibious Capabilities: Structured for Deterrence," Jamestown Foundation *China Brief* 10, no. 17 (August 19, 2010), available at www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_news%5D=36770.
38. Hu Haijun and Yang Zurong, "Launch of New Civilian Ship Helps PLA Enhance Strategic Projection Capability," *China Military Online,* August 9, 2012, eng.chinamil.com.cn/news-channels/china-military-news/2012-08/09/content_4987597.htm.
39. "Ro-ro Passenger Ship Makes Maiden Voyage," *People's Daily,* July 12, 2006, available at english.peopledaily.com.cn/200607/12/eng20060712_282368.html; "China's Largest Locally Produced RO-RO Passenger Ship Makes Debut," *Shandong on Internet,* October 19, 2009, www2.china-sd.com/News/2009-10/19_3727.html; Chen Li and Du Mingjun, "Advanced Passenger Ro-ro Ship Commissioned in Shenyang MAC," *China Military Online,* January 19, 2012, eng.mod.gov.cn/Photos/2012-01/19/content_4339129.htm.
40. Peng Guangqian and Yao Youzhi, eds., *The Science of Military Strategy* (Beijing: Military Science Publishing House, 2001 [Chinese edition] / 2005 [English edition]), p. 213. Page numbers are for English edition.
41. Ibid., p. 228.
42. Ibid., p. 224.
43. Ibid., p. 468.
44. Ibid., p. 222.
45. Ibid., pp. 456–57. Likewise, the 2006 white paper specifically states, "The Navy is enhancing research into the theory of naval operations and exploring the strategy and tactics of maritime people's war under modern conditions."
46. Ibid., p. 454.
47. Sun Yanxin and Ju Zhenhua, "Chinese Navy Normalizes Open-Sea Training," *China Military Online,* December 12, 2012, eng.chinamil.com.cn/news-channels/china-military-news/2012-12/12/content_5138811.htm.
48. 30多次军演提升综合作战能力 ["More Than 30 Exercises Improve Comprehensive Combat Capability"], 中国军网 [*China Military Online*], April 15, 2009, pic.chinamil.com.cn/zt/2009-04/15/content_1727697.htm.
49. Sun and Ju, "Chinese Navy Normalizes Open-Sea Training."
50. 海军:勇闯大洋苦练硬功 持续大抓军事训练 ["Navy: Marching into the Ocean Working Hard to Continuously Grasp Military Training"], 中国军网 [*China Military Online*], December 12, 2012, chn.chinamil.com.cn/zghj/2012-12/12/content_5137937.htm.
51. Information Office of the State Council, *China's National Defense in 2004* (Beijing: December 2004), available at english.gov.cn/official/2005-07/28/content_18078.htm.
52. U.S. Defense Dept., *Annual Report to Congress 2012,* p. 19.

CHAPTER TWO

What Do China's Surface Fleet Developments Suggest about Its Maritime Strategy?

Bernard D. Cole

A maritime strategy is designed primarily to defend a nation's homeland and associated vital national security interests on the oceans and seas. It also may incorporate nontraditional naval missions, which seek to maintain the security of the commons against threats such as the proliferation of weapons of mass destruction, piracy and international criminal activity, and terrorism, and to perform humanitarian assistance and disaster relief ashore.

But maritime strategy is not simply a matter of naval forces and national security objectives; a nation's domestic political priorities and economic demands are major, indeed vital, influences on developing and executing a maritime strategy. Maritime strategy subsumes naval strategy. Developing effective strategy does not result primarily from composing "overarching, erudite strategic theories" but from "day by day policy and program choices, backed up by thorough training and experience . . . and by a modern, multifaceted fleet capable of swift deployment and effective employment" of naval forces.[1]

Elements of China's Maritime Strategy

China has not promulgated a formal maritime strategy, a failure criticized by representatives at the spring 2012 meeting of the National People's Congress in Beijing. They called for the government to "formulate and promulgate a complete, comprehensive, and systematic maritime development strategy, with all the national political, economic, and military factors being brought into consideration!"[2]

But important Chinese governmental and Communist Party documents do address maritime strategic issues. One is the 1998 *National Ocean Policy of China*.[3] The 1998 *Ocean Policy* identifies several maritime concerns that remain pertinent today. These tasks have been placed within a framework of "four coordinations": between national and international maritime law; among China's many agencies concerned with the management of maritime issues; between traditional and nontraditional maritime security issues; and between national priorities and international paradigms.

Another is the series of biennial defense white papers first published in 1998, the most recent of which at this writing was published in early 2015. These papers contain important indicators of maritime strategic thought.[4] The concept of "offshore defensive operations" was addressed in the 2004 white paper, which stated that "the Navy has expanded the space and extended the depth for offshore defensive operations." This verbiage was repeated in the 2006 iteration, then expanded in the 2008 white paper: "[S]ince the 1980s the Navy has realized a strategic transformation to offshore defensive operations." The 2010 paper discussed the People's Liberation Army (PLA) Navy (PLAN) strategy in terms of "the requirements of offshore defensive operations" in three maritime areas of concern: the Yellow, East China, and South China Seas. Sometimes referred to as the "three seas" or the "near seas," these waters clearly are considered by Beijing to form the maritime arena of greatest strategic concern to the nation.[5]

"Offshore defensive operations" within the three seas represent a formidable national strategic focus. For instance, on July 8, 2010, a Chinese foreign ministry spokesperson stated, "We resolutely oppose foreign military ships and aircraft coming to the Yellow Sea and other Chinese adjacent waters and engaging in activities that influence China's security interests."[6] This view, combined with aggressive actions against foreign fishing craft in the South China Sea and against U.S. surveillance aircraft and ships, points toward a view of these waters as "sovereign" and of vital strategic concern to China.

The 2013 white paper continued to emphasize the PLAN's responsibility "to protect the seas and oceans, and build China into a maritime power." The navy was "responsible for safeguarding [China's] maritime security and maintaining its sovereignty over its territorial seas" while executing "its offshore defense strategy."

Additionally, China's civilian and military leaders have addressed maritime strategy in speeches and articles. President Hu Jintao's "Four Historic Missions" speech in 2004, for instance, reflected important maritime strategic interests. These included Taiwan's status, maritime border issues, and "protection of China's expanding national interests," including missions other than war.[7] Hu returned to these themes in a December 2006 speech to the Party's Central Military Commission, in which he urged the PLA "to develop capabilities to deal with many kinds of security threats and complete diversified military tasks . . . in distant waters."[8]

Adm. Liu Huaqing, who may be called the father of modern China's first global navy, developed a strategic plan of sorts in the 1980s. His program for modernizing the navy was well thought out, recognized internal PLA budget priorities (and his goal to alter those to increase PLAN funding), and was essentially defensive.

Liu's "island chains" construct is best viewed as a reactive strategic paradigm, as he responded to perceived U.S.-imposed lines at sea. Liu viewed the island chains as barriers

to be overcome, not as limits on China's maritime objectives or as bases for maritime defensive perimeters.[9]

In sum, China's "maritime strategy" is traditional: it is concerned primarily with defense of the homeland. Secondarily it is concerned with the other missions addressed above: defense against threats on the maritime commons; safeguarding economic interests, including the security of sea lines of communication; and responding to humanitarian crises afloat and ashore. Beijing's "maritime strategy" also supports the continued rule of the Chinese Communist Party (CCP), suggesting that China would employ its navy in situations for political reasons that other nations might not anticipate.

The Strategic Maritime Missions

Although China's maritime strategy is not formally promulgated, it includes traditional naval missions. These support both domestic political goals, especially sovereignty concerns, and traditional economic objectives.

Defending China's Littoral

Defense of the homeland and its littoral waters is Beijing's number one strategic priority for its navy. The U.S. Navy is concerned with the regional plan of operations China apparently is developing, what non-Chinese analysts describe as antiaccess and area-denial (A2/AD). This plan is intended to guarantee China control of the sea in the maritime area deemed vital to its national security. More specifically, it is intended to prevent an opponent—the United States—from intervening in a scenario involving armed conflict with Taiwan, or other military operations in the three seas.

China presumably would rely primarily on submarines, antiship cruise missiles (ASCMs), and antiship ballistic missiles (ASBMs) to defend its maritime interests in the area between the Chinese coast and the second island chain, a distance of approximately 1,600 nautical miles (nm).[10] This would constitute an application of China's policy of "Active Defense," in its own view—whereas a U.S. analyst might well consider it "offensive." The PLAN's surface combatants likely would be responsible for a defensive line relatively close to the coast.

The PLAN will not be constrained by lines or Western defensive concepts in defending China's maritime interests. Its doctrine is one of "strategically defensive and active self-defense counterattack," which could be triggered "as soon as the enemy splits and invades China's territory, severely harming China's interests, . . . equivalent to firing the first shot at China at the strategic level." Furthermore, the PLA's mission is "to do all we can to dominate the enemy by striking first . . . as far away as possible."[11]

The 2006 *Science of Campaigns* ascribed to maritime operations shifting battle lines and the maneuverability and offensive power of naval forces. It discussed naval campaigns at length, noting the sea's characteristics of openness and lack of defensive lines, which require taking the initiative with offensive operations to neutralize enemy forces. The volume emphasized flexibility and the clever employment of tactics and forces, with asymmetric operations on, above, and beneath the sea. Even naval defensive operations, in the PLAN's view, should be imbued with an offensive spirit based on taking the initiative and attacking the opponent's weak points.[12]

PLAN strategists are focused on mobile, noncontiguous, nonlinear operations that bypass the island chains to achieve specific objectives for specific periods.

Sea Lines of Communication Defense

Chinese analysts have expressed concern that the United States might intervene in navigational choke points to intercept seaborne energy supplies destined for Chinese ports. From a naval operational perspective, this so-called Malacca Dilemma is baseless, but apparently real at least to some in Beijing, and might provide maritime strategic rationale for PLAN planners. Maritime sovereignty disputes are a more serious strategic concern. So the region presents a Chinese maritime strategist with serious maritime security concerns, most of them attributed to U.S. containment.

Military Operations Other Than War

Military operations other than war (MOOTW) form a relatively new mission for the PLAN. The 2013 defense white paper assigned the navy responsibility for "law enforcement, fisheries, [and securing] oil and gas exploitation" as well as ensuring "the safe flow of traffic in sea areas of responsibility." The navy also regularly performs one traditional naval mission not specifically addressed in these documents: presence, or naval support for diplomacy.[13]

On a cooperative tack, the white paper touted the PLAN's role in UN peacekeeping operations (UNPKOs), as well as its exercises with foreign navies. The paper took a positive slant on events and was worded for the public, but remains an important document, reflecting China's maritime security concerns.

Despite the lack of a single authoritative description of China's maritime strategy, a review of various Chinese documents and speeches reveals the missions that form a de facto maritime strategy for Beijing. This strategy seems to be driving PLAN modernization, particularly in terms of the surface ships being acquired.

Who Is the Strategic Opponent?

It is clear the PLAN views the U.S. Navy as "a strategic opponent of the Chinese Navy." In addition, a 2012 article written by a nongovernmental analyst described Japan as an immediate concern, noting "naval hatred stretching over one hundred years, Diaoyu Islands sovereignty, maritime boundaries in the East China Sea, and the possibility of Japanese military interference in the Taiwan issue and the South China Sea." Vietnam and the Philippines were categorized as "local tactical opponents" and India as a "potential blue-water opponent." Summing up the strategic situation, the author concluded that the "Chinese navy now faces a maritime competition structure that involve[s] a broad maritime region, great depth, and multiple opponents."[14]

The Fleet

China's continuing economic growth, so crucial to continued CCP rule, is supported by one of the world's largest and most modern merchant marines. Its effectiveness depends to a significant degree on the security of the maritime commons. Beijing believes that security requires a strong, capable navy.

For it to perform the strategic maritime missions that policy makers have outlined, they have directed the PLAN to continue developing and deploying "new types of submarines, frigates, aircraft, and large support vessels" while building "a shore-based support system which matches the deployment of forces and the development of weaponry and equipment." Particularly important is "the Navy [accelerating] the building of surface logistical platforms [and] working to improve its surface support capabilities," to include "new methods of logistics support for sustaining long-time maritime missions."[15]

Purchasing Soviet combatants in the 1950s and copying Soviet models in the 1960s and 1970s marked the first era of PLAN growth. China's maritime strategy during this period focused on coastal defense or army support.

The second era was marked by acquisition of the *Sovremenny*s from Russia and Chinese construction of the Luhu and Luhai classes. In the 1990s, China made a commitment to build a navy with a new strategic mission, usually described in the United States as "missions other than war."

China moved into a third and most significant period of naval surface ship modernization after the turn of the twenty-first century, with indigenous construction of four new classes of guided-missile destroyers (DDGs) and several classes of guided-missile frigates (FFGs). This latest phase of ship acquisition is equipping the PLAN with its first warships able to support a maritime strategy focused beyond China's littoral, throughout the three seas.[16]

The navy's most recent addition to the PLAN's auxiliary forces is China's first dedicated hospital ship, the Type 920, named *Peace Ark,* commissioned in 2008. This 23,000-ton-displacement ship has a combat mission, but to date has been Beijing's primary platform for pursuing soft power, making humanitarian cruises to the western Indian Ocean and to the Caribbean Sea.

Future Intentions at Sea?

The decision early in the current decade to build additional underway replenishment ships indicates Beijing's inclination to deploy a navy capable of operating at sea for extended periods. Two Fuchi-class oilers joined the fleet in 2005; one each was assigned to the East and South Sea Fleets. These are the first PLAN logistics-support ships capable of simultaneously providing destroyers and frigates with fuel, provisions, and ordnance. Two more of this class joined the fleet in 2013.[17]

Beijing has emphasized the navy's increasing role in international efforts in general, striving "to maintain maritime security through multiple peaceful ways and means." It highlighted PLAN ship visits to foreign ports, with "more than twenty naval ships" visiting "more than thirty countries."[18] Additionally, the PLAN played its first prominent role in MOOTW in 2011, when the frigate *Xuzhou,* on antipiracy patrol in the Gulf of Aden, was dispatched into the Mediterranean to assist in evacuating Chinese citizens trapped by the civil war in Libya.[19] That this frigate did not actually evacuate any Chinese citizens is not as significant as the fact that Beijing had the confidence to dispatch a warship on such a mission and that the PLAN was able to execute the mission successfully.

China's naval building program remains focused on missions in the three seas, but the PLAN is adapting gradually to new missions in distant seas. Only the newer destroyers and frigates are being deployed on the Gulf of Aden mission. These are the PLAN surface combatants well suited to escorting China's developing carrier fleet.

During the past two decades, the PLAN has added to its fleet approximately seventeen DDGs, twenty-four FFGs, at least ten corvettes, and more than sixty Houbei-class patrol craft capable of firing cruise missiles. Additionally, three Yuzhao-class amphibious transport docks (LPDs) and twenty-four tank landing ships (LSTs) have been added to China's amphibious force.

China's program of naval modernization has accelerated since 2000, with most of these new ships commissioned during that period. This pace reflects Beijing's expanding but carefully modulated strategic maritime ambitions.

As the new century's second decade proceeds, China is deploying ships capable of operating in coherent, if not yet integrated, naval task forces able to project power on the seas. These new platforms are the beginning of the first really modern Chinese navy that

may serve to deter Taiwan, thwart U.S. intervention, and secure China's territorial claims in the East and South China Seas.

New Destroyers. The PLAN continues to acquire new classes of frigates and destroyers, each more technologically advanced and capable than its predecessors. These ships remain few in number, although not as few as the support ships necessary for the PLAN to execute long-range, long-term deployments on a regular basis.[20]

China's new DDG classes—which should give pause to the U.S. and other navies—began with the Luzhou class, or Type 51C. The first ship in this class is *Shenyang* (DDG 115), launched in 2003 and commissioned in 2004. The second class member is *Shijiazhuang* (DDG 116), also launched in 2003 but commissioned in 2005. The ship's formidable antiair warfare (AAW) system is built around the Russian SA-N-20 Rif-M missile, the naval version of the S-300; acquired by China in 2002, this is a twenty-year-old but still daunting missile system, with an 81 nm range and maximum speed of Mach 6.

The Luzhous are also equipped to participate in the antisurface warfare (ASUW) mission area, armed with eight potent C-803 surface-to-surface missiles (SSMs). The ship exhibits the typically limited PLAN antisubmarine warfare (ASW) capability. Its primary ASW weapon should be the helicopter it is capable of embarking, but operating this aircraft is limited by the lack of a hangar.

Joining the fleet contemporarily with the Type 51C are the three Luyang ship classes, the Types 52B, 52C, and 52D, displacing approximately the same seven thousand tons as the 51C. The 52s appear to be a Chinese version of the Soviet *Sovremenny*-class DDGs, intended as a multimission naval task group's primary ASUW platform. Their main battery is the same box-launched C-803 SSM found on the 51C.

The several Type 52C and 52D DDGs appear to be built on the same hull as the 52B and equipped with the same propulsion plant, guns, and ASW and electronic countermeasures capabilities. However, their primary mission is AAW; the ships' most notable topside feature is an Aegis-like phased-array radar system. They apparently are armed with the Hongqi (HQ-9) AAW missile system, with a range of 54 nm and speed of Mach 3, relying on semiactive radar homing. The ship also has a very capable ASUW suite, composed of eight C-802 SSMs in two cylindrical launchers amidships. These are the first Chinese combatants capable of area AAW, a key requirement for operating multiship formations.

New Frigates. The PLAN is acquiring the Jiangkai I and II–class FFGs, which, while significantly less capable than the DDGs, exhibit the most "stealthy" characteristics of any PLAN ship. They may have been designed to operate primarily in littoral waters, but apparently have been performing very well during extended operations in the Gulf of Aden.

China also is building a new, smaller class of multimission-capable escort, the Type 056 corvette. This 1,300-ton-displacement warship will be ideal for sale to foreign nations, but also provides the PLAN with an escort vessel well suited to coastal waters.[21]

New Amphibious Warfare Ships. Since 2000, the PLAN's shipbuilding program has included modernization of its amphibious force, without significantly expanding that force's capacity—the PLAN is still limited to transporting approximately one mechanized division of fully equipped troops.[22]

China has built more than twenty new LSTs and smaller medium landing ships (LSMs) since 2000, all capable of landing troops and equipment directly on a beach, over a bow ramp, and all equipped with a flight deck. However, all these ships have been built without hangars or aviation maintenance facilities.

These ships could serve in a Taiwan scenario, but the paucity of suitable landing beaches on that island and the positive trend at this writing in the relationship between Beijing and Taipei make an amphibious assault unlikely. Instead, recent events in the South China Sea and the new PLAN bases in that theater indicate that China's amphibious force has a strategic focus on the disputed land features south of Hainan.

New Fast-Attack Craft. China's newest class of small combatant is the Houbei-class catamarans, which the PLAN began building in 2004. At least sixty are now in commission or under construction. They are small, displacing just 250 tons, but remarkably seaworthy because of their wave-piercing hull. Each Houbei is armed with eight C-803 SSMs. If equipped with a datalink capability, they provide the PLAN with a new capability to deploy anti–surface ship barriers in coastal waters that would be nearly immune from submarine attack and would offer a difficult target to attacking aircraft.[23]

Mission Capability

The surface combatant force has made major strides in the past decade, now mustering its first area AAW defense destroyers and more-capable ASW ships. The next destroyer class is reportedly well into the design process and will represent a significant increase in size, perhaps displacing over ten thousand tons, matching the size of the U.S. *Arleigh Burke*–class destroyers. The PLAN is focusing on the Luyang and Jiangkai classes as its primary surface combatants.[24] The Chinese navy is building a numerically large class for the first time since the Luda DDGs.

Despite its new platforms, the PLAN's command-and-control (C2) information management remains problematic, although "link" systems are in place, allowing coordinated operations both among ships and between a ship and its embarked helicopter. It seems clear that the PLAN, even in its newest ships, has yet to demonstrate the C2 capability

necessary to conduct net-centric operations successfully in the twenty-first-century maritime battle space.

In sum, the Chinese navy at the beginning of the century was still severely limited in several warfare areas necessary to a modern strategic maritime force. Currently the PLAN is developing that credibility in all warfare areas—even if it remains marginal in AAW, antimine warfare (AMW), and force integration, and simply inferior in ASW.

State Oceanic Administration

China deploys a large number of smaller vessels organized under various national ministries. Beijing is attempting to increase the utility of these organizations, marked by the March 2013 announcement that the State Oceanic Administration (SOA) would retain or take administrative control of the coast guard, Fisheries Law Enforcement Command, China Marine Surveillance, and Border Maritime Police.[25] This very logical step potentially will provide a single national ministry, Land and Resources, with the capability and authority via which Beijing can exercise rational control over its maritime enforcement organizations.

Several points of uncertainty remain, however. First is the as yet unclear role of the State Oceanic Commission, also recently announced. Second is the unclear role and chain of command of the Maritime Safety Administration. Third is the issue of operational control of the SOA's newly assigned units. Will the coast guard, for example, no longer be operationally controlled by the Ministry of Public Security? Finally, and most importantly, will the newly authoritative SOA be able to maintain its independence from the PLAN, which reportedly for many years has sought the ability to call on China's "coast guard" forces and resources to supplement its maritime missions?

PLAN Strategic Readiness Today

The PLAN's number of state-of-the-art ships does not yet give it the ability to dominate East or South Asian waters, when measured against the U.S. Navy, the Japan Maritime Self-Defense Force, or possibly even the Indian navy. However, measuring total naval forces against one another is not particularly useful in strategic terms; what is more meaningful is a Clausewitzian measure: How large and effective a naval force can China deploy against a given objective at a time of Beijing's choosing? Whether this mission concerns Taiwan or an East or South China Sea objective, Beijing likely will be able to seize the initiative when employing its new navy.

China's recent naval exercises and deployments have demonstrated the PLAN's ability to employ twenty-first-century ships on operations to far seas. More significant than the number of advanced technology platforms joining the PLAN, however, is the strategic

maritime direction they indicate Beijing has adopted. As discussed above, the shorthand by which U.S. observers refer to this perceived goal is A2/AD.

The PLAN presumably is writing operational doctrine to enable its ships to play an important role in accomplishing A2/AD in the three seas. This comprises a coherent maritime strategy that reflects PLAN capabilities.

China's first aircraft carrier, *Liaoning,* joined the fleet in 2012. The ship has yet to receive a full carrier air wing, but organization of the PLAN's first such wing was announced in May 2013.[26] Beijing almost certainly will build two or more additional carriers, possibly nuclear powered. More important than the carriers themselves is their symbolism of Beijing's apparent intention to deploy a navy capable of out-of-area operations on a sustained basis.

Beijing's focus on maritime issues is understandable, given China's dependence on seaborne trade, its 10,250 nm of coastline, and its more than 6,500 claimed islands. China is also the world's leading shipbuilder and its shipping fleet is the world's fourth largest. China has eight of the world's ten largest harbors, and its "ocean-related activities" constituted almost 10 percent of the nation's gross domestic product (GDP) in 2009.[27] Finally, while Chinese government officials have listed as "core interests" only the sovereignty status of Taiwan, Tibet, and Xinjiang, classifying the East and South China Sea disputes as "sovereignty issues" suggests that these also could be considered "core interests." These disputes would then rise significantly in Beijing's priorities and pose a greater chance that the PLAN would be employed to enforce strategic policies.

In a long 2011 article, Vice Minister of Foreign Affairs Dai Bingguo argued that China had been following and would continue to follow a national policy of "peaceful development" rather than following "the western powers' practice of invasion, plunder, war, and expansion." That is a very selective view of China's history. Furthermore, as a professor at China's National Defense University noted, "peaceful development . . . does not mean that military means are not employed."[28]

Will the beliefs embodied in Dai's discourse affect the PLAN's future composition, capability, and strategic employment? China's mantra about future naval modernization includes the claim that the country never has been expansive or aggressive, nor has it stationed military forces overseas. All these claims are extremely debatable, given China's dynastic history of expansion and foreign expeditions, but it is too soon to know to what extent current PLAN modernization will take Chinese forces overseas.

The PLAN's near-term strategic focus will remain on potential Taiwan scenarios, which include U.S. naval intervention. East and South China Sea concerns are secondary. Future out-of-area PLAN operations likely will expand, particularly after the Taiwan issue

is resolved. Such operations may focus on sea lines of communication security, but more practically will reflect the historically typical move by a nation gaining global economic status: deploying a global navy.

Two issues of particular concern to the PLAN are, first, India's apparent maritime strategy of effectively controlling the Indian Ocean and, second, the potential for the United States to control navigational choke points crucial to China's trade, and hence to its economy. Beijing may be exaggerating both concerns, but that does not reduce their influence in China's maritime strategic thought, which seems to assume that the United States is determined to contain and encircle China. One analyst at the influential PLA Academy of Military Science has described the PLAN as "relatively weak," with "China's maritime security at the mercy of . . . the United States Navy."[29]

Future Chinese maritime expansion will depend in large part on the nation's continuing GDP growth and lack of serious threat to its very long land borders. In fact, China is already a global maritime power when one considers the nation's existing navy, globally ranked merchant fleet, shipbuilding industry, and cargo-handling seaports.

Beijing must be reassessing continually how much to invest in the PLAN and how to employ its modernizing capabilities. Previous examples of developing nations emerging as global powers indicate that if China's global economic impact continues to grow, so will its navy.

Beijing's national security concerns are traditional, including defense of the homeland and against potential threats in the near seas, especially relating to Taiwan's status. Additionally, the PLAN already has demonstrated its ability to conduct noncombat naval missions, including counterpiracy operations, evacuation of Chinese citizens from danger zones, disaster relief, presence, and UNPKOs.

China views the United States as the primary strategic threat to its national security interests, especially in view of the 1979 Taiwan Relations Act and the 1996 Taiwan Strait crisis, as well as updated U.S. defense treaties with Japan, South Korea, the Philippines, and Australia. The U.S. determination to strengthen relations with Vietnam, Singapore, and India also causes concern in China. U.S. treaties and special relationships throughout the Indo-Pacific area paint an unfavorable strategic picture for Beijing.

China apparently is trying to beat the historical odds by transitioning from a continental to a concurrent maritime power, so as to gain the latter without losing the former.[30] History does not offer ready examples of land powers also becoming sea powers, with France, Germany, and Russia having failed to do so. If China succeeds in building and deploying an effective global navy, it will have beaten the historical odds.

The PLAN has progressed from operating obsolete Soviet ships to building near-state-of-the-art combatants able to play their role in a formidable defensive maritime strategy.

It is deploying ships that are suitable for multimission task groups. However, Beijing remains focused on the three seas—while looking toward wider horizons.

Despite the lack of a public document with that title, China does have a maritime strategy. It is unremarkable and traditional for a large, wealthy nation that is expanding its sea power. The PLAN surface fleet is an integral component of Beijing's maritime strategy. That strategy begins with defense of the homeland—defending the coast and littoral waters. For China, this encompasses a huge maritime area extending approximately 1,600 nm from its coastline. The responsibility includes not just defense of those waters but defense of the extensive maritime trade on which China's economy depends.

Second is strategic deterrence, a maritime capability the PLAN is well able to execute in conventional terms. The nuclear part of deterrence remains one for which China is still striving, but that appears to be on this side of the PLAN's horizon.

The third element in Beijing's maritime strategy is the ability to conduct long-range power projection on a situational, but if necessary recurrent, basis. The counterpiracy deployments to the Gulf of Aden since 2008 show that the PLAN is making progress toward achieving this capability.

Fourth is presence, the maritime diplomatic mission that China's navy has demonstrated for the past quarter-century or more, as both warships and auxiliaries—from guided-missile destroyers to hospital ships—visit foreign ports and participate in exercises with foreign navies.

Fifth, and most important, is conducting combat operations at sea. This obviously is the first reason for which navies are created.

Former U.S. commander of Pacific forces Adm. Robert Willard stated that China "aspires to become a 'global military (power)' by extending its influence beyond its regional waters."[31] Some believe that a Chinese drive to global power will lead to conflict with the United States.[32] That is far from certain, but the possibility must influence U.S. naval strategic thought.

China is building and deploying a twenty-first-century navy to be able to defend its interests at sea. A new force of surface combatants armed with impressive ASCMs and with growing AAW capabilities is emerging rapidly to serve Beijing's maritime strategy.

Notes

1. Adm. Arleigh Burke's thoughts, restated by David Alan Rosenberg in "Process: The Realities of Formulating Modern Naval Strategy," in *Mahan Is Not Enough: The Proceedings of a Conference on the Works of Sir Julian Corbett and Admiral Sir Herbert Richmond,* ed. James Goldrick and John B. Hattendorf, Historical Monograph 10 (Newport, RI: Naval War College Press, 1993), p. 144ff.
2. See, for instance, Fei Shiting and Chen Xiaojing, "Enrich and Strengthen the Nation through Maritime Development—PLA Deputies to the NPC Call for Introducing a Maritime Strategy,"

Jiefangjun Bao, March 9, 2012, Open Source Center [hereafter OSC] CPP20120309787007, p. 7; Rear Adm. Yin Zhou's statement in "China's Maritime Strategy Being Tested amid South China Sea Disputes," *Caijing,* October 24, 2011, available at english.caijing.com.cn/2011-10-24/110914257.html; and Maj. Gen. Luo Yuan, quoted in Russell Hsiao, "Military Delegates Call for National Maritime Strategy," Jamestown Foundation *China Brief* 11, no. 4 (March 10, 2011), www.jamestown.org/. The degree of policy-making incoherence in Beijing was indicated in a July 2011 speech by Maj. Gen. Zhu Chenghu, reported at opinion.huanqiu.com/roll/2011-07/1792964.html (no longer available online). Zhu called for a South China Sea strategy "where the lead agency is the State Oceanic Administration with input from the PLA, [Ministry of Foreign Affairs], [Public Security Bureau], [Ministry of Commerce], Ministries of Agriculture, Transportation, Defense, Customs, and coastal provinces."

3. This is an old document, but it still seems to describe China's current maritime policies accurately. Information Office of the State Council, *National Ocean Policy of China* (Beijing: May 1998), available at www.jodc.go.jp/info/ioc_doc/Technical/158387e.pdf. But also see "China Issues Plan for Maritime Development," *Xinhua,* April 26, 2012, news.xinhuanet.com/english/china/2012-04/25/c_131551501.htm.

4. Found at china.org.cn/government/whitepaper/node_7114675.htm.

5. See Andrew Erickson and Gabe Collins, "Near Seas 'Anti-navy Capabilities,' Not Nascent Blue Water Fleet, Constitute China's Core Challenge to U.S. and Regional Militaries," *China SignPost,* no. 55 (March 6, 2012), available at www.chinasignpost.com/wp-content/uploads/2012/03/China-SignPost-55_Strategic-Horizon_1A_Near-Seas-Are-The-Real-Challenge_20120306.pdf.

6. Statement is at www.mfa.gov.cn/chngxh/tyb/fyrbt/jzhsl/t714888.htm.

7. Discussed in James Mulvenon, "Chairman Hu and the PLA's 'New Historic Mission,'" *China Leadership Monitor,* no. 27 (January 9, 2009), available at www.fnvaworld.org/download/tibet-related-oc/Hu-PLAs-missions-2008.pdf.

8. Quoted in "Chinese President Meets Deputies for Military Meetings," *Xinhua,* December 7, 2011, news.xinhuanet.com/english/china/2011-12/06/c_131291648.htm.

9. See Bernard D. Cole, "Drawing Lines at Sea," U.S. Naval Institute *Proceedings* 137/11/1,305 (November 2011), available at www.usni.org/magazines/proceedings/2011-11/drawing-lines-sea.

10. Sixteen hundred nautical miles is the approximate distance from Shanghai to Palau, from Shanghai to Brunei, and from Shanghai to Guam (1,670 nm).

11. A2/AD apparently is not discussed, per se, in Chinese literature, although in Shi Xiaoqin, "Boundaries and Directions of China's Seapower," in *Twenty-First Century Seapower: Cooperation and Conflict at Sea,* ed. Peter Dutton, Robert Ross, and Oystein Tunsjo (Annapolis, MD: Naval Institute Press, 2012), p. 137, the author advocates that the PLAN develop "the capacity to deny access to the [U.S.] navy to China's sea territory." The PLA's "Active Strategic Counterattacks on Exterior Lines" approximates that operational policy and is discussed in Anton Lee Wishik II, "An Anti-access Approximation: The PLA's Active Strategic Counterattacks on Exterior Lines," *China Security,* no. 19 (2011), pp. 37–48. Peng Guangqian [Maj. Gen.], *Research on China Military Strategy Issues* (Beijing: PLA Press, 2006), p. 248, quoted in Wishik, "An Anti-access Approximation," p. 41, and in Michael A. McDevitt, "The PLA Navy Anti-access Role in a Taiwan Contingency" (paper prepared for the 2010 Pacific Symposium, "China's Naval Modernization: Cause for Storm Warnings," National Defense Univ., Washington, DC, June 10, 2010), p. 3.

12. 张玉良 [Zhang Yuliang], ed., 战役学 [*The Science of Campaigns*] (Beijing: National Defense Univ. Press, 2006), pp. 52, 577–79. Excerpt furnished by Dennis Blasko.

13. A useful summary is in Ni Eryan, "Putting Weapons Down to Achieve Peace: The Calmness of PLA Diplomacy," *Feng Huang Chou Kan* (Hong Kong), no. 378 (October 15, 2010), OSC CPP20101018787005, pp. 42–43; also see Kamlesh K. Agnihotri, "Military Operations Other Than War: PLA Navy's Role in 'Peaceful Development' of China," *National Maritime Foundation,* n.d., www.maritimeindia.org/CommentryView.aspx?NMFCID=1230; and Taylor Fravel, "Why 'Non-combat' PLA Operations Are Vital for China's Regime Stability," *Global Asia* 6, no. 2 (June 2011), available at www.globalasia.org/V6N2_Summer_2011/M_Taylor_Fravel.html.

14. Hai Tao, "The Chinese Navy Has a Long Way to Go to Get to the Far Seas," *Guoji Xianqu Daobao* (Beijing), January 6, 2012, OSC CPP20120109671003; PLAN officers, discussions with author, various dates and locations. Hai is a nongovernmental analyst.

15. "Chinese Navy Sees Role Further Afield," *Xinhua,* April 22, 2009, OSC CPP20090422968187.
16. "China Takes a Proactive and Open Attitude toward Intl. Escort Cooperation," *Xinhua,* March 31, 2011, news.xinhuanet.com/english2010/china/2011-03/31/c_13806943.htm.
17. Ship and weapons systems information comes from various Jane's Information Group publications.
18. People's Republic of China Ministry of National Defense, *China's National Defense in 2010,* available at eng.mod.gov.cn/.
19. Xinhua, "China Evacuates 12,000 from Libya, Sends Frigate to Help," *China Daily,* February 25, 2011, available at www.chinadaily.com.cn/china/2011-02/25/content_12075249.htm; Xinhua, "Chinese Navy Frigate Arrives Waters off Libya for Escort Mission," *People's Daily,* March 1, 2011, available at english.peopledaily.com.cn/90001/90776/90883/7305215.html.
20. Ship and weapons systems information in this section comes from various Jane's Information Group publications.
21. The U.S. Navy's littoral combat ship pales in comparison with the Type 056 in every category except speed and endurance.
22. Ship and weapons systems information in this section comes from various Jane's Information Group publications.
23. Ship and weapons systems information in this section comes from various Jane's Information Group publications.
24. Ship and weapons systems information in this section comes from various Jane's Information Group publications.
25. This reorganization is reported in "China to Restructure Oceanic Administration, Enhance Maritime Law Enforcement," *Xinhua,* March 10, 2013, news.xinhuanet.com/english/china/2013-03/10/c_132221768.htm.
26. On *Liaoning* (ex-*Varyag*), see Norman Friedman, "A Long Wait," U.S. Naval Institute *Proceedings* 137/10/1,304 (October 2011), pp. 88–89. Friedman provides an excellent analysis of this ship's history and problematic future, noting that it has been under construction since the early 1980s. An indigenously built carrier is discussed in Kathrin Hille, "China Reveals Aircraft Carrier Plans," *Financial Times,* December 17, 2010, available at www.ft.com/cms/s/O/fa7f5e6a-09cc-11e0-8b29-00144feabdc0.html?ftcamp=rss#axzz18NkTvXM6; Lin Liyao, "Ex-Varyag Carrier May Join PLA Navy in 2012," China.org.cn, March 10, 2012, www.china.org.cn/china/NPC_CPPCC_2012/2012-03/10/content_24860546.htm. Also see "China's Aircraft Carrier Finishes 9th Sea Trial," *Xinhua,* July 31, 2012, news.xinhuanet.com/english/photo/2012-07/31/c_131749394.htm; and "PLAN Establish Carrier Air Wing," *Malaysia Flying Herald,* May 13, 2013, available at malaysiaflyingherald.wordpress.com/2013/05/13/plan-establish-carrier-air-wing/.
27. These data are from Yang Mingjie, "Sailing on a Harmonious Sea: A Chinese Perspective," *Global Asia* 5, no. 4 (Winter 2010), p. 24, also at www.siis.org.cn/Sh_Yi_Cms/Mgz/.../20121916530B210.pdf.
28. Dai Bingguo, "Persisting with Taking the Path of Peaceful Development" (Ministry of Foreign Affairs statement, Beijing, September 15, 2011), available at www.fmprc.gov.cn/eng/zxxx/t860218.htm. The latter quote is from Han Xudong, "Peaceful Development Also Requires Military Support," *Liaowang,* no. 27 (July 4–10, 2011), p. 68, available at www.9abc.net/index.php/archives/5711.
29. Shi, "Boundaries and Directions of China's Seapower," p. 67.
30. See Gong Jianhua, "Sea Dispute a Real Test for China," *China Daily,* June 8, 2011, available at usa.chinadaily.com.cn/opinion/2011/06/08/content_12656288.htm. Historically, only the United States has been able to exercise both continental and maritime power; Moscow's attempt to do so in the 1970s and 1980s contributed to the Soviet Union's downfall.
31. Quoted in Yoichi Kato, "U.S. Commander Says China Aims to Be a 'Global Military' Power," *Asahi Shimbun,* December 28, 2010, available at www.asahi.com/english/TKY201201270279.html.
32. See, for instance, John J. Mersheimer, "China's Unpeaceful Rise," *Current History* 105, no. 690 (April 2006), pp. 160–62, and Robert S. Ross, "China's Naval Nationalism: Sources, Prospects, and the U.S. Response," *International Security* 34, no. 2 (Fall 2009), pp. 46–81. On the Chinese side, see Yang Yi, "China Must Have Strong Navy," Xinhua, December 5, 2011, available at www.chinadaily.com.cn/opinion/2011-12/02/content_14200571.htm. A more questioning position is offered in Bernard D. Cole, *The Great Wall at Sea: China's Navy in the Twenty-First Century,* 2nd ed. (Annapolis, MD: Naval Institute Press, 2010), and in Liu Zhongmin, "Some Thoughts on the Issue of Sea Power and the Rise of Great Nations," *World Economy and Politics,* no. 12 (December 2007), p. 22 note 24.

A Japanese Perspective on China's Evolving Surface Fleet

Yoji Koda

People's Liberation Army (PLA) Navy (PLAN) forces are organized into three fleets: the North Sea Fleet (NSF), the East Sea Fleet (ESF), and the South Sea Fleet (SSF). Together they are charged with covering and protecting waters extending from China's lengthy coastline.

The NSF is responsible for defending the Bo Hai (Gulf of Chihli) and Yellow Sea, and its nations of responsibility are North Korea and South Korea. Since this maritime area is closest to Beijing, China's capital, naval specialists sometimes call the NSF the "Imperial Guard Fleet."

The area of responsibility of the ESF is the East China Sea and the northeasternmost area of the South China Sea. So the ESF is believed to be tasked with preparing for a Taiwan crisis, operating around Japan's southwestern island chain, and patrolling the Bashi Channel / Luzon Strait between Taiwan and the Philippine Islands. The ESF's hypothetical adversaries long have been both the robust naval forces of the Self-Defense Fleet (SDF) of the Japan Maritime Self-Defense Force (JMSDF) and the mighty Seventh Fleet of the U.S. Navy, which have been close naval partners under the Japan–United States alliance for decades.

The SSF long has been charged with protecting China's national interests in the South China Sea, where the maritime security situation has been complicated by maritime disputes among the coastal states in the area. In particular, China's varied and unique unilateral claims in the South China Sea make the roles and mission of the SSF very complicated. The scope of the SSF's operations is broad, from the most difficult anti-submarine warfare (ASW) against submarines belonging to regional navies and the U.S. Navy to potentially complex amphibious warfare landings to seize remote and isolated islands.

Thus, to support China's strategic objectives and protect its national interests, the PLAN has to maintain three separate fleets. The nature of China's geopolitical situation makes integrated operations and mutual support efforts among them difficult to conduct in general.

The PLAN Destroyer/Frigate Force

From 1990 to the middle of the first decade of the twenty-first century, the PLAN tried to find the best solution for its fleets by building as many types of destroyers (DDs) as possible, but in small numbers. The PLAN has commissioned eight types of destroyers since 1990. These included two 4,700-ton Luhus (052A) in 2004 and one 6,100-ton Luhai (051B) in 1999. China also purchased two sets of two Russian-built *Sovremenny*s, Type Is in 1999/2001 and Type IIs in 2005/2006. All four were assigned to the ESF as "pinch hitters," ready to fill a naval resource gap revealed during the 1996 Taiwan crisis. In parallel with the Russian purchase, two 7,000-ton Luyang Is (052B) were completed in 2004, followed by two 7,200-ton Luzhou I (051C) sisters in 2006 and 2007.[1]

From this experience, the PLAN ultimately decided to build a single class of destroyers—the Luyang II (052C) sisters—in great numbers.[2] The PLAN commissioned two 7,200-ton Luyang IIs (052C) in 2005. They greatly resembled the U.S. Navy's *Arleigh Burke*–class guided-missile destroyer (DDG 51).[3] Follow-on ships were not built during the next eight years, but eventually construction resumed, with a new ship (DD 150) commissioned in 2013.

The reason for this interruption is unknown, but it probably was necessary for the PLAN to conduct at-sea system qualification tests, fleet acceptance tests, and fleet tactical-operational evaluations in realistic, even fierce, simulated combat environments. These tests and evaluations always take time; in cases of complicated and sophisticated systems, they can take two to three years to complete. Then it can take many years to implement corrective measures to the malfunctions or shortcomings discovered during the tests and evaluations. So it is not unusual to see a period of interruption during the construction timeline. There are also rumors that improvements to facilities at construction dockyards were another reason for the six-to-eight-year Luyang II "construction holiday."

In the renewed construction period, the PLAN has shifted to an improved and more modern Luyang III (052D). The first ship of this class was commissioned in early 2014. It looks as if the PLAN, like the U.S. Navy, finally has started to build a single class of destroyer in large numbers.

Frigate (FF) construction has proceeded in a very similar fashion, albeit at a faster pace. After the construction of fourteen Jiangwei Is and IIs (2,300 tons) in the 1990s and the first half of the first decade of the 2000s and two Jiangkai Is (4,000 tons) in 2005 and 2006 as intermediate transition ships, the PLAN started quantitative production of its latest Jiangkai II–class frigates (4,000 tons). Since 2008, sixteen Jiangkai II frigates have entered fleet service. The Jiangkai II is a handsome ship, with good stealth design, and its combat systems look modern.

There are about fifteen old Luda-family (modified ex-Soviet *Kotlin*) destroyers and about twenty-five obsolete Jianghu I/II–family frigates in fleet service today. However, given their long service lives and outdated combat systems, all these aged destroyers and frigates are likely to be retired by 2020.

Destroyer/Frigate Force Strength in 2020

What might the PLAN's surface fleet look like five to ten years from now? A March 2013 edition of the Japanese publication *Sekai no Kansen (Ships of the World)* provides estimates of the likely order of battle of the PLAN fleet in 2020. It will serve as a basis for discussion in the sections below.[4]

North Sea Fleet. According to *Sekai no Kansen,* the NSF likely will have six destroyers and five frigates in 2020. Both destroyers and frigates will be of the most modern classes of these ships in the PLAN. Table 1 provides details.[5]

Table 1

Type	Class	2013	2020
DD	051C Luzhou	2	2
	052A Luhu	2	2
	052D Luyang III	0	2
FF	054A Jiangkai II	0	5

East Sea Fleet. The ESF, which has been the PLAN's largest and most capable fleet, likely will be upgraded with six Aegis-like ships, i.e., four Luyang II and two Luyang III destroyers. Adding these to the four Russian-built *Sovremenny* sisters will improve the ESF's destroyer force substantially. One noteworthy element of the *Sovremenny* destroyer is its formidable antisurface warfare (ASUW) capability, provided by SS-N-21 antiship missiles. The Mach 2-plus–capable SS-N-21 has been regarded as the toughest surface-to-surface missile (SSM) threat against the surface forces of free-world navies since Cold War days. In this regard, the combination of the ASUW capability of the *Sovremenny*s and the antiair warfare (AAW) capability of the Luyang sisters will provide well-balanced combat capabilities to the ESF, whose potential opponents long have been the SDF of the JMSDF and the Seventh Fleet of the U.S. Navy. Four old Luda destroyers most likely will be decommissioned.

In 2013, the ESF operated sixteen new frigates and about ten old frigates. However, unlike the destroyer forces, no new frigates will be added to the inventory. Instead, it is likely that about ten aging frigates will be taken out of service by 2020. As a result, in 2020 the ESF will comprise ten destroyers and sixteen frigates. Table 2 provides details.

Table 2

Type	Class	2013	2020
DD	*Sovremenny* I/II	4	4
	052C Luyang II	0	4
	052D Luyang III	0	2
FF	054A Jiangkai II	4	4
	054 Jiangkai I	2	2
	053H3 Jiangwei II	6	6
	053H2G Jiangwei I	4	4

Note: Obsolete destroyer and frigate classes are not included.

South Sea Fleet. The SSF has been in the spotlight owing to the intensification of South China Sea maritime sovereignty issues. For the PLAN to protect China's national interests and fully support the country's South China Sea policies, it must improve and maintain a robust and capable SSF. The estimated force strength of the fleet in 2020 will be only a bit smaller than that of the ESF. In 2020, the SSF likely will have eight destroyers and twelve frigates.

The SSF likely will possess six total Luyang II and III DDs, equal to the ESF's. Its frigate force will be a little smaller than the ESF's; however, the newest eight Jiangwei IIs will provide more operational flexibility in relation to the many Association of Southeast Asian Nations (ASEAN) navies operating in the South China Sea.

The absence from the inventory of the SSF of the ASUW-oriented *Sovremenny* provides a striking contrast with the ESF. However, if we take into account the importance of ASW in SSF operations, it is natural for the PLAN to assign only Luyang-family destroyers and Jiangkai II frigates to the SSF.

Like the other two fleets, the SSF likely will decommission five Ludas and twelve Jianghus of multiple variants by 2020. Table 3 provides details of force compositions.

Table 3

Type	Class	2013	2020
DD	052B Luyang I	2	2
	052C Luyang II	2	2
	052D Luyang III	0	5
FF	054A Jiangkai II	6	8
	053H3 Jiangwei II	4	4

Note: Obsolete destroyer and frigate classes are not included.

The PLAN's DD/FF Fleets in Comparison

How do the PLAN's three fleets compare with the navies of major regional states—especially the JMSDF's SDF and the Republic of Korea (ROK) Fleet (ROKF)? Table 4 provides a detailed comparison of the three navies in 2020, as projected.

Table 4

Fleet	PLAN			SDF	ROKF
	NSF	ESF	SSF		
Strength	6 DDs	10 DDs	9 DDs	36 DDs	12 DDs
	5 FFs	16 FFs	12 FFs	6 FFs	6 FFs

Even in 2020, each Chinese fleet still will be inferior in destroyer and frigate strengths to either the Japanese or Korean fleet's. For example, the ESF will be only about 28 percent (10/36) the size of the SDF in numbers of destroyers, and 62 percent (26/42) in total destroyer and frigate numbers. Similarly, the NSF will be much smaller than the ROKF in 2020. Nonetheless, each PLAN fleet generally will be of good quality and capable of meeting mission requirements for each region.

The PLAN will continue to face several challenges, the most fundamental being the PLAN's surface force allocation problem. Owing to China's geopolitical realities, the PLAN needs to maintain three separate fleets on its three maritime fronts. In most of the possible national maritime crises of the future, it still would not be strategically feasible to concentrate destroyers and/or frigates from the different fleets into one force to take care of the problem in question. In the near future, the PLAN cannot resolve this classic military challenge of dispersion versus concentration of force. So the strength of each PLAN fleet will remain inferior to that of the SDF or the ROKF, to say nothing of the combined power of the SDF and the U.S. Navy (USN) Seventh Fleet.

The next challenge is resource allocation for new requirements. At some point in the future, the PLAN will operate aircraft carriers as part of carrier battle/strike groups (CVB/SGs). When this happens, it will need destroyers and frigates to form screening forces for CVB/SGs.

Another new future problem will be providing a force for Indian Ocean deployments. China's dependence on sea lines of communication (SLOCs) that pass through the Indian Ocean likely will increase substantially, so the PLAN very likely will be tasked with operating and safeguarding them.

However, the total force strength of the PLAN's DD/FF force in 2020 barely will meet the requirements of the three regional fleets. Because of the time-consuming nature of surface force buildup, a rapid and substantial increase of the DD/FF force is not likely. Even more worrisome for China, taking some of the already-assigned DDs/FFs from each

mission-challenged fleet to create new CVB/SG screening forces and an Indian Ocean SLOC patrol force would end up creating more risk for the PLAN. In sum, establishing by 2020 any new add-on forces—e.g., organizing new fleets with the same force strength as the three current fleets—will be difficult. This could pose a serious dilemma for the PLAN.

The fourth challenge involves the actual capabilities of the new equipment. The PLAN's modern destroyers and frigates—especially the Luyang II/III destroyers and Jiangkai II frigates—operate lots of new equipment and systems. However, on the basis of available information, such as observations of the PLAN's at-sea training and exercises conducted around Japanese waters, it is doubtful that the systems' true capabilities, especially for extreme performance in a realistic combat environment, have been tested effectively. The same goes for the tactics for fully employing the new equipment—it is unlikely they have been developed properly. These are many unknowns, but generally speaking the PLAN's new equipment and the tactics for employing them, especially to conduct ASW, AAW, antiship missile defense, and electronic warfare (EW), may not be well tested or sufficiently developed.

The Aegis System as a Comparative Case Study

The history of the U.S. Navy's development of today's Aegis combat systems and their *Burke*-class platform sheds light on how difficult this process can be. Aegis represents the summit of USN AAW development, which began in December 1941. After the outbreak of World War II in the Pacific, USN fleet air defense had great difficulty stopping the naval aviation of the Imperial Japanese Navy (IJN). In particular, after late 1944, the protection of surface forces, especially carrier task forces, from fierce, massive kamikaze air attacks provided the U.S. Navy one of its most severe challenges.

However, after suffering bitterly from casualties resulting from IJN air attacks, the U.S. Navy became able to protect its surface forces by developing AAW networks that consisted of radar picket ships with air-surveillance radars; the carriers' own radar; combat information centers; radar-directed combat air patrol fighters providing distant AAW; and layers of different kinds of antiaircraft guns (5-inch, 40 mm, 20 mm), with fire-control systems providing terminal air defense.

However, the debut of jet fighters after World War II fundamentally changed the game; the effectiveness of using gun systems to provide terminal air defense came into question. To resolve this challenge, the U.S. Navy started to develop surface-to-air missile (SAM) systems. This involved fully integrating the infant computer and rocket technologies from the mid-1940s into developmental efforts. By the mid-to-late 1950s, three sets of first-generation SAM systems (Talos, Terrier, and Tartar) began fleet service, with

Western navies widely referring to them as 3-T systems. These 3-T systems were considered the most successful SAM systems in the 1960s and '70s.

As Soviet air threats against USN surface forces, especially carrier battle groups, became tougher and more complex, the U.S. Navy launched a new development attempt, nicknamed "Typhon," that incorporated a revolutionary technological breakthrough. The basic idea of this AAW system was to engage multiple targets simultaneously at long distance. However, the attempt failed because of too many technological challenges, and the program was abandoned.

Around the same time, in parallel with the Typhon development, the U.S. Navy started improving SAM systems to meet the new threats fully by integrating the most sophisticated missile technologies of the time. One measure was integrating Terrier and Tartar into the Standard Missile System (SMS). The attempt was successful, and the first generation of standardized SAM, SM-1, went into fleet service in the early 1970s.

However, the Soviet air threat in the 1970s and '80s also made a jump in progress by introducing various longer-range, very capable SSMs, air-to-surface missiles, and underwater-to-surface missiles. In this extremely difficult environment, even the latest SM-1 system was considered insufficient to meet new Soviet air threats. Therefore, the U.S. Navy had no alternative to developing new shipboard AAW systems with revolutionary concepts and ideas.

New technology and, more importantly, huge lessons learned from Typhon development supported this new attempt. The resultant shipboard AAW system, having the capability to engage multiple targets simultaneously at long distances, was named Aegis. Major areas of development included command and control, phased-array radar, and the next-generation SM-2 SMS.

During the late 1970s and early '80s, extensive at-sea tests were conducted on board USS *Norton Sound* (AVM 1), a World War II seaplane tender converted into a missile test ship. Without this at-sea testing, the development of the Aegis system might have experienced serious troubles or even failed.

The first operational Aegis cruiser (CG), USS *Ticonderoga* (CG 47), was commissioned in 1983. Even after the commissioning of the early production groups of Aegis CGs and DDGs, the Aegis combat system was improved and updated continuously by collecting data and deriving lessons learned from thousands of live-firing tests and exercises. Without these lessons learned from a long operational history and uninterrupted improvements, supported by state-of-the-art technologies and a robust industrial base, today's Aegis systems might have been impossible.

There are so many unknowns about the PLAN's Aegis-like ships and systems. But the JMSDF has been keeping a keen, intense watch over all naval activities in Chinese waters

for some time, and there have been very few confirmed at-sea testing operations associated with the development of the PLAN's systems. Thus, it may be fair to conclude that the PLAN's Aegis-like systems are untested at sea.

The Remaining Challenges

The fifth challenge is the training posture, especially for ASW and AAW, of the PLAN's surface force. On the basis of the JMSDF's accumulated surveillance experience, the sophistication and maturity of the PLAN's at-sea exercises and training events are far below Western navies' standards. These criticisms apply to all elements of naval training basics, such as the training ranges around Chinese (Yellow Sea and East China Sea) and Japanese waters (northwestern Pacific), training support postures, and exercise scenarios.

The PLAN—especially its DD/FF force—likely has been making its best effort to correct these shortfalls and will continue to do so. However, it will not be easy for the PLAN, which is somewhat isolated owing to China's nonaligned policy, to make rapid and meaningful progress in a short, limited time.

Regarding the JMSDF, which has had the world's best allied partner-navy (the U.S. Navy) as an instructor and mentor since its founding, it is fair to say that it took twenty or even thirty years to grow into a really capable and functioning maritime partner. One striking difference between the JMSDF and the PLAN in this regard is that the JMSDF was built on human resources inherited from the IJN, which had seventy-six years of history and experience as a blue-water, oceangoing navy, with skills in all the conventional naval warfare areas. The PLAN is a growing and robust navy, but it is still a kind of branch service of the huge PLA, which is still largely focused on land power.

Last but not least are PLAN ASW capabilities, which must face the growing submarine forces of other Asian navies. Some regional navies have been undergoing ambitious submarine buildup programs since the turn of the century. For example, it is public knowledge that Indonesia's navy has a plan to introduce about ten submarines, and Vietnam's navy already has received three of six Russian Kilos.[6] The Singaporean navy already operates four submarines. In addition to a training submarine in France, the Malaysian navy has two operational submarines in its fleet inventory.

In addition to these ASEAN navies in the South China Sea, the ROK Navy reportedly plans to build about twenty submarines, and in December 2010 the JMSDF announced plans to increase the number of its operational submarines from sixteen to twenty-two. In addition to these submarine forces of regional navies, it is clear that the U.S. Navy is prepared to deploy its nuclear-powered submarines—the finest in the world—to the region when necessary.

When the fundamental nature of ASW—i.e., 24/7 warfare—is taken into account, the PLAN will face a serious and complex ASW challenge in its surrounding waters, especially in the South China Sea and East China Sea.

Having said all the above, we should not underestimate the PLAN's capabilities. Similarly, overestimation without concrete evidence is also a dangerous thing.

Aircraft Carriers

For China and the PLAN, having aircraft carriers (CVs) clearly has been an enduring dream, a symbol of having a world-class navy and being a superpower. For the PLAN, the carrier will be a key asset to complete missions successfully so as to support national objectives, especially strategic and tactical strikes, sea control, fleet air defense to support ASW, and noncombat missions. These represent the elements of a carrier's added value that so attract today's force planners and strategic thinkers.

However, this being said, what is the operational relationship between a carrier's capability and China's antiaccess/area-denial (A2/AD) strategy? Is the carrier an essential element of China's A2/AD strategy or not? In open-source information on China's A2/AD posture, antiship ballistic missiles and submarines often are discussed as the primary enablers of the strategy, with no mention of the carrier. What, then, is the PLAN's rationale for having two or more CVs in the future?

Another factor that may mitigate the effectiveness of the PLAN's carrier is weak and insufficient CV-protection capability. Of course, the carrier has been a magnificent military asset for almost all naval warfare since 1941. But a carrier is also a high-value asset that must be protected. During World War II, the IJN and U.S. Navy contrasted strikingly in this regard. After 1943, the U.S. Navy was extremely successful at protecting its overwhelming CV forces from both air threats and submarine attacks. The IJN, however, did an extremely bad job at CV protection, and ultimately lost twelve carriers to USN air attacks and eight to submarine attacks, out of a total force of twenty-four carriers.

If we consider the PLAN's current and near-future AAW and ASW capabilities in light of the rapidly expanding submarine forces of regional navies, the PLAN surely will face serious problems in the area of CV protection. The PLAN has been taking steps to remedy these deficiencies. However, considering the JMSDF's experience improving its own ASW and AAW capabilities, it may take decades for China to improve them significantly.

Amphibious Ship Force

The PLAN has been constructing the 19,000-ton Yuzhao-class amphibious ship (071) since 2008.[7] Three ships are in fleet service now, with one more currently fitting out. In

addition to these ships, the PLAN operates a total of seventeen 5,000-ton tank landing ships (LSTs) of three different classes (Yuting II, Yuting I, and Yukan). Moreover, six medium landing ships (LSMs) (2,000 tons) and forty-four mechanized landing craft (LCMs) are in active service. Table 5 shows estimated amphibious ship assignments to the three fleets through 2020.

Table 5

	NSF	ESF	SSF
Kunlunshan			4
Yuting II	2	2	10
Yuting I		5	5
Yukan		7	
LSM		4	6
Capacity (personnel)	500	5,000	7,000
DD/FF force	6 DDs, 5 FFs	10 DDs, 16 FFs	9 DDs, 12 FFs

This table clearly projects that in 2020 the PLAN will be focusing its amphibious ships on the South China Sea, where many territorial disputes remain unsettled. At the same time, however, the SSF's DD/FF component, which will be tasked with escorting the large amphibious ships, will be relatively small. This may be another problem for the PLAN should it attempt to conduct amphibious operations in the South China Sea. The growing number of submarines in Southeast Asian navies will make the PLAN's force-protection equation more difficult than before.

Another related element is the PLAN's capability to conduct an opposed amphibious landing in a hostile threat environment. Currently, only the U.S. military is capable of doing so. The U.S. Navy–Marine Corps (USN-USMC) team established and polished this type of operation, including its tactics and equipment, through the island-hopping operations in the Pacific during World War II, and in the Korean and Vietnam conflicts. But it took a long time before the USN-USMC team became an amphibious combat force to be reckoned with, and the capability was purchased at an extremely high cost during the war in the Pacific.

The PLAN's capability to conduct this type of operation should be examined carefully. It would be a lot easier for the PLAN to conduct an opposed amphibious operation against islands in the South China Sea if the U.S. Navy were not in the area. This is one of the reasons China developed the PLAN's A2/AD strategy, which tries to exclude the U.S. Navy from this area.

Fast-Attack Craft

In recent years, the PLAN's new fast-attack craft (FAC), the Houbei-class missile boat, has attracted the attention of regional and U.S. navies. The Houbei-class FAC incorporates many new features into its design, such as stealthy construction and shape, a wave-piercing catamaran hull with a top speed of more than thirty-five knots, and two sets of quad launchers for the YJ-83 antiship cruise missile (100 nm range, Mach 1.5 top speed). This boat is likely the most suitable terminal-defense asset against an incoming enemy surface force of any kind. The PLAN likely has built more than sixty Houbei FACs to date.

However, considering the research and experience of the JMSDF, there are several aspects to consider with respect to the real operational capability of this new equipment. For perspective: The JMSDF established a goal of building a robust coastal-defense force to counter a possible Soviet army landing on Japanese territory, especially the northern part. At the same time, the FAC also seemed as if it would be effective at conducting coastal defense and supporting straits-blockade operations. In the late 1980s the JMSDF selected several types of high-speed SSM boats as strong candidates to perform these missions.

In those days, aside from antilanding operations, one of the JMSDF's strategic tasks was to control three straits: Tsushima, Tsugaru, and Soya. Such control would turn them into bottlenecks for the Soviet Union's Pacific Fleet, homeported at Vladivostok. For years the JMSDF conducted in-depth and precise war-gaming and scientific research as well as mathematical and operational analyses. It concluded that the FACs were so vulnerable to air threats that their survivability in combat situations would be extremely low.

In addition to this, targeting information on enemy ships, which would be a key to successful operations by the surviving small number of lucky boats, constituted another serious problem. It became clear that in many combat scenarios the JMSDF's fleet of one hundred P-3C aircraft would not be able to provide sufficient target information.

To achieve its coastal-defense posture under the alliance, the JMSDF had a plan to introduce three sets of six-missile-boat squadrons in three areas. However, the above-mentioned research and examinations showed that about four boats would be destroyed before they could reach missile firing points. The remaining two boats would be able—barely—to fire eight missiles against enemy combatants, but also would be destroyed, while returning to base. So a six-boat squadron would disappear after a single sortie. P-3Cs conducting the surveillance and targeting mission also would suffer substantial losses during their operations.

The JMSDF's appetite for this type of small FAC faded very quickly, so it stopped its program after building three hydrofoil boats in the early 1990s. Then, in the early part of the following decade, it built six high-speed SSM boats with a gliding-hull design. However,

the main mission of the latter FACs was not SSM attacks against enemy landing forces but quick reaction to North Korea's covert seaborne infiltration attempts against Japan's coastal waters.

Of course, FACs have other capabilities, especially in peacetime, such as offshore patrol. The PLAN seems to have launched an ambitious FAC production program; however, the FAC is one of the most difficult naval assets to operate, and it is doubtful the PLAN has undertaken the types of in-depth analyses the JMSDF conducted.

In recent years the PLAN has pursued an ambitious surface force buildup program. However, over the next ten years the PLAN's surface force strength will remain insufficient even to fulfill all the PLAN's requirements for the three regional fleets. This is the time-consuming reality of naval surface force buildup, which is true for all navies in the world, including today's U.S. Navy. Because the PLAN has to maintain three separate fleets, it may take two decades or more to build up a surface force sufficient to provide for them, provide an escort force for carriers, and support Indian Ocean deployments. However, we should be careful neither to underestimate nor to overestimate the future capability of the PLAN.

Notes

1. In spite of their recent construction, the two Luzhou I sisters are obsolete steam-propelled DDs, the only ones the PLAN built during this period.
2. It follows standard practice to count some improved ships of the same variant as members of the Luyang II class. Even in the U.S. Navy, for instance, there are at least four different groups of Aegis DDGs: Basic, Flight I, Flight II, Flight IIA, and the upcoming Flight III.
3. There has been some speculation about the origins of the Chinese DDs' Aegis-like weapons system on the Luyang IIs. While the real capabilities of its onboard combat systems are unknown to outsiders, the Luyang II markedly resembles the U.S. Navy's Aegis DDGs. Some even have said that the class is a clone of the USN DDG 51 class. However, there is no evidence of copying by the PLAN, and it is also clear that the PLAN has developed, on its own, some programs to build the ship and its combat systems. Waiting to observe the Luyang II's actual performance while gathering more information from various sources is preferable to engaging in unfounded speculation or prejudice on the subject.
4. *Sekai no Kansen* [*Ships of the World*] 774 (March 2013), special edition for the PLA Navy.
5. Four old Luda DDs and four Jianghu I FFs are obsolete and are not represented in the table. Two of the latest 052Ds, improved with the Chinese, purportedly "cloned[,] combat system," à la USN Aegis ships, and five Jiangkai II FFs will replace these obsolete ships.
6. Sam Lagrone, "Report: Vietnam Receives Third Kilo Attack Boat," *USNI News,* February 3, 2015, news.usni.org/2015/02/03/reports-vietnam-receives-third-kilo-attack-boat.
7. Its characteristics: speed of twenty knots; capacity of five to eight hundred soldiers, four transport helicopters, and four air-cushion landing craft (LCACs).

CHAPTER FOUR

Why Is the Surface Fleet Gaining Importance?

Insights from PLA Doctrinal Writings

Nan Li

For several decades the People's Liberation Army (PLA) Navy (PLAN) was considered to be a small coastal-defense navy comprising a large number of conventional submarines and fast-attack craft (FACs) with limited operational radius. The naval modernization that began in the late 1990s seems to have continued the emphasis on submarines and FACs. For instance, China has acquired a total of twelve Kilo-class diesel-electric submarines from Russia. It also has built and commissioned thirteen Type 039G diesel-electric submarines and added three Type 093 nuclear attack submarines and three Type 094 nuclear ballistic missile submarines. Since 2005, thirteen Type 041 diesel-electric submarines that are probably more capable than the Kilos have been launched or commissioned, and more are planned.[1]

Between 2004 and 2008, the PLAN also commissioned more than sixty Type 022 FACs. Featuring a wave-piercing catamaran hull, the Type 022 reportedly travels at a maximum speed of thirty-six knots and has an operational range of three hundred 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 mile–range YJ-83 antiship cruise missiles (ASCMs) and a datalink antenna that can receive off-board sensors for over-the-horizon targeting information.[2] Their high speed, small profile, and stealth features enable these craft to approach a target quickly and quietly from multiple directions. The operational range combined with the missile range, together with the datalink antenna, enables the Type 022 to cover most of the sea area near China's shores. These features increase the craft's probability of succeeding in engaging a superior opponent, thereby raising the cost to the opponent of operating in the near seas.

During the period in which the PLAN emphasized submarines and FACs in the order of battle, it conspicuously neglected procurement of major surface combatants—aircraft carriers and guided-missile destroyers and frigates. As recently as the middle of the last decade, Chinese holdings of these ship types consisted of four *Sovremenny*-class destroyers acquired from Russia, two Type 051C destroyers, two Type 052B destroyers, two Type 052C destroyers, and two Type 054 frigates. This acquisition of a small number of

various types of ships led analysts to believe that the PLAN approach to its surface fleet was largely experimental, on the principle of "more research, more technological accumulation, but less armament" (多研制, 多技术储备, 少装备). That is, 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. Beyond that, after launching the first two 052Cs in 2003, the PLAN constructed no new 052Cs for about seven years, leading some analysts to conclude that the PLAN would no longer acquire major combatant ships for its surface fleet.

Since late in the first decade of the twenty-first century, however, construction of major surface combatants has gained momentum. The PLAN's first Type 001 aircraft carrier, purchased from Ukraine and refurbished with modern systems, was commissioned on September 25, 2012, and more reportedly are planned. Moreover, construction of Type 052C destroyers resumed in late 2010, resulting in four new hulls. Furthermore, since 2012, six Type 052D destroyers—an upgraded variant of the Type 052C—have been launched or commissioned or have begun construction. The Type 052D has a larger active phased-array radar system than the Type 052C. Rather than the forty-eight surface-to-air missiles (SAMs) embedded in eight revolver-type six-cell vertical launching systems (VLSs) on the 052C, the Type 052D has two canister-type thirty-two-cell missile VLSs. A total of sixty-two missiles reportedly includes a mixture of SAMs, ASCMs, antisubmarine missiles, and land-attack cruise missiles. If this is true, the Type 052D may be China's first dedicated multirole destroyer. Construction of more hulls is expected.

Finally, a large number of new frigates are being added to the PLAN's surface fleet. Since 2006, twenty 4,000-ton Type 054A frigates have been launched or commissioned, and more reportedly are planned. Furthermore, twenty-three Type 056 light frigates were launched or commissioned during the 2011–14 period. This 1,400-ton ship features a deep-V hull, sloped surface, and reduced superstructure clutter; a 150 kilometer (km)–range air- and sea-search radar; and a helipad at the stern. It is armed with a 76 mm gun, two two-cell YJ-83 ASCM launchers, one eight-cell FL-3000N short-range SAM system, and two three-cell antisubmarine torpedo tubes.[3] These features clearly are intended to enhance the speed, stealth, and versatility of the ship. The relatively simple and conventional nature of the weapons systems and sensors reduces the production cost so a large number of ships can be acquired. Even though the Type 056 is not a major ship class, it can fulfill many surface warfare missions in the near seas.

The above account shows that the PLAN's surface fleet is gaining importance. What can account for this new emphasis within China's naval modernization? Conventional explanations include the availability of funding and shipbuilding infrastructure and technologies and the need to replace a large number of obsolete surface ships. But because major surface ships such as aircraft carriers are perceived as vulnerable targets when facing a

superior opponent, the PLAN could have chosen to shift scarce funding and available technologies to constructing more and better submarines and FACs, which have the sort of stealth capabilities that give the PLAN asymmetrical advantages. In short, surface ships need not be replaced when they become obsolete; resources could be shifted to constructing more submarines and FACs.

This essay shows that two conceptual developments by PLA analysts account best for this new emphasis on the surface fleet. The first is the notion of "balanced development," a lesson PLA analysts learned from modern Western naval history and from Soviet naval development during the Cold War. The second is the need to develop the PLAN's "system of systems," a major requirement for conducting "information systems–based system-of-systems operations" (基于信息系统的体系作战), a new concept that Hu Jintao endorsed in 2005 to guide PLA development in general and PLAN development in particular.

"Balanced Development"

The notion of "balanced development" is a lesson PLA analysts learned from two sources: modern Western naval history and Soviet naval development during the Cold War. PLA analysts also have suggested a few additional specific lessons related to balanced development for China's naval development.

Learning from Western Naval History

By examining the modern history of Western naval powers, PLA analysts have discerned two distinct models of fleet development. The first is the large surface fleet centered on battleships in the early days and aircraft carriers in modern days. Contributing to and shaped by the classical theory of sea power developed by Alfred Mahan, such a fleet is associated mostly with traditionally dominant sea powers such as Great Britain and the United States, and distinctively manifested in the British and U.S. navies. According to this analysis, the primary mission of such a fleet is to mass, maneuver to seek the enemy, then fight the opponent frontally and directly in a "decisive fleet engagement" (舰队决战) or impose a "forceful blockade" (强势封锁). Victory in a decisive fleet engagement accomplishes the ultimate objective of a sea power: command of the sea. For this fleet, missions such as sea-lane operations, maritime commerce raiding, and amphibious operations are mostly secondary, and can be accomplished best after seizing command of the sea. Similarly, in such a fleet other, smaller-sized vessels such as submarines have only secondary importance, generally playing a supportive role to battleships and/or aircraft carriers.[4]

The second model is the smaller or asymmetrical fleet, composed mainly of submarines and FACs. Such a fleet largely is associated with continental powers with maritime

aspirations that seek to challenge the status quo sea powers. Because of its inferiority, such a fleet would avoid a direct, frontal fight with the large fleet of a dominant sea power, eschewing the decisive fleet engagement that would surely doom it. Instead, it would pursue asymmetrical strategies. Even though such a fleet also might acquire some major surface ships, their purpose is not to participate in a decisive fleet engagement; instead, such ships mostly would coordinate and support submarine and other asymmetrical operations.[5]

French naval strategists of the late nineteenth century argued for a small or asymmetrical fleet that would exploit new technologies such as submarines, automated torpedoes, and torpedo boats and other light, fast ships. Rather than accepting a frontal fleet engagement that favored the comparative advantages of an opponent such as Great Britain, this small fleet would target the chief vulnerability of the opponent as a maritime trading and colonial power: its merchant fleet. By raiding the opponent's maritime commerce, the French hoped to create chaos in Great Britain and eventually force it to negotiate on terms favorable to France. This French Jeune École (Young School) of thought influenced not only French naval development but the naval thinking of other continental powers, such as Germany, which prioritized submarines among its naval acquisitions during the later phase of World War I.

While the Jeune École emphasized the offensive use of the small fleet, the "small war strategy" school of the Soviet navy in the 1930s emphasized the defensive value of a small or asymmetrical fleet. The central premise of this school was that submarines and shore-based aircraft make close blockade difficult for traditional sea powers. Command of the sea was not the objective of the Soviet navy; therefore it would employ its small, submarine-based fleet to counter amphibious landings of the opponent, forcing the latter to retreat.[6]

According to this analysis, as a result of the advancement of ship-protection technologies against torpedoes and improvements in antisubmarine warfare (ASW) technologies, particularly after the failure of German submarine warfare in World War I, the role of surface ships in coordinating with submarines and the need for a balanced fleet capable of raiding the opponent's maritime commerce drew more attention. The interwar German navy, for instance, built high-speed "pocket battleships" or "heavy cruisers," whose primary purpose was to conduct sea-lane operations. They were designed to be fast enough to outrun the opponent's more-powerful battleships so as to avoid a frontal fleet engagement, but their stronger armor and firepower would enable them to defeat the opponent's cruisers and destroyers escorting convoys of merchant ships as protection against German submarines.

Despite some successes, this strategy did not achieve the desired results during the early stages of World War II owing to a lack of coordination between surface combatants and submarines. The German navy then adopted a "wolf pack" strategy, employing its submarines en masse in attacking the opponent's merchant shipping in convoy. The Germany strategy failed partly because of a lack of sufficient submarines. But a more important reason, according to this analysis, was the German inability to coordinate surface combatants and submarines effectively, that is, to employ surface ships to protect submarines and use submarines to support surface ships. The German experience apparently had an impact on later Soviet naval development, because Soviet navy commander Sergey Gorshkov allegedly believed that the Germans' mistake was their "unbalanced fleet structure" (失衡的舰队结构).[7]

Learning from Soviet Naval Development

PLA analysts believe that Soviet naval development in the late 1950s and early 1960s was highly "unbalanced" or "deformed" (畸形), with a narrow focus on acquiring submarines, particularly strategic nuclear submarines. This largely was owing to 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 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, during which the Soviet navy had no major surface combatants to deploy against the U.S. naval blockade, and deployed submarines were mostly locked on (锁定) by the U.S. Navy's ASW forces. As a result, the U.S. Navy stopped, boarded, and inspected Soviet cargo ships carrying missiles to Cuba.[8]

According to PLA analysts, 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, which elevated somewhat the role of the Soviet navy. But more importantly, guided by the notion of balanced development that Admiral Gorshkov endorsed and sustained by Soviet economic and technological strength, the Soviet navy was able to expand from its narrow focus on nuclear submarines to developing a substantial surface fleet capable of naval aviation. This expansion helped to achieve a balanced fleet of both surface and submarine forces capable of challenging Western naval power. By 1981, the number of Soviet submarines reached 342, including strategic nuclear submarines, nuclear attack submarines, and conventional attack submarines. The Soviet surface fleet also boasted fifty guided-missile cruisers and five heavy air cruisers, or Soviet-style aircraft carriers. However, according to PLA analysts, this balanced fleet continued to regard submarines as providing its core capabilities. Because the surface

fleet worked primarily to protect submarines, particularly strategic nuclear submarines, its offensive power for fleet engagement clearly was constrained and limited.[9]

Lessons for the PLAN

PLA analysts acknowledge that, like the navies of other continental powers, the PLAN began as a small or asymmetrical fleet centered on submarines, FACs, and shore-based aircraft (潜, 快, 飞). While the PLAN deployed some major surface combatants, they were not designed to coordinate with submarines on matters of command and control, mutual protection, or offshore supply. On the other hand, this force structure was largely consistent with the earlier strategy of "maritime sabotage and raid guerrilla warfare" (海上破袭游击战), which highlighted the use of separate, well-concealed, and flexible small-force groups (小兵力群) capable of quick concentration to conduct surprise raids against an opponent's vulnerabilities, followed by quick dispersion. The goal of such a strategy, according to PLA analysts, was to weaken the opponent through protracted, small-scale operations rather than a direct frontal fleet engagement. This strategy also entailed coordination with land operations, and required the PLAN to play a supportive role in an overall land war.[10]

The near-seas defense strategy that has evolved since the mid-1980s, however, has aimed to expand the PLAN's maritime operational space and shift the service away from merely supporting land operations. To deal with the long-range strike capabilities of the opponent, for instance, this strategy requires the PLAN to expand its defensive depth in the near seas and develop naval combined-arms capabilities extending from subsurface to surface, air, and outer space. Similarly, the naval modernization that began in the late 1990s has enhanced the surface fleet's air and missile defense. The current PLAN acquisition of major surface combatants, including an aircraft carrier, shows that the PLAN is "following the historical path that the German and Soviet Navies traveled": increasing the proportion of surface combatants in the fleet and adding big-deck naval aviation. Consequently, the "PLAN is standing at a crossroads, and needs a fundamental reevaluation of both its strategic thought and fleet structure" to determine whether it wants a carrier-centered fleet or a Soviet-style, submarine-based fleet in which carriers serve more to support submarine operations than to fight a fleet engagement.[11]

To guide the PLAN's future development, PLA analysts have proposed a few specific lessons learned, particularly from earlier continental powers with maritime aspirations. First, as both German and Soviet naval histories show, balanced development is both desirable and necessary. This is because different types of naval combatants deployed to different spatial spectra (e.g., subsurface, surface, and air) can support and protect one another to reduce each other's vulnerabilities. These "balanced capabilities" are also

useful for coping with "many types of security threats" and for fulfilling "diversified military missions," a task that China's top civilian leadership assigned to the PLA.[12]

Furthermore, for this balanced development to succeed, it is necessary to have top-level design (顶层设计), long-term planning (长远规划), and institutionalized implementation. Top-level design and long-term planning are needed mainly because naval development is capital and technology intensive, and therefore requires consistent, long-term, and heavy investment through long shipbuilding and personnel-training cycles. Institutionalized implementation, on the other hand, can help to avoid major disruptions resulting from any change in top leadership. From the Soviet case, PLA analysts concluded that the ascendance of erratic leaders such as Khrushchev and Mikhail Gorbachev caused "big losses" associated with either "unbalanced development" or naval decline.[13]

Finally, Gorshkov's notion of balanced development not only broadened the Soviet navy from its narrow focus on nuclear submarines to include major surface combatants but expanded its role in Soviet foreign policy through activities such as ocean naval maneuvers, port visits, export of submarines and other warships, and transport operations to support client states that included Cuba, Egypt, Syria, Libya, and Vietnam. Also associated with naval expansion was the expansion of the Soviet shipbuilding industry, fishing fleet, and other maritime capabilities. According to PLA analysts, however, the critical driving factors behind the Soviet naval expansion were largely political and ideological, "not economic in the traditional sense of the term" (that is, related to maritime commerce). As a result, Soviet naval development went "beyond the defensive needs" and embarked on a path to "seek hegemony" beyond the country's means, contributing to a weakening of the Soviet economy that ultimately caused the regime's decline. PLA analysts believe that this is where China's naval development has been and should continue to be different from the Soviet experience. That is, it always should be closely associated with trade-based maritime activities, reflecting the integration of the Chinese economy with the global economy. While this driver is similar for both China and the United States, PLA analysts differentiate China from both the United States and the Soviet Union in that the focus of China's naval development should "not be competition and contest against a certain opposing force" (不是与某一对立力量的竞争和较量) but rather the cultivation of a maritime environment and order that can benefit China's development.[14]

Constructing the PLAN's "System of Systems"

The need to develop the PLAN's system of systems, a major requirement for conducting "information systems–based system-of-systems operations," also helps to explain the PLAN's new emphasis on its surface fleet.

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

The notion of information systems–based system-of-systems operations (ISSSO) first was endorsed by Hu Jintao at an "important army conference" in December 2005, but PLA analysts did not articulate it fully and operationalize it until after early 2010. By then, the policy to "informatize" the PLA, which Jiang Zemin had endorsed earlier, had produced a few unintended but serious consequences.[15]

According to PLA analysts, one consequence involved interservice integration. Because "informatization" was "service-centered" rather than "system of systems–based," each service (军种) became more informatized, leading to more powerful stovepipes, or "isolated information islands" (信息孤岛), due to lack of collateral information networking across the services. Also, each service tends to be "self-serving" (自我完备). That is, under the pretext of enhancing joint operations, each concentrates on becoming an "all-around service" (全能军种): ground forces expand air, shore-defense, and ship capabilities; the navy expands air and land capabilities; and the air force expands land capabilities. This causes not only unnecessary redundancy and waste of resources but erosion of each service's comparative advantage. Moreover, service-centered "informatization" leads to a lack of common information standards and results in a monopolization of information by each service, which not only may contribute to interservice tension but may cause a loss of initiative in wartime.[16]

PLA analysts believe that correct implementation of ISSSO may help to resolve this interservice issue. This is because ISSSO requires fostering a consciousness that war can be fought and won by a PLA system of systems, but not by individual services. Therefore, the emphasis of military modernization should shift from "forging all-around services to constructing an all-around system of systems" (从打造全能型军种转向建设全能型体系). This means that services should transfer ownership (所有权) and command and control of their operational elements and resources to the PLA system, while retaining the usage right of these resources. Services also should become open and transparent to one another and "share the usage right" (军种共享使用权) of each other's and the PLA system's resources, because services constitute and are the builders of the PLA system of systems. "Transferring communications bandwidth and satellites to the system, for instance, can give full play to the utility of these elements." In return, services benefit from system construction by retaining the usage right to all the resources the system offers.[17]

Generally speaking, future "integrated operations" (集成作战) would "reinforce services' functions for force construction and management, but weaken their role to command such operations." "Services will supply functional units and essential elements to integrated operations command according to operational needs." To optimize the use of

these units and elements, the integrated operations command would rely on information systems such as the all-army, unified (全军统一) command-and-control network, early-warning and reconnaissance network, communications grid network, weapons-control network, and comprehensive support (综合保障) network.[18]

According to PLA analysts, ISSSO also requires "construction of collateral, integrated system-of-systems operations capabilities centered on integrated networks" (以集成网络为中心, 建设横向一体的体系作战能力) across services. This "net-centered" approach leverages information technologies and networks to permeate (渗透), fuse (融合), and connect (连通) all forces (力量), units (单元), and essential elements (要素) deployed at different distances and in different spatial spectra, to achieve interconnectedness (互联), intercommunications (互通), interoperability (互操作), and mutual complementarity (互补), particularly in terms of early warning and reconnaissance, command and control, communications, weapons control, and combat support. This interconnectivity should enable synchronized joint action (同步联动), thus enhancing precision, coordination, efficiency, and orderliness of actions and strikes.[19]

How does the concept of ISSSO enhance military operations? First, such system of systems–based synergy not only surpasses what an individual service, unit, or weapons platform is capable of achieving; it also helps to reduce the vulnerability of any individual platform. For instance, "employing information systems to permeate, fuse, and connect weapons systems can accomplish operational effectiveness that far exceeds what a single weapons platform such as an aircraft carrier can accomplish. At the same time, this integration can reduce the risks to an aircraft carrier."[20]

Moreover, information systems–based integration leads to real-time and common battlefield transparency, reduces reaction time, and enables more-precise strikes, thus creating conditions for dispersed (分散) and pointed (点状化) force deployment but concentrated firepower. This deployment can expand from traditional spatial spectra such as land, sea, and air to new spectra such as outer space, electromagnetic space, and cyberspace, exhibiting a trend toward "comprehensive spatial spectra" (全域性). These deployment patterns of different distances, altitudes, and visibilities should enhance not only force survivability but multispatial, spectra-based battlefield versatility and flexibility.[21]

Finally, PLA analysts believe that information systems integration enables real-time, synchronized target acquisition, decision making, mobility, strikes, and control. These in turn shorten decision cycles and increase operational tempo, making it possible to conduct parallel operations, achieving "all-dimensional superiority" (全维优势) over the opponent by "maximizing the comprehensive effects of system-of-systems operations."[22]

ISSSO and the Surface Fleet

ISSSO requires the PLAN to contribute to the construction of the PLA's system of systems. A small or asymmetrical fleet centered on conventional submarines and FACs may constitute the most appropriate contribution, because such a fleet primarily focuses on coastal and near-seas defense and the support of land operations, and therefore can integrate better with other services that are mostly land based. Since the middle of the first decade of the twenty-first century, however, China's naval strategy has integrated the new concept of "far-seas operations."[23] China's most recent defense white paper reiterates the need to "enhance capabilities for far-seas mobile operations, and for far-seas cooperation and coping with nontraditional security threats" (提高远海机动作战能力, 远海合作与应对非传统安全威胁能力). It also has added, for the first time, sections on "safeguarding China's overseas interests" and "enhancing the security of international sea lanes"—new missions for the PLAN to fulfill in the far seas.[24] To the extent that "far-seas operations" are conducted in waters remote from China's shores, the PLAN may have to develop its own system of systems. This is because it no longer would be able to count on support from the PLA's land-based system of systems.

A small or asymmetrical fleet is clearly not appropriate for far-seas operations, because of its limited operational radius and sustainability. This fleet also constitutes an incomplete system of systems, because it cannot reach all spatial spectra, particularly the air spectrum, in the far seas. It may possess major surface ships such as destroyers and frigates that can be deployed to the far seas, but these ships would be left exposed, vulnerable to air, missile, and submarine attacks. Aircraft carrier capabilities, however, can reduce these vulnerabilities. Carriers can provide air resources that can compete for air superiority and provide air cover for surface operations in the far seas. These air capabilities also can be deployed against the opponent's air-based ASW capabilities, thus protecting one's own submarines operating in the far seas. Carriers' air-based ASW capabilities also can be deployed against the opponent's submarines, thus providing protection for China's own surface ships and submarines operating in the far seas. Finally, with the PLAN's lack of overseas naval bases, carriers can serve as sea bases to sustain the PLAN's system-of-systems operations in the far seas.

Furthermore, as discussed earlier, an information systems–based system of systems can become a force multiplier, not only because it can accomplish what an individual weapons platform such as an aircraft carrier cannot accomplish otherwise, but also because it helps to reduce the vulnerability of that individual weapons platform. PLA analysts believe that a carrier battle group (CVBG) is an ideal "maritime operations system of systems" (海上作战体系). With escorts such as destroyers, frigates, nuclear attack submarines, and oceangoing replenishment ships, this system of systems is capable of air operations, strikes, submarine warfare and ASW, air and missile defense, and electronic

warfare, thus possessing the "five integrated operational capabilities" (五为一体作战能力). If well integrated by the information systems, a CVBG represents a "fully functional and optimally combined" (功能完备, 优化组合) system of systems, in which all individual weapons platforms not only work together to create operational synergy against the opponent but offer mutual support and protection by reducing each other's vulnerabilities. On the other hand, analysts also recognize that a CVBG is too massive to conceal, making it easy, under certain conditions, for an opponent to detect and attack it.[25]

Finally, the versatility of a system of systems is reflected in the system's deployability not only to different distances and spatial spectra but at different times and for different purposes. In spite of their different roles and functions, all naval weapons systems are designed to fight wars. But some systems may be more appropriate for peacetime missions than others. To the extent that a navy can play an important role in serving a state's foreign policy in peacetime, performing this role may require either substantial surface capabilities or a visible naval presence in the far seas, and a major surface fleet may be more appropriate to accomplish this. Peacetime missions that require substantial surface capabilities may include provision of sea-launched humanitarian assistance and disaster relief to a foreign country, evacuation of nationals from a foreign country by sea in times of crisis, and naval deployment to secure international sea-lanes against pirates and terrorists. Peacetime missions requiring visible naval presence also may include port visits and naval maneuvers, many of which serve the purpose of reassuring allies and deterring opponents from engaging in risky behavior. By contrast, because of their less-visible features and lower profile, submarines and FACs are probably less appropriate for such peacetime missions.

Notes

1. For information on the PLAN's acquisition of new submarines and major surface combatants as discussed in this essay, consult *China Defense* at www.china-defense.com/smf/.
2. See Nan Li, "China's Navy Develops Fast Attack Craft," *Jane's Intelligence Review,* September 2009.
3. See 王进 [Wang Jin], 新时期新使命, 中国056型轻型护卫舰 ["New Mission in the New Period, China's Type 056 Light Frigate"], 舰载武器 [*Shipborne Weapons*] (August 8, 2012); 烽火 [Feng Huo], 056型轻型护卫舰的思考 ["Reflections on Type 056 Light Frigate"], 现代舰船 [*Modern Ships*], no. 07B (2012). *Shipborne Weapons* and *Modern Ships* are publications of the China Shipbuilding Industry Corporation.
4. 师小芹 [Shi Xiaoqin], 小型舰艇的历史定位与中国式均衡海军 ["Historical Position of Small Ships and Craft and a Balanced Navy with Chinese Characteristics"], 军事历史 [*Military History*], no. 1 (2011), p. 33; 理解海权的另外一条路径 ["Another Path to Understand Sea Power"], 和平与发展 [*Peace and Development*], 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 论海权与中美关系 *(On Sea Power and Sino-U.S. Relations)* (Beijing: AMS, 2012), and deputy editor in chief of 战略研究 *(Strategic Studies),* a publication of AMS.
5. Shi, "Historical Position of Small Ships and Craft," p. 33.
6. Ibid., pp. 35–36. For Soviet "small war theory," see also 张晓林 [Zhang Xiaolin], 王攀 [Wang Pan], and 张忆南 [Zhang Yi'nan], 苏联远洋海军建设的启示 ["Revelations from the Soviet Construction of a Far-Oceans Navy"], 军事历

史研究 [*Military History Studies*], 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.

7. Shi, "Historical Position of Small Ships and Craft," pp. 36–37.
8. Zhang, Wang, and Zhang, "Revelations from the Soviet Construction of a Far-Oceans Navy," pp. 97–98; Shi, "Historical Position of Small Ships and Craft," pp. 37–38.
9. Zhang, Wang, and Zhang, "Revelations from the Soviet Construction of a Far-Oceans Navy," p. 98; Shi, "Historical Position of Small Ships and Craft," pp. 37–38.
10. Shi, "Historical Position of Small Ships and Craft," pp. 38–39; 周德华 [Zhou Dehua], 胡鹏 [Hu Peng], and 喻永红 [Yu Yonghong], 人民海军海上破袭游击战思想的历史回顾 ["Historical Retrospect on the Thought of Maritime Sabotage and Raid Guerrilla Warfare of the People's Navy"], 军事历史研究 [*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 Unit 92674.
11. Shi, "Historical Position of Small Ships and Craft," pp. 39–40.
12. Zhang, Wang, and Zhang, "Revelations from the Soviet Construction of a Far-Oceans Navy," p. 100.
13. Ibid., pp. 99–100.
14. Ibid.; Shi Xiaoqin, cited in 吴挺 [Wu Ting], 中国应学会合理运用海军力量支撑其全球秩序 ["China Should Learn to Employ Naval Forces Rationally to Sustain Its Ideal of a Global Order"], 东方早报 [*Oriental Morning Post*] (Shanghai), August 1, 2011.
15. See 任连生 [Ren Liansheng], 对基于信息系统的体系作战能力的初步认识 ["A Preliminary Understanding of Information Systems–Based System-of-Systems Operations Capabilities"], 中国军事科学 [*China Military Science*], no. 4 (2010), p. 26. Major General Ren is director of the Scientific Research Guidance Department of AMS.
16. 林东 [Lin Dong], 基于信息系统的军事力量体系的发展理念 ["Development Concepts for Information Systems–Based Military Force System of Systems"], 中国军事科学 [*China Military Science*], no. 1 (2011), pp. 19–20; 张宏 [Zhang Hong] and 于召 [Yu Zhao], 基于信息系统锻造新型作战力量体系 ["Forge New-Type Operational Force System of Systems Based on Information Systems"], 中国军事科学 [*China Military Science*], no. 5 (2010), p. 12. Senior Colonel Lin is an associate professor in the Strategy Teaching and Research Department of China's National Defense University in Beijing. Colonel Zhang is an associate professor and director of the Combined Arms and Tactics Teaching and Research Office of the Army Command College in Shijiazhuang, and Captain Yu is a master's student there.
17. Lin, "Development Concepts," pp. 20–21.
18. Ibid., p. 22.
19. Ibid.; Ren, "Preliminary Understanding," pp. 27–29; 蒋磊 [Jiang Lei], 提高基于信息系统的海上体系作战能力的思考 ["Reflections on Enhancing Information Systems–Based Maritime Systems of Systems Operations Capabilities"], 中国军事科学 [*China Military Science*], no. 5 (2010), pp. 27–28. Senior Captain Jiang is a professor and director of the Navy Development and Construction Studies Office of the Naval Command College in Nanjing.
20. Lin, "Development Concepts," p. 22.
21. See 平志伟 [Ping Zhiwei], 曾筱晓 [Zeng Xiaoxiao], and 张学辉 [Zhang Xuehui], 基于信息系统的体系作战机理研究 ["A Study of Mechanisms for Information Systems–Based Systems of Systems Operations"], 中国军事科学 [*China Military Science*], no. 4 (2010), p. 41. Ping is a professor and deputy director of the Campaign and Tactics Department of the Army Command College in Shijiazhuang, and Majors Zeng and Zhang are lecturers in the Combined Arms and Tactics Teaching and Research Office of that department.
22. Lin, "Development Concepts," p. 22.
23. "Near seas" refers to the three seas near China, that is, the South China Sea, East China Sea, and Yellow Sea. "Far seas," on the other hand, refers to the seas beyond the near seas, or the western Pacific and Indian Oceans. See Nan Li, "The Evolution of China's Naval Strategy and Capabilities: From 'Near Coast' and 'Near Seas' to 'Far Seas,'" *Asian Security* 5, no. 2 (2009), pp. 144–69.
24. See 中国武装力量的多样化运用 ["Diversified Employment of China's Armed Forces"], 新华社 [Xinhua], April 16, 2013.
25. PLA analysts cited in 中国航母, 从今天驶向未来 ["China's Aircraft Carrier, from Today to the Future"], 解放军报 [*Liberation Army Daily*], September 26, 2012.

The Modern PLA Navy Destroyer Force

Impressive Progress in Achieving a "Far-Seas" Capability

Michael McDevitt

Just a few years ago few people cared very much about any People's Liberation Army (PLA) Navy (PLAN) destroyer, much less with what it was armed. That was because the central problem the PLAN posed for the United States in East Asia had nothing to do with destroyers. Instead, the focus of attention was China's "antiaccess" strategy, the military objective of which is to keep U.S. naval and air forces as far away from China as possible.[1]

The PLAN's surface force (its destroyers, frigates, and amphibious ships) plays a small, even marginal, role in the PLAN's wartime counterintervention operations. To execute this objective, the PLAN's most important arm is its submarine force, along with its land-based air arm operating in conjunction with the PLA Air Force. In fact, the counterintervention arsenal capability that justifiably has received the most attention in the Western press—the DF-21 antiship ballistic missile—does not belong to the PLAN at all; it is a PLA Second Artillery weapons system.

In a conflict with the United States over Taiwan, for example, the surface forces of the PLAN would have two missions, neither directly related to keeping U.S. forces from interfering with Chinese operations. The surface force would be responsible for getting the army safely across the Taiwan Strait and conducting sea-control missions in the East China Sea. Its ships also might make contributions as seaward extensions of China's air defenses, while remaining close to China. The surface force would be very unlikely to venture out from under land-based air cover (i.e., beyond the first island chain). If it did, it would be very vulnerable to U.S. submarines and air attack. In short, during a major conflict over Taiwan, the PLAN surface fleet would stay close to home, while U.S. surface forces would operate in the Philippine Sea.

On the other hand, when China is not at war, which is to say virtually all the time, the surface fleet becomes the most significant element of China's navy. During the last half-dozen years, the PLAN has performed missions that are not directly related to the territorial defense of China and its claimed island possessions.[2] The best way to characterize these new (for China) "far-seas" missions is as peacetime operations. In 2009, the PLA

defense white paper applied a U.S. Department of Defense term to these new missions: "military operations other than war" (MOOTW).[3]

With its expanding global economic interests, China has developed global political interests as well. This has created a "demand signal" for a PLAN that can support UN-sanctioned missions, protect People's Republic of China (PRC) interests abroad with a show of force, respond to situations in which PRC citizens are in jeopardy or require evacuation, protect sea lines of communication, respond to natural disasters, and, if necessary, demonstrate PRC resolve in support of embattled friends in Africa and along the South Asia littoral—in other words, the typical mission set that traditional naval powers have practiced for centuries.

These new missions require a mix of naval capabilities different from those needed to conduct wartime offshore active defense. A navy that is expected to operate in "far seas" requires more logistics-support ships; amphibious ships with helicopter facilities; and large destroyers with good sea-keeping characteristics, better endurance, helicopter hangars and facilities, and longer-range air defenses. Far-seas operations also rationalize a requirement for a modest aircraft carrier force.[4] Carrier-based aircraft will provide the PLAN with sea-based air cover for its distant operations; eventually yield a credible power-projection, limited-war capability; and, most importantly for the topic of this article, generate a requirement for a number of multimission destroyers to escort the carrier and provide air and submarine defense.

Any study of the PLAN destroyer force has two basic problems: the lack of really credible open-source information on the specific capabilities and performance of combat systems, and the fact that until very recently China approached its surface combatant force as a two-decade-long research-and-development project. In effect, the PLAN has been executing a long-running experiment to marry a suitable hull and propulsion plant to effective antisubmarine warfare (ASW) and antiair warfare systems.

This has made it difficult to keep track of the differences among the various iterations of destroyer classes. The basic challenge that Chinese designers faced with the "build a little, test a little" approach to developing surface combatants was to try to find a hull form and propulsion plant suitable for distant operations. The PLAN desired a ship large enough to accommodate a helicopter detachment and with the volume to house magazines that could store a significant number of missiles along with the necessary radar and electronics. The other challenge was to ensure that over time it could develop modern combat systems indigenously, or reverse engineer modern combat systems from France, Russia, Italy, and the United Kingdom, then integrate them with unique Chinese systems. China overcame these two challenges relatively quickly.

The First Modern Destroyers

The now-obsolete Luda (Type 051) class (3,700 tons full-load displacement) comprised the early test platform used to mix and match combat systems. Its design was derived from an early Cold War–era Soviet ship. The sixteen ships of this class entered PLAN service over a twenty-year period (1971–91). The experience seems to have confirmed for the PLAN that steam plants and the associated rotating machinery simply created too much self-noise for the sonar systems to be effective.[5] The PLAN, like the U.S. Navy and other global navies, learned that changing from steam propulsion to either gas turbine or combined diese–gas turbine propulsion had advantages not only in self-quieting but in reliability, ease of maintenance, and performance as well. Moreover, the PLAN learned that, at just 3,700 tons, the Luda class was relatively small, so sea keeping in rough blue water was a challenge. During a 1997 transit to Honolulu, a three-ship PLAN task force ran into ten consecutive days of heavy weather, during which it encountered a great deal of difficulty refueling the small Luda. Because the class has limited fuel-storage capacity, the PLAN found the Luda needed to be underway replenished every three days, and high seas made that very difficult.[6] In sum, just short of two decades ago the PLAN destroyer force consisted of eighteen ships—sixteen of which had capabilities closer to the World War II–vintage "tin can" in which I served during the 1960s than to the state-of-the-art destroyers China's northeast Asian neighbors and the United States were operating in the western Pacific.

That began to change with the introduction of the Type 052 series of destroyers, which, according to the NATO classification system, comprise the Luhu (Type 052—two ships), Luhai (Type 052A—one ship), Luyang I (Type 052B—two ships), Luyang II (Type 052C—eight ships), and Luyang III (Type 052D—one commissioned and up to twelve planned) classes. Commissioned in 1994, the Luhu marked the transition of Chinese destroyers from steam to gas turbine propulsion—in fact, both ships of the class were equipped with General Electric LM2500 gas turbine engines, the same engines that have powered all U.S. destroyers since the late 1970s. But it was the Type 052B that marked the advent of the PLAN's first truly modern destroyer.[7]

Combat Systems

Starting with the Type 052B *Guangzhou* (hull number 168), commissioned in 2004, all Chinese destroyers have used roughly the same hull design: a 508-foot-long, 6,500–7,300-ton-full-load-displacement ship, with a combination diesel–gas turbine propulsion system.

Guangzhou and all the subsequent Type 052 series are handsome warships that incorporate a hull form and superstructure designed to reduce the radar cross section of the

ship. But, as attractive as *Guangzhou* is, its war-fighting capabilities were outdated the day it was commissioned.

Antiair Warfare

Although the ship's primary mission was air defense, it carried the short-range (twenty nautical miles [nm]) Russian SA-N-12 surface-to-air missile (SAM). At best, the ship could defend only itself, and even then not very well, because of the short range of its missiles. Aircraft easily could remain outside its SAM envelope and launch a variety of weapons with impunity, overwhelming its defenses because it depends on four individual fire-control radars to control the semiactive SAMs. It uses rotating 3-D radar as its primary air-search radar, which is inferior to the phased-array systems that are state of the art. For comparison, phased-array systems such as the SPY-I Aegis radar have been in use in the U.S. Navy since 1983. The Japan Maritime Self-Defense Force had phased-array systems in service for over a decade by the time *Guangzhou* was commissioned. Norway commissioned its first Aegis-equipped ship in 2004, the same year *Guangzhou* entered the PLAN.

This is a noteworthy reference point, because it took China only ten years to close the radar gap by introducing its own phased-array radar system. Phased-array systems search and track simultaneously, an important capability in the antiship cruise missile (ASCM) era. One needs quick reaction time, firepower, and good reliability to survive in today's precision-weapon environment—and *Guangzhou* has none of that. Reaction time and firepower come with a phased-array system mated to a vertical-launch system (VLS) firing long-range SAMs. So, while this ship was the beginning of a truly modern air-warfare destroyer for the PLAN, it had a long way to go to match the capabilities of the ships of other modern navies.

Anti–Surface Ship Warfare

In terms of anti–surface ship warfare (ASUW), *Guangzhou* packs a punch, with sixteen YJ-83 cruise missiles in four quad box launchers located aft of the engine room exhausts. This missile has a 120 nm range with a 420-pound warhead. Like the U.S. Harpoon, it is a subsonic fire-and-forget missile.[8] With the YJ-83, *Guangzhou* could outrange many U.S. surface combatants.[9] The PLA has been good at fielding an impressive array of ASCMs that can be launched from aircraft, submarines, or surface combatants. Although there is scant open-source information on how effective this missile has been in testing, one must assume the PLAN has confidence in its capabilities. We do know that a Chinese export C-802 ASCM, which Iran purchased in numbers in the 1990s, does work: in July 2004, during Israel's war with Hezbollah, the Israeli corvette *Hanit* was hit by a truck-mounted C-802. A two-missile salvo had been fired; one hit *Hanit*'s

stern crane, while the other overflew the target and hit a Cambodian-flagged Egyptian freighter some sixty kilometers downrange.[10]

Antisubmarine Warfare

Since the Type 052s are intended primarily to be missile-defense ships, they are equipped with a short-range (15,000 yards), medium-frequency, chin-mounted sonar (SJD-8/9), which is based on a French Thales DUBY-23-series sonar. The PLAN apparently has adopted the Russian navy's approach to destroyer ASW, in which the intent is ASW self-defense.[11] This is unlike the U.S. approach, which for decades has tried to achieve much-longer-range detection because it assumes U.S. Navy (USN) destroyers will operate as screening forces for aircraft carriers and contribute to the submarine defense of the carrier.

Like USN destroyers, *Guangzhou* has two triple-tube ASW torpedo launchers. Unlike USN ships, it is also equipped with short-range (1,000 yards) ASW rockets that, if nothing else, will put a "bang in the water" that can be very distracting to a submarine. All Type 052 classes have a helicopter-capable flight deck and a hangar for Ka-27 helicopters. These aircraft are equipped with dipping sonar derived from Russian systems.

Getting a Lot Better in a Hurry: The Type 052C (Luyang II)

While the Type 052B represented impressive improvement toward a state-of the-art destroyer, the ships the PLAN really wanted were the two successor classes, the 052C and 052D. That they are both in series production is the best evidence of PLAN satisfaction. And the PLAN has reason to be satisfied, because not only are they handsome ships, but on paper their combat capability is impressive.

The first two Type 052Cs were commissioned in 2004 and 2005, in parallel with the two Type 052Bs.[12] This was followed by a long—eight-year—hiatus, apparently caused by the relocation of the building yard to the Shanghai area. Unlike the earlier Type 052s, which combined Russian and Chinese systems, the Type 052C uses primarily Chinese systems derived from earlier foreign technology.[13]

Antiair Warfare

The Type 052C marks a big jump for the PLAN into phased-array air-search radars. The eight ships of this class have electronically scanned array radar (AESA), which, when combined with vertically launched missiles, greatly improves firepower. These eight ships permit the PLAN to narrow dramatically the capability gap with the United States, Japan, and South Korea, all of which operate Aegis-equipped destroyers in the western Pacific.

The Luyang II is generally similar to the 052B, with the notable addition of four fixed phased-array antennae in the forward superstructure. Two antennae cover the forward hemisphere, while the other pair covers the rear hemisphere—the same arrangement adopted on the U.S. Navy's *Arleigh Burke* class. Reports indicate that this radar may be the outcome of a codevelopment program with a Ukrainian company.[14]

These ships mark the PLAN's first venture into VLSs, which, along with the AESA radar, improve the Type 052C's antiair firepower by allowing it to track and shoot more rapidly. The VLS is made up of eight six-cell components. All are assumed to be filled with long-range HHQ-9 SAMs. The HHQ-9 has a maximum slant range of approximately 110 nm. Although this constitutes a dramatic improvement, any aircraft carrying long-range variants of the air-launched Harpoon ASCM still can remain outside a 052C's missile envelope and engage the ship. Thus, the U.S. Navy, which relies on sea-based airpower to contribute to gaining sea control, retains an important tactical asymmetry.

During the Cold War the U.S. Navy concluded that the best way to defend against massive Soviet air raids that would involve the launching of ASCMs was to destroy the launching platform before it reached its launch range—colloquially known as "shooting at the archer, not at the arrow." Until the PLAN can field a SAM system that can outrange most air-launched antiship weapons, it will remain condemned to "shooting at arrows." Of course, this is why the Aegis system was developed in the first place—to ensure the air defenses around an aircraft carrier could shoot down arrows.[15]

The Luyang II's terminal air defense is provided by two Type 730 close-in weapon systems (CIWSs). This CIWS can fire at a rate of 4,600–5,800 rounds per minute up to a range of 2,700 yards.[16]

Antisurface Warfare

Like the earlier Type 052s, the Type 052C carries ASCMs in separate launch canisters (two four-cell launchers). That these cruise missiles are in canisters rather than boxes suggests they are the indigenously produced YJ-62 (C-602) ASCMs. This is a subsonic missile that flies at an altitude of one hundred feet during the cruise phase of an engagement. It has an impressive range of about 250 nm. On paper, this is a formidable system; but trying to target individual ships at very long, over-the-horizon ranges is difficult. It almost certainly requires third-party assistance, often from the embarked helicopter, to make certain of the target and to ensure that other ships are not in the vicinity, lest they become unintended targets. In the terminal phase, the missile descends to twenty to thirty feet. The active radar seeker has an acquisition range of up to 22 nm.[17]

The 052C also carries one main gun, a single-barrel, 100 mm gun "derived" from a French Creusot-Loire weapon. The fully automatic gun can engage surface and aerial

targets such as aircraft and low-speed missiles. It has a maximum rate of fire of ninety rounds per minute.

Antisubmarine Warfare

Like those of the Type 052B class, the eight ships of the Luyang II class apparently are equipped with derivative French sonar suites, manufactured in China under license, and identified as SJD-8/9. For twenty years, from 1972 to 1993, France provided modern sonar technology to China; the post–Tiananmen Square arms embargo that the European Union still maintains apparently has brought that to a halt. This medium-frequency sonar has a surface duct range of ten thousand to eighteen thousand yards, again suggesting that the primary purpose of the ASW suite on these ships is self-defense rather than "main body defense."[18] The relatively short range of the hull-mounted sonars on these air-defense destroyers has interesting implications for how many escort ships will be required to provide adequate ASW protection for China's aircraft carrier(s).

The Luyang IIs are not fitted with a hull-mounted, variable-depth sonar or a towed array, and experts speculate that so equipping them would entail both a major hull redesign and a dramatic increase in processing power in the ships' integrated command-and-control system.[19]

In terms of ASW weapons, the 052Cs are outfitted with the standard six ASW torpedo tubes. ASW rockets, however, are apparently not part of the suite.

An embarked helicopter, either the export version of the Russian Kamov Ka-28 or the Chinese version of the Eurocopter Dauphin (AS-365N), known as the Z-9, constitutes a significant element of the ASW capability of this ship. Both aircraft have a dipping sonar capability, but the Z-9 is probably the more desirable since it has an onboard processor, whereas the Ka-28 has to datalink its acoustic information to the ship for processing. In either case, the helicopters perform a vital function in providing self-defense ASW for the ship.[20]

"Red Aegis"—the Type 052D (Luyang III)

A September 5, 2012, *Global Times* article created quite a stir among PLAN watchers when it revealed that a new destroyer was under construction at the Changxingdao-Jiangnan shipyard, near Shanghai, identifying it as "the Type 052D, the 052C's successor."[21]

The article went on, "As the most sophisticated combat ships, Aegis destroyers are commonly referred to as air-defense destroyers equipped with phased-array radars and modern ship-to-air missiles, which enable the ships to provide regional air-defense shields for the entire fleet."[22]

Photos of the ship turned up shortly thereafter in the blogosphere. They reveal that the Type 052D appears to be a more handsome Chinese cousin of the U.S. Navy's *Arleigh Burke*–class guided-missile destroyers (DDGs). Designers have adopted the flat-panel phased-array radar, similar to U.S. and allied Aegis systems. The ship apparently is fitted with two thirty-two-cell VLSs as well, one forward and one aft. Exactly what SAM they will carry is open to question, as is the nature of the rest of the combat systems suite, except for the gun—the 100 mm gun of the 052C class has been replaced with a larger-caliber 130 mm weapon.

In recent years, China has demonstrated an impressive ability to construct complex warships in large numbers. For example, it has launched four Type 052Cs since 2010. The new Changxingdao-Jiangnan yard where the 052Ds are building has the capacity to build several warships simultaneously.[23] According to some accounts, at one point this yard had eight ships of the Type 052C/D classes in various stages of construction.[24] I suspect that the 052D will go into series production to provide the most capable escort force available for the PLAN's first aircraft carrier strike group. In other words, the world will begin to see this ship in numbers in two years or so when the PLAN carrier *Liaoning* transitions from testing and training and begins to conduct more routine operations at sea.

The *Sovremenny* Class

No discussion regarding China's modern destroyer force would be complete without addressing the four Russian-built *Sovremenny*-class destroyers that entered the PLAN force structure in the early years of the twenty-first century. While for a brief moment they were the most capable surface combatants in the PLAN, these were "old" ships: old in design; old in hull, mechanical, and electrical structures; and old in combat systems.

In 1996, the PLAN decided to purchase two unfinished ex–Russian navy Project 956 destroyers, one two-thirds complete, the other one-third complete. Both ships were laid down in the late 1980s by the North Shipyard in Saint Petersburg, but their construction was suspended in 1995 owing to a lack of funds. The first hull, renamed *Hangzhou* (136), was delivered in December 1999, followed by the second hull, renamed *Fuzhou* (137), in December 2000.

In 2002, the PRC signed a contract with Russia to purchase an additional two ships of this class. The first to be delivered was *Taizhou* (138), in 2005; the second, *Ningbo* (139), was delivered in September 2006. These dates are significant: *Taizhou* and *Ningbo* were delivered *after* the first two Type 052Cs. Why China thought it needed two more of this class is a bit of a mystery. The blog SinoDefence.com asserts, "The *Sovremenny*-class destroyers provided a balanced platform that vastly exceeds [*sic*] the capabilities of Chinese domestic designs at the time of delivery."[25] That may have been what the senior officials

in Beijing concluded, but it was not an accurate judgment—perhaps reflecting their lack of confidence in China's own design abilities.

In any case, the contemporaneous Type 052B/C models had SAM systems of range equal to the *Sovremennys*', and their French-based ASW capabilities were slightly superior. The one unique capability the Russian ships did bring to the table was a long-range (195–210 nm), high-speed (Mach 3) ASCM, the Moskit, or SS-N-22. This is an impressive weapon, and when mated to a large (8,000 tons full load) hull, the class provides the PLAN with a good sea-keeping ship that it could employ against U.S. carrier forces.

On the other hand, short-range SAMs and mediocre ASW capabilities make ships of this class extremely vulnerable when operating beyond the PLA's land-based air cover, which they would have to do to get within range of U.S. carrier forces in a Taiwan scenario. Beyond these shortcomings in self-defense capabilities, they are steam-powered ships that use unreliable pressure-fired boilers.[26] This was a design the United States tried, unsuccessfully, in two classes of frigates (FF 1040 and FFG 1), both of which had trouble staying at sea because of the fickle engineering plants.

Given how far the PLAN design and production capabilities have come in less than a decade, to some analysts the *Sovremenny*s appear to be the PLAN's "white elephants." That they are not interoperable with the PLAN's own datalink standard, combat control systems, and communications systems makes their deployment especially anomalous.[27]

Large, reliable, long-endurance, multimission destroyers are essential for any navy that aspires to conduct sustained operations an ocean away from its home waters. Modern destroyers are expected to provide air defense for themselves and other ships in company, defend against submarines, and use embarked helicopters to find and attack hostile submarines before they can close to firing range. Destroyers also are expected to prevail in encounters with other ships, using ASCMs and helicopters with antiship missiles. Finally, modern destroyers are expected to be able to project power ashore, employing land-attack cruise missiles, and if necessary using their gun batteries to provide fire support for forces ashore.[28]

Over the last ten years, China has demonstrated, at least to outward appearances, that it has the ability to produce a state-of-the-art, multimission destroyer. The PLAN has at least eleven in commission or at various stages of construction, with an unknown total inventory objective. It joins Japan's (six Aegis destroyers) and South Korea's (three Aegis destroyers) as the only Asian navies with an Aegis, or Aegis-like, capability actually at sea, and by 2020 seems likely to have around twenty ships with this type of system. At that point, the PLAN's destroyer force will be far and away the second most capable (on paper) in the world. However, perspective is important: American destroyer capabilities

still will be unmatched. With the *Arleigh Burke,* or DDG 51, class, the U.S. Navy currently has sixty-three state-of-the-art destroyers in commission, with a total of at least seventy-five planned.

Finally, it is of course unclear how effective the combat systems of China's ships are, and how competent the crews will become. China is still dependent on Russian or Western "assistance" in the development of its most advanced weapons and combat systems; but so too are the Japanese and South Koreans. The reality is that China has joined the ranks of a handful of countries that have the money, infrastructure, design talent, and national strategic demand signal to build credible modern destroyers. Watching this incipient transregional Chinese navy develop will continue to be a fascinating occupation.

Notes

1. See Michael McDevitt, "The PLA Navy's Antiaccess Role in a Taiwan Contingency," in *The Chinese Navy: Expanding Capabilities, Evolving Roles,* ed. Phillip Saunders et al. (Washington, DC: National Defense Univ. Press, 2011), pp. 191–214.
2. See Michael McDevitt and Frederic Vellucci, "The Evolution of the People's Liberation Army Navy: The Twin Missions of Area-Denial and Peacetime Operations," in *Sea Power and the Asia-Pacific: The Triumph of Neptune?,* ed. Geoffrey Till and Patrick C. Bratton (Abingdon, U.K.: Routledge, 2012).
3. Information Office of the State Council of the People's Republic of China, *China's National Defense in 2008* (Beijing: January 2009), p. 12.
4. Nan Li and Christopher Weuve, "China's Aircraft Carrier Ambitions: An Update," *Naval War College Review* 63, no. 1 (Winter 2010), p. 15, available at www.usnwc.edu/publications/Naval-War-College-Review/2010---Winter.aspx.
5. See the entry for the Luda class at the *Military Today* website, www.military-today.com/navy/luda_class.htm. Also, an extensive and credibly detailed discussion of the Luda class as a test platform is found in *Wikipedia,* s.v. "Type 051 Destroyer," en.wikipedia.org/wiki/Type_051_destroyer.
6. Huang Li, *Sword Pointed at the Gulf of Aden: The PLAN's Far Seas Shining Sword* (Guangzhou: Sun Yat-sen Univ. Press, 2009).
7. From 1980 to 1982 I commanded a *Spruance*-class destroyer (USS *Oldendorf,* DD 972) with an LM2500 propulsion system. The *Spruance*-class ships were the U.S. Navy's first gas turbine–powered major warships. I suspect, but do not know for certain, that the LM2500s in *Qingdao* (DDG 113) and *Harbin* (DDG 112) have been replaced by Ukrainian-designed gas turbines, since spare parts for the General Electric engines would be hard to come by because of sanctions the United States imposed following the Tiananmen Square massacre. Both of these ships have participated in antipiracy patrols in the Arabian Sea.
8. Christopher P. Carlson, "China's Eagle Strike-Eight Anti-ship Cruise Missiles: The YJ-83, C803, and the Family Tree," *Defense Media Network,* www.defensemedianetwork.com/stories/chinas-eagle-strike-eight-anti-ship-cruise-missiles-designation-confusion-and-the-family-members-from-yj-8-to-yj-8a/.
9. For Harpoon data, see *Wikipedia,* s.v. "Harpoon Missile," en.wikipedia.org/wiki/harpoon_(missile).
10. According to Carlson (see note 8), the C-802 was an export-only cruise missile marketed to provide funds for the PLAN to develop the YJ-83; apparently the seeker of the YJ-83 was derived from the C-803. Dov S. Zakheim, *The United States Navy and Israeli Navy: Background, Current Issues, Scenarios, and Prospects,* CNA Research Paper COP D0026727.A1/Final (Alexandria, VA: CNA, February 2012), p. 27, available at www.cna.org/sites/default/files/research/The%20United%20States%20Navy%20and%20Israeli%20Navy%20D0026727%20A1.pdf.
11. James C. Bussert, "China Pursues Antisubmarine Warfare," *Signal: On Line,* November 2004, www.afcea.org/content/?q=node/509; James C. Bussert, "Chinese Naval Sonar Evolves from Foreign Influences," *Signal: On Line,* December 2002, www.afcea.org/content/?q=node/279. See also Norman Friedman, *The Naval Institute Guide to World Naval Weapons Systems* (Annapolis, MD: Naval Institute Press, 2006), p. 612.

12. The discussion of the Type 052C class is based on *Wikipedia,* s.v. "Type 052C Destroyer," en.wikipedia.org/wiki/Type_052C_destroyer/, and "Type 052C (Luyang-II Class) Missile Destroyer," SinoDefence.com, www.sinodefence.com/navy/surface/type052c-luyang2.asp. There are a number of other Google results for this class, but they all repeat the same information regarding weapons systems. See also Ronald O'Rourke, "The PLAN Force Structure: Submarines, Ships, and Aircraft," in *The Chinese Navy,* ed. Saunders et al., pp. 141–74.
13. James C. Bussert, "China Debuts AEGIS Destroyers," *Signal: On Line,* July 2005, www.afcea.org/content/?q=node/992.
14. "Luyang II/Type 052C Multi-role Destroyer, People's Liberation Army Navy," *Global Security,* www.globalsecurity.org/military/world/china/luyang-ii.htm. This report suggests the radar resulted from a codevelopment program with Kvant-Radiolokatsiya Company of Ukraine.
15. Norman Friedman, "Aegis Air Defense System at Thirty," *Defense Media Network,* April 23, 2013, www.defensemedianetwork.com/stories/aegis-air-defense-system-at-thirty/.
16. Jeff Head, "PLAN-USA DDG Compare," JeffHead.com, www.jeffhead.com/PLAN-USA-DDGCompare/.
17. Dennis Gormley, Andrew Erickson, and Jingdong Yuan, "JFQ-75: A Potent Vector—Assessing Chinese Cruise Missile Developments," *NDU Press,* September 30, 2014, ndupress.ndu.edu/Media/News/NewsArticleView/tabid/7849/Article/11240/jfq-75-a-potent-vector-assessing-chinese-cruise-missile-developments.aspx; Carlo Kopp and Martin Andrew, "CASIC YJ-62/C-602 in PLA Cruise Missiles," *Air Power Australia,* www.ausairpower.net/APA-PLA-Cruise-Missiles.html#mozTocId32149.
18. James Bussert and Bruce Elleman, *People's Liberation Army Navy: Combat System Technology, 1949–2010* (Annapolis, MD: Naval Institute Press, 2011), pp. 132–33.
19. *Wikipedia,* s.v. "Type 052C Destroyer."
20. Ibid.
21. Xu Tianran, "China Launches New Destroyer," *Global Times,* September 5, 2012, www.globaltimes.com.cn/content/731150.shtml. *Global Times* is owned by *People's Daily,* and hence is considered an official, although *not* an authoritative, source.
22. Ibid.
23. Gabe Collins and Andrew Erickson, "New Destroyer a Significant Development for Chinese Sea Power," *China Real Time Report* (blog), *Wall Street Journal,* October 8, 2012, blogs.wsj.com/chinarealtime/2012/10/08/new-destroyer-a-significant-development-for-chinese-sea-power/.
24. "2012 in Review," *Information Dissemination* (blog), December 28, 2012, www.informationdissemination.net/2012/12/2012-in-review.html.
25. "Project 956/EM, *Sovremenny*-Class Missile Destroyer," SinoDefence.com, www.sinodefence.com/navy/surface/sovremenny.asp.
26. Robert O. Work, "Winning the Race: A Naval Fleet Platform Architecture for Enduring Maritime Supremacy" (briefing, Center for Strategic and Budgetary Assessments, March 1, 2005), available at www.csbaonline.org/. Work, who at time of writing was Deputy Secretary of Defense, makes specific reference to the boiler problems associated with *Sovremenny.*
27. "The White Elephants of the PLAN," *Information Dissemination* (blog), September 29, 2012, www.informationdissemination.net/2012/09/the-white-elephants-of-plan.html.
28. As of this writing, the best open-source information indicates that the Luyang III (Type 052D) class will at some point be fitted with the DH-10 land-attack cruise missile (LACM), which will mean that China's most modern destroyers will carry a land-attack weapon with an approximate range of 1,900 nm. See Gormley, Erickson, and Yuan, "JFQ-75: A Potent Vector," p. 102.

CHAPTER SIX

China's Evolving Surface Fleet

Its Possible Roles and Missions in the Indian Ocean Region and Its Impact on Regional Security and Stability

Sureesh Mehta

China's naval modernization program is driven by three primary factors: potential conflict within the Taiwan Strait; the increased challenge posed by the significant U.S. naval presence in the Pacific Ocean; and the desire to develop a blue-water fleet to secure China's sea lines of communication (SLOCs) that pass through the Indian Ocean and the South China Sea.[1] This modernization involves naval hardware accretion, additional infrastructure to support the growth of naval forces, and a matching manpower profile. The latter two aspects are contingent on the modernization of naval hardware.

The major naval hardware elements being modernized consist of the surface combatant forces—destroyers, frigates, amphibious ships, patrol craft, and, above all, China's aircraft carrier—as well as submarines, antiship ballistic missiles, and antiship cruise missiles (ASCMs). While submarines and long-range missiles unquestionably complement a country's surface fleet and synergistically increase overall naval capacity, it is the surface fleet that provides the primary and most visible indicator of national naval capabilities.

Developments in the PLA Navy's Surface Fleet

Since the start of the new millennium, modernization of the People's Liberation Army (PLA) Navy (PLAN) has received a huge impetus. Within that larger effort, the pace of surface fleet modernization can be gauged by the increase in the portion of surface combatants qualifying as modern from less than 10 percent in 2004 to more than 30 percent in 2011.[2] While certain advanced platforms were acquired from Russia, surface fleet modernization has relied largely on indigenous production of a wide variety of ships.

The Liaoning *Aircraft Carrier*

Any discourse on PLAN modernization has to begin with the Chinese aircraft carrier program. Chen Bingde, the PLA chief of general staff, acknowledged for the first time in June 2011 that the former *Varyag,* after undergoing a ten-year refit, was being readied in the Dalian shipyard.[3] After extensive machinery and navigational equipment checks and deck landing trials by PLAN helicopters, the carrier was commissioned into the PLAN

on September 25, 2012. The first deck landing and takeoff of J-15 fighter aircraft from *Liaoning* were accomplished at the end of November 2012. Since then, the carrier has been based at the North Sea Fleet base of Qingdao for operational workup and exploitation.

Chinese media releases suggest that the planned "way forward" for consolidation of a Chinese carrier task force will be carried out in phases. A Xinhua report, for instance, speculates that, "restricted by the number of main PLA naval ships, China's aircraft carrier formation will be kept in an appropriate scale, and mainly be composed of *Liaoning,* four to six guided missile destroyers and guided missile frigates, one to two nuclear attack submarines or new-type conventional submarines, and one comprehensive supply ship."[4]

As for its air wing, China intends to operate two types of fixed-wing aircraft from the carrier. Beyond the already-tested J-15 fighter aircraft, it projects the J-31 as the next-generation carrier-borne fighter. The Chinese consider the fifth-generation J-31 to have three traits that will make it suitable for service on the aircraft carrier: medium size, reliability, and multirole functionality. The PLAN hopes that these two aircraft operating together will provide "comprehensive time-domain and airspace coverage, and greater combat radius" around the carrier.

Unsubstantiated media discourse assesses that the PLAN may construct up to two more carriers by 2020. One might be of *Liaoning*'s follow-on class. The other could have an improved design, with heavier displacement (seventy thousand tons), steam catapults and conventional steam power, and the capability to carry domestically manufactured advanced fighter and fixed-wing airborne warning and control system (i.e., AWACS) aircraft.[5]

Destroyers and Frigates

China has acquired four *Sovremenny*-class destroyers and advanced Kamov-28 antisubmarine warfare (ASW) helicopters from Russia. Indigenous production includes the building and commissioning of the Luyang I and II–class destroyers and Jiangkai I and II–class frigates. The Chinese regard Luyang II (052C)–class destroyers as Chinese "Aegis" destroyers. To augment further its surface vessels to meet escort requirements for an aircraft carrier task force, the PLAN commissioned the first of its Type 052D air-defense destroyers, named *Changchun* (150), on January 31, 2013.[6] Displacing about six thousand tons, it has greater long-range air-warning and regional air-defense capabilities than earlier destroyer classes.

Building of Jiangkai-class frigates has proceeded at a rate of one per year, and several more of the same class likely will be built. The commissioning of the new-class destroyer was followed in quick succession by the introduction of the first Type 056 advanced ASW frigate on February 25, 2013, again primarily for carrier escort tasks. *Bengbu* (582)

was commissioned on March 12, 2013. It reportedly integrates different types of weaponry and equipment of advanced technologies and features good stealth performance and high electromagnetic compatibility.[7]

Missile Boats

Through 2013, China had built roughly seventy Houbei-class attack craft. It may have plans to build as many as one hundred of these stealthy boats. They have a wave-piercing catamaran hull design. Each is armed with eight YJ-83 ASCMs.

Amphibious Ships

Amphibious warfare capabilities also are being augmented through significant equipment upgrades, including introduction of new Yuzhao (071)–class amphibious ships (LPDs) and their integral air-cushion landing craft. China has built three Type 071 LPDs, with at least one more to be commissioned. More multimission amphibious platforms are likely to be built to enable the PLAN to fulfill both traditional missions and requirements for military operations other than war.

Assessed Roles and Missions in the Indian Ocean Region

Chen Mingyi, a member the National Committee of the Chinese People's Political Consultative Conference, laid out the role of the PLAN quite aptly when in March 2009 he exhorted it to "move to oceans and shoulder the tasks of safeguarding territory, development of national economy and overseas interests."[8] This suggests that China looks at the Indian Ocean region (IOR) in light of two imperatives. The first concerns the security of China's SLOCs, on which its growing economy is so dependent. The second is the need to expand its operating space, striving for presence in all global hot spots, so as to be able to influence events in favor of its national interest.[9]

Answering these imperatives—involving distant-area operations, far and wide—may have led China to strengthen the capacity of its surface fleet. In this context, the PLAN's evolving surface fleet's roles and missions in the IOR may be viewed from three distinct perspectives: traditional, nontraditional, and support of extended Chinese maritime interests and endeavors.

Traditional Military Role

The Chinese vision of expanding the country's maritime frontiers in accordance with the "three island chain" construct entails establishing a blue-water presence within the "first island chain" of the Pacific Ocean by 2010; gaining the capability to exercise presence out to the "second island chain" by 2025; and possessing a true blue-water fleet with credible presence in the Pacific to the "third island chain," extending from the Aleutian Islands to Antarctica, by 2050.[10] Considering the PLAN's current growth and modernization

trajectory, once the PLAN's reach has passed the "second island chain" credibly, projecting itself toward the IOR would be well within its capabilities.

One hopes that opportunities for the PLAN surface fleet to engage in its conventional role of war fighting will not present themselves readily. Nevertheless, the mere presence of "men-of-war" implies an offensive and coercive capability, whether used or not. At present levels of surface fleet evolution, the PLAN would find it difficult to carry out the traditional naval role at the high end of the spectrum of warfare in the IOR, mainly because of its lack of integral air-defense capability. However, the situation will change substantially within a decade or so, by which time the gap between the Chinese intent of "conducting operations in distant waters" and its aircraft carrier task force–based "power-projection" capabilities will have narrowed substantially.[11]

The intervening time also will enable Beijing to gain relevant technical expertise in carrier construction and aircraft manufacture, learn the highly specialized art of carrier air operations, and acquire enough influence over its regions of interest to transform one or two "influence-heavy places" into bases for supporting such a force at extended ranges. The most probable locations for the latter are Gwadar in Pakistan, Hambantota in Sri Lanka, Chittagong in Bangladesh, and Kyaukpyu in Myanmar. But the Chinese maritime options may not be limited to these "pearls" alone. The PLAN's current tasking and China's future naval vision may warrant the exploration of other suitable sites deep into the Indian Ocean, such as Mauritius, Seychelles, one of the East African littorals, or ports in the Gulf of Aden.

In fact, *Liaoning*'s political commissar forecast the shape of things to come when he reportedly stated that "as the first generation of Chinese aircraft carrier crew, we must . . . ensure early establishment of our high-sea combat capability, making due contributions to safeguarding our national maritime rights and interests, and building up China into a marine power."[12] While the PLAN assiduously works toward that vision, the ongoing capability accretion of the PLA naval surface fleet could be used appropriately for nontraditional activities that project a benign face for the state while keeping the force well trained and equipped and operationally active.

Nontraditional Roles

Military operations other than war (MOOTW) now form an important component of the application of military forces. Chinese doctrine governing this area directs the PLAN to "defend the country's maritime rights, interests, and security, safeguard its economic development, and serve its peaceful diplomacy" by engaging in maritime operations in offshore areas.[13] The IOR has provided numerous opportunities for the PLAN to engage in these activities. The most important has been the PLAN's antipiracy escort mission, which (as of early 2014) the service has been conducting for more than six years. The

PLAN has sent nineteen naval task forces to the Gulf of Aden and has performed more than eight hundred escort missions.[14]

But the real and invaluable gains for China from these missions have extended far beyond the safety of the merchant ships escorted. China has undertaken many maritime and diplomatic activities either associated with or complementing the presence of its ships in the Gulf of Aden. While on deployment, PLAN ships have increased their interoperability by jointly operating with other countries' ships, conducting joint exercises, and exchanging visits of task force commanders and other personnel from NATO, the European Union, and Combined Task Force 151.

Warships of different task forces also have been "showing the flag" in various IOR littorals, including those of India, Pakistan, Sri Lanka, Myanmar, and Malaysia, while proceeding to or returning from antipiracy mission deployments. The PLAN's postdeployment arena has expanded progressively as its escort mission has endured. Ships of the eleventh task force transited the Suez into the Mediterranean and ventured into the Black Sea for the first time, making maiden visits to Ukrainian, Bulgarian, and Romanian ports. These ships subsequently docked at Istanbul and the Israeli port of Haifa, thus remaining in a potentially volatile area—considering the ongoing Syrian turmoil and the Israel-Lebanon standoff—for close to a month in July–August 2012. The warships of the twelfth task force reached out even farther by routing themselves home via Australia. The thirteenth task force ships sailed into the Atlantic in the first half of April 2013 and visited Moroccan, Portuguese, and French ports in that ocean. They called at Mediterranean Sea ports in Malta and Algeria en route. The emergent pattern resembles a wheel, with the hub at the Gulf of Aden and the spokes fanning out across the globe in all directions.

Other nontraditional PLAN activities in the IOR merit mention:

- The PLAN hospital ship *Peace Ark* sailed across the Indian Ocean on Mission Harmony from September to November 2010, visiting Djibouti, Kenya, Tanzania, Seychelles, and Bangladesh. It also operated in the Gulf of Aden for a few days with the sixth escort task force.
- The PLAN training ship *Zheng He,* while transiting through the Gulf of Aden as part of its around-the-world training mission, also effected a rendezvous with the *Yantai* frigate of the eleventh task force on May 17, 2012, with the ships operating together for a day.
- Diversion of the frigate *Xuzhou* from the antipiracy task force to the Libyan coast in February 2011 to assist in the withdrawal of Chinese citizens from crisis-struck Libya—the first role of this kind for the PLAN—is well documented.

- Three PLAN warships participated in the Pakistan-initiated multilateral maritime Exercise AMAN in March 2013 prior to service as the fourteenth task force in the Gulf of Aden. This represented the second time the PLAN followed this sequence, the first being when the frigate *Ma'anshan* joined Exercise AMAN in March 2011, then proceeded to join in escort operations in the Gulf of Aden.

All these nontraditional activities have accorded the PLAN an unprecedented opportunity to perform operational tests, showcase the frontline units of all three of its fleets, and provide the bulk of its manpower with hands-on workup in distant-area operations, in a theater it did not have to create. While these are the visible dividends, the biggest gains have accrued in the PLAN's institutionalization of back-end logistical, administrative, and infrastructural setups, which have evolved into well-coordinated mechanisms for supporting the pre-, post-, and actual deployment activities of the successive task forces.

Supporting Extended Maritime Interests and Endeavors

On November 8, 2012, during his final keynote address at the National Party Congress in Beijing, then–Chinese president Hu Jintao called for "enhancing the Chinese capacity for exploiting marine resources, resolutely safeguarding China's maritime rights and interests, and building China into a maritime power."[15] These comments represented the first time the country's topmost leader had enunciated clearly in a party congress a decisive road map for maritime development.

As part of its marine resources exploration policy, China has been extending its deep-sea exploration activities in the Indian Ocean since 2005. In July 2011, the International Seabed Authority granted the China Ocean Mineral Resources Research and Development Association exclusive rights to explore an area measuring ten thousand square kilometers (3,800 square miles) of the sub-ocean Southwest Indian Ridge.[16] China also has dispatched its oceanographic-survey and intelligence-collection vessels to the IOR on a regular basis. The large-scale, China-bound, seaborne trade and energy flow needs no further elaboration. In addition, a large Chinese diaspora inhabits the IOR littorals, engaged in varied economic activities. For instance, Chinese people—including technical reserve PLA troopers—are carrying out uranium, mineral, metal, and oil exploration, infrastructure development, and humanitarian-assistance activities in about twenty-eight African countries.

In keeping with the oft-repeated dictum that "the flag follows economic interests," it appears quite logical that the PLAN surface fleet would feel, sooner rather than later, the need to secure the above-mentioned maritime endeavors and interests of the Chinese state. The presence of PLAN ships in proximity to the Gulf of Aden—albeit for a

different task, antipiracy escort—does imply an unstated and notional sense of security assurance for Chinese economic and personnel interests.

Impact on Stability and Security in the IOR

> *To the other countries, the Indian Ocean is only one of the important oceanic areas; to India, it is a vital sea. Her lifelines are concentrated in that area, her freedom is dependent on the freedom of that coastal surface. No industrial development, no commercial growth, no stable political structure is possible for her unless her shores are protected.*
>
> K. M. PANIKKAR, *INDIA AND THE INDIAN OCEAN*

Although the noted Indian maritime historian Sardar Panikkar expressed the prophetic words of the epigraph above in 1945, they remain relevant. In the contemporary era of globalized economic interdependence, predicated on uninterrupted traffic along maritime sea-lanes, the existing myriad security challenges in the IOR could have a decided impact on the security and stability of the entire region.

Impact in the Indian Maritime Domain

While the extent and intensity of future instability in the region are debatable at present, there is no denying that any such instability would affect Indian maritime interests and activities immediately, and to a considerable degree. India has a coastline of 7,516.6 km and an exclusive economic zone (EEZ) of 2.013 million sq. km. The outlying Indian islands; offshore assets, fisheries, and deep-sea interests within the EEZ; major and minor harbors; and the overall seaward security of the vast coastline are other vital aspects of the Indian maritime dimension and responsibilities. The Andaman and Nicobar Islands, which serve as strategic outposts for India, have to be defended against various threats from state and nonstate actors. The main missile and rocket test launch centers connected to the Indian space and strategic-missile programs are located on India's east coast. The Bay of Bengal, particularly the area around the Andaman Sea, is used extensively for experimental missile tests and operational rocket launches for placing various kinds of satellites into space. These activities entail deployment of maritime assets, including those of the navy, over a large area, necessitating wide-area communications, data transfer, and relaying, both terrestrially and through satellites.

In recent years, there have been reports of PLAN intelligence-gathering ships being deployed in the Bay of Bengal.[17] Such ships easily would be able to monitor the entire gamut of India's scientific activities related to its space and missile program by intercepting the ongoing communications and transmitting them to China for intensive analysis. Further, the presence of Chinese listening posts in the Myanmar-controlled Coco Islands (which has been reported in the global media, accompanied by a fair amount of

speculation) would present Beijing with permanent infrastructure to conduct communications and signals intelligence.

Additionally, when PLAN ships regularly start visiting ports such as Chittagong, Kyaukpyu, and Yangon in the Bay of Bengal, and Hambantota, Karachi, and Gwadar in the Arabian Sea, they would be right in the midst of a maritime area critical to Indian maritime interests. While transiting the region, these warships, along with research and intelligence-collection vessels, surely would indulge in activities such as seawater and atmospheric profiling, weather pattern observation, and routing and navigational familiarization. The increased data collection resulting from this ongoing presence combined with diligent management of such data would enable the PLAN to identify emerging patterns, which it could exploit in future maritime confrontations.

The institutionalization of the AMAN series of multilateral exercises also has enabled the PLAN to plant its footprint regularly in the close vicinity of the Indian seaboard. The scope of the exercises themselves and the extent of PLAN participation therein have been expanding over time. From the presence of one warship and the conduct of basic naval drills in 2007, the activities have increased to three PLAN ships participating in tactical surface interception exercises, formation helicopter flying, and coordinated weapon firings. Asked by the media to comment on the enhanced participation of PLAN ships, Rear Adm. Khan Hasham Bin Saddique, commander of Pakistan's fleet, said: "Given the kind of relationship between Pakistan and China as well as between the Pakistan Navy and PLA Navy, we expect this level of participation from our Chinese friends. It could give us the opportunity to further refine our procedures and enhance cooperation between the two navies."[18]

Implications for the Indian Navy

To be sure, China definitely will not be able to "project power" in as comprehensive a manner as the United States defines it—as the ability "to rapidly and effectively deploy and sustain forces in and from multiple dispersed locations to respond to crises and contribute to deterrence"—even should it gain the three medium-sized aircraft carriers and supporting hardware expected in the 2020 time frame.[19] However, the PLAN is making steady progress in its aircraft carrier program, with the stated aim of "developing its naval capabilities of conducting operations in distant waters." Assuming that eventually this will lead to a Chinese carrier formation deploying in the Indian Ocean, the Indian navy has reason to be concerned.

As an integral part of such a future Chinese carrier formation, nuclear attack submarines (SSNs) will bring about a quantum change in the undersea security paradigm for the Indian navy. Since the submarine-detection problem in the IOR is rather complex—the tropical seawater conditions complicate the sound-propagation profile—submarines

occupy an inherently advantageous position. In such an environment, Chinese SSNs armed with ASCMs and modern torpedoes effectively would be able to achieve sea denial while posing a credible threat to IOR SLOCs.[20] A disproportionate ASW effort would be required for the Indian navy to detect and prosecute such SSNs. The recent hype created around media reports of Chinese submarines being detected in the Indian Ocean demonstrates the challenges such submarines would pose in the region. The media also have highlighted Indian concerns—for instance, citing an Indian Ministry of Defence document to the effect that "the implicit focus of the Chinese navy appears to be undermining the Indian navy's edge to control highly sensitive sea lines of communication."[21]

In addition to Chinese SSNs, the Chinese surface fleet (whether operating independently; or in the traditional role as part of a carrier group, likely a decade from now; or continuing the current engagement in nontraditional MOOTW activities) definitely will impact the operational pattern of the Indian navy. With PLAN ships crisscrossing the northern Arabian Sea for purposes of transit, passage, joint exercises, antipiracy patrols, and postdeployment activities, the availability of maritime space for the Indian navy to conduct operations, exercises, and training could be constrained somewhat, with its intentions and movements open to monitoring and possible interdiction. In such a constricting environment, the policies, plans, and procedures of the Indian navy will have to be transformed accordingly.

Pakistan's acquisition of Chinese frigates and patrol craft, and possibly Chinese submarines, in addition to the two countries' extensive maritime cooperation, may lead progressively to the positioning of Chinese maritime assets and expertise in Pakistan. Moreover, the handing over of Gwadar port operations to a Chinese company makes it easy for the PLAN to gain a foothold there eventually. Such a presence may merely facilitate training and "enhance[d] cooperation between the two navies," as the Pakistani fleet commander has articulated, but the Indian naval establishment will have to be cognizant of this potential when planning its maritime mission profiles, operational doctrines, and tactical plans.[22] In any period of heightened tensions, the possibility of active or tacit cooperation between the two forces will have to be factored in.

Impact on Regional Security

The naval forces of most maritime nations, including many extraregional powers, are undertaking antipiracy missions in the Gulf of Aden. In "A Cooperative Strategy for 21st Century Seapower" (October 2007), the U.S. Navy articulated its intent to maintain a permanent presence in the Indian Ocean, officially reiterating that "[c]redible combat power will be continuously postured in the Western Pacific and the Arabian Gulf / Indian Ocean to protect [America's] vital interests . . . and deter . . . potential adversaries

and peer competitors."[23] The 2010 American Naval Operations Concept further elaborated that for the foreseeable future, the U.S. Navy will maintain continuous presence of one carrier strike group and one amphibious readiness group in the Arabian Gulf / Indian Ocean.[24]

Chinese strategic discourse indicates that Beijing's strategic elite is debating seriously the possibility of China's future energy security in the Indian Ocean being affected by India's maritime strategy.[25] As part of the larger energy security effort in the IOR, during one meeting of the Shared Awareness and Deconfliction organization on streamlining antipiracy patrols and escort duties in the Gulf of Aden, China suggested that the sea-lanes currently being patrolled be divided into separate national sectors.[26] Similar proposals—to the effect that various countries' naval forces should define individual areas of responsibility to improve the efficiency of escort operations—also were floated by the Chinese representative at the UN Security Council.[27] Had the participating nations approved such a proposal for implementation, the PLAN would be sitting pretty by now in a legitimately allotted "maritime slice" of the Arabian Sea.

The PLAN's sustained naval presence in the IOR also allows Beijing's foreign ministry to delve into regional diplomacy and test out foreign policy overtures. A case in point was the reported Chinese offer to mediate in the long-running sovereignty dispute between the United Arab Emirates and Iran over the Greater and Lesser Tunbs and Abu Musa Island in the Persian Gulf.[28] This mediation offer, if accepted by one or the other party, could go a long way toward establishing China's credentials as a preeminent player in the Gulf region. Yet another facet of the Chinese naval presence in the region came into focus when certain countries sought to leverage that presence to create an impression of overt Chinese support in their favor. When the ships of the eleventh Chinese task force, after completing their tenure in the Gulf of Aden, were transiting through the eastern Mediterranean Sea on their way to the Black Sea, local-language articles in Syrian and Iranian media averred that the Chinese and Russian navies would conduct joint exercises with Syria and Iran. Although both China and Russia rejected such a possibility out of hand, the PLAN ships' mere presence in the vicinity raised undue concerns at a time of great and ongoing regional turbulence.[29]

The above instances indicate that even the PLAN's currently limited presence in the IOR is being leveraged by either China or others in various nuanced ways. Hence, even if the problem of piracy in the Arabian Sea hypothetically were to be resolved, the PLAN might not return to China, especially after investing so much in the way of effort, resources, and international relations capital, and having gained strong sea legs, vital lessons in interoperability, and, above all, a say in global maritime matters.

An Indian scholar argues that "the continued presence of these two extraregional navies [i.e., the U.S. Navy and the PLAN] in the Indian Ocean with the similar stated motives of 'SLOC security' and 'freedom of the seas' but diametrically opposite ways of thinking, does have portents for instability. Rising capabilities of the Indian navy also adds the third dimension into the regional power matrix."[30] The Indian navy's assigned role of "safeguarding India's national interests encompassing sovereignty, territorial integrity, secure maritime environment conducive to safety, security, and development of the nation and its citizens" is quite similar to what members of the Chinese political elite want their navy to do.[31] Thus, when the PLAN's assigned task of "safeguarding . . . development of national economy and overseas interests" overlaps with the charter of the Indian navy, there are bound to be conflicts of interest. The resultant maneuvers aimed at convincing each other—and the larger IOR littoral—of the seriousness of their imperatives could cause internecine fault lines, which, if not adroitly managed, could widen with time. Robert Kaplan in fact identifies the "Indian Ocean [as the place] where the global struggles will play out in the 21st century."[32] One Chinese author also suggests that since India perceives the Indian Ocean as a guarded sphere of influence, it offers an important arena for Beijing and New Delhi to "display their strategic muscle."[33]

One of the scenarios that two Indian strategists have painted predicts that China will manage to find a military base on the East African coast and will station an air expeditionary wing there to provide air cover for PLAN ships deployed in the region. In that scenario, India would find itself isolated with regard to its strategic interests in the IOR.[34] India would have to generate alternatives to reverse this "isolation" predicament, and many other Asian countries would have to seek options for a power balance vis-à-vis the proactive Chinese presence in the region. These dynamics and any counterresponses obviously would impact regional stability.

Since the end of the Cold War, China has manifested a gradual doctrinal shift from its previous continental focus to a maritime one and the notion of outward expansion, leading to a stress on naval modernization. As a result, the contours of the PLAN have undergone considerable change, transforming both its force composition and its maritime strategy. While the numbers of surface combatants likely will remain more or less constant, as new ships are commissioned and older ones get phased out more modern weapons systems and sensors will find their way into the inventory, so the force capability will keep on rising.

The relevance of the PLAN's conducting far-seas operations and its increasing necessity may be explained in terms of the increasing vulnerability of the Chinese energy flow through the Indian Ocean and the need to secure China's maritime areas of interest.

The theaters associated with such a far-seas operations strategy appear to be the western Pacific Ocean, followed by the eastern IOR.

The PLAN's enhanced capabilities, combined with the desire to "operate in distant waters," suggest an eventual permanent Chinese presence and power projection in the IOR. The PLAN's current capabilities may not match its intent yet, but its rapid progress in acquiring these capabilities and the current Chinese maritime orientation do raise security concerns for India, and may pose questions regarding the future stability quotient in the IOR.

Therefore, maintaining a clear perspective on the PLAN's evolving surface fleet and its accompanying shift in strategic focus will serve the interests of the larger global community well.

Notes

1. Ronald O'Rourke, *China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress,* CRS Report (Washington, DC: Congressional Research Service, December 10, 2012), p. 5, available at www.fas.org/sgp/crs/row/RL33153.pdf.
2. Ibid., p. 15.
3. See "China's Aircraft Carrier May Undergo Sea Trials from July," *Wantchinatimes,* June 22, 2011, www.wantchinatimes.com/news-subclass-cnt.aspx?cid=1101&MainCatID=&id=20110622000062.
4. "PLAN Makes Preparations for Aircraft Carrier Formation," *People's Daily Online,* December 14, 2012, english.peopledaily.com.cn/102774/8058419.html.
5. "Future of Chinese Navy Aircraft Carrier Development," *China Defence Mashup,* October 16, 2012, www.china-defense-mashup.com/the-future-of-chinese-navy-aircraft-carrier-development.html.
6. "'Changchun' Warship Commissioned to PLAN," *China Military Online,* February 4, 2013, eng.chinamil.com.cn/news-channels/china-military-news/2013-02/04/content_5208440.htm.
7. "New Frigate Delivery in Line with Procedure: Spokesman," Xinhua, February 28, 2013, available at news.xinhuanet.com/english/china/2013-02/28/c_132199281.htm.
8. "Chinese Navy Urged to Go from Coastal Waters to Oceans," *China Internet Information Center,* www.china.org.cn/government/NPC_CPPCC_2009/2009-03/07/content_17397799.htm. This is basically quite similar to the Indian navy's mandated constitutional role "to ensure peace and stability in the waters around us, so that economic development can proceed ahead uninterrupted."
9. Kamlesh Kumar Agnihotri, "Modernisation of the Chinese Navy, Its Strategic Expansion into the Indian Ocean Region, and Likely Impact on the Regional Stability," *Maritime Affairs: Journal of the National Maritime Foundation of India* 7, no. 1 (Summer 2011), p. 54.
10. David Shambaugh, *Modernizing China's Military: Progress, Problems, and Prospects* (New Delhi: Bookmart, under arrangement with Univ. of California Press), p. 67.
11. "PLAN Makes Preparations."
12. "Political Commissar of 'Liaoning' Ship: Safeguarding China's Maritime Territory, Sovereignty, Rights, and Interests," *People's Daily Online,* January 18, 2013, english.people.com.cn/90786/8097202.html.
13. See "National Defense Policy," sec. 2 of the white paper *China's National Defense in 2010,* available at news.xinhuanet.com/english2010/china/2011-03/31/c_13806851.htm.
14. "Chinese Navy Completes 800th Escort Mission in the Gulf of Aden," *China Military Online,* english.chinamil.com.cn/news-channels/china-military-news/2015-01/04/content_6294429.htm.
15. "Hu Calls for Efforts to Build China into Maritime Power," Xinhua, November 8, 2012, available at news.xinhuanet.com/english/special/18cpcnc/2012-11/08/c_131959403.htm.
16. Decision ISBA/17/C/16 dated July 19, 2011, in International Seabed Authority, *Selected*

Decision and Documents of the Seventeenth Session (11–22 July 2011) (Kingston, Jam.: 2011), p. 109, available at www.isa.org.jm/files/documents/EN/SelDecisions/SD17/EN-1.pdf.

17. "Suspected Chinese Spy Ship near Andamans," *Hindustan Times,* August 30, 2011, available at www.hindustantimes.com/India-news/NewDelhi/Suspected-Chinese-spy-ship-near-Andamans/Article1-739769.aspx.
18. "Naval Powers for Peace: Sino-Pakistani Maritime Partnership," *Beijing Review Online,* March 21, 2013, www.bjreview.com.cn/world/txt/2013-03/18/content_527956.htm.
19. U.S. Defense Dept., *Dictionary of Military and Associated Terms,* JP 1-02 (Washington, DC: Joint Staff, April 12, 2001), p. 367.
20. Kamlesh Kumar Agnihotri, "'The Chinese Navy's Submarine Arm: Lynchpin of 'Active Defence,'" *Maritime Affairs: Journal of the National Maritime Foundation of India* 8, no. 2 (Winter 2012), p. 114.
21. "China's Submarines in Indian Ocean Worry Indian Navy," *China Daily Mail,* April 7, 2013, available at chinadailymail.com/2013/04/07/chinas-submarines-in-indian-ocean-worry-indian-navy/.
22. "Chinese Navy Completes 800th Escort Mission."
23. See J. T. Conway, G. Roughead, and T. W. Allen, "A Cooperative Strategy for 21st Century Seapower," October 17, 2007, available at www.navy.mil/; repr. *Naval War College Review* 61, no. 1 (Winter 2008), p. 7.
24. See U.S. Navy Dept., "Forward Presence," chap. 4 in *Naval Operations Concept 2010: Implementing the Maritime Strategy* (Washington, DC: n.d. [2010]), p. 30.
25. See Zhang Li, *China-India Relations: Strategic Engagement and Challenges,* Asie.Visions 34 (Paris: IFRI, September 2010), p. 28, available at www.ifri.org/downloads/asievisions34zhangli.pdf.
26. Richard Weitz, "Priorities and Challenges in China's Naval Deployment in the Horn of Africa," Jamestown Foundation *China Brief* 9, no. 24 (December 3, 2009), available at www.jamestown.org/single/?no_cache=1&tx_ttnews%5Btt_ news%5D=35795.
27. "China Calls for Integrated Solution to Somali Piracy," *People's Daily Online,* November 19, 2009, english.peopledaily.com.cn/90001/90776/90883/6817473.html.
28. T. S. V. Ramana, "Chinese Diplomatic Riposte in the Gulf?," *Maritime India,* September 25, 2010, www.maritimeindia.org/sites/all/files/pdf/Commentary_China_Gulf_Diplomacy.pdf.
29. Joanna Paraszczuk, "Russia, Syria Deny War Games with China, Iran," *Jerusalem Times,* June 19, 2012, available at www.jpost.com/Middle-East/Russia-Syria-deny-war-games-with-China-Iran.
30. Agnihotri, "Modernisation of the Chinese Navy," p. 60.
31. "New Frigate Delivery." For elaboration of how the role of the Indian navy flows from the national aim, national interests, and national security objectives and policy, see Ministry of Defence, *Indian Maritime Doctrine 2009* (Sivakasi, India: Standard Press [India], 2009), pp. 6–11.
32. Robert Kaplan, "Center Stage for the 21st Century: Power Plays in the Indian Ocean," *Foreign Affairs* 88, no. 2 (March–April 2009), p. 23.
33. Zhang, *China-India Relations,* p. 28.
34. See Raja Menon and Rajiv Kumar, *The Long View from Delhi* (New Delhi: Academic Foundation, 2010), p. 161.

An Assessment of Chinese Aircraft Carrier Aviation

Robert C. Rubel

The People's Liberation Army (PLA) Navy (PLAN) aircraft carrier *Liaoning* is now afloat and conducting initial operations to develop its deck-aviation capability. The PLAN has demonstrated on several occasions an ability to outstrip the projections of Western analysts; and the Chinese themselves, while asserting that *Liaoning* is a developmental platform, nonetheless tout their entry into the club of navies that have aircraft carriers.[1] Now that *Liaoning* is conducting sea trials and an initial series of flight operations with the J-15 fighter (a derivative of the Russian SU-33), it is appropriate to assess the prospects that the PLAN will achieve a useful deck-aviation capability.

The U.S. Navy's development of carrier aviation has been well chronicled, and of course is a success story of legendary proportions. However, this development process required two decades leading up to World War II and four decades afterward to achieve a true marriage of jet propulsion and aircraft carriers.[2] The PLAN can leapfrog much of the agony and bloodletting the U.S. Navy experienced in that process, but certain aspects of carrier aviation are inherently challenging and must be confronted through an institutional learning process. The PLAN will not be able to proceed solely on the basis of adopted technology, U.S. Navy (USN) doctrine, or stolen patents and secrets. It will have to learn on its own, and its ability to do so is not a given.[3]

The Limits of Leapfrogging

There are big lessons the PLAN does not have to learn that have contributed and will contribute to a massive leapfrog. First and foremost is the adoption of the angled flight deck. All aircraft carriers that employ an arrested landing system have this feature. The angled deck was not a self-evident solution to the catastrophic accident rates the U.S. Navy experienced from the late 1940s through the early 1960s; however, the introduction of the angled deck led to an almost halving of the USN aviation accident rate, from 776 in 1954 to 360 in 1960. Other technological developments such as the optical landing system also contributed.[4] Moreover, early jets had difficult handling characteristics and poor engine response; these caused many mishaps. The PLAN will be able to avoid all these problems. Looking at videos of flight operations on *Liaoning,* one clearly sees the adoption, almost from whole cloth, of USN flight deck procedures.[5] Thus, in many

fundamental ways the PLAN will be able to enter the deck-aviation business at a technically sophisticated level and avoid the costs the U.S. Navy incurred.

While technical leapfrogging is a considerable advantage, in a number of areas the PLAN will be on its own—no amount of imitation will help. The first is night and all-weather operations. Up through World War II, aircraft carriers generally operated only during the day and in good weather. With the advent of nuclear weapons and the U.S. Navy's desperation to make its aircraft carriers viable nuclear strike platforms, night and all-weather operations were initiated—also at a terrible cost in aircraft and lives.[6] Of course, the technology for conducting such operations has gotten vastly better, both in the aircraft and on the ship, but "come-last" crews actually have to develop proficiency in such operations, and they are anything but risk-free.

To understand the challenges and risk of all-weather and night carrier operations, we have to examine the USN experience. Night operations are perhaps the easier of the two conditions, assuming the weather is decent: ceiling and visibility are sufficient for pilots on final approach to sight the landing area visually from at least three-quarters of a mile behind the ship on glide path; and the seas are relatively smooth.[7] Before digital cockpits and heads-up displays, pilots had to become proficient at scanning a least five separate gauges (instruments) to keep the airplane upright and on the desired course, altitude, and speed. Instrument (or "blind") flying is not easy and requires constant practice to maintain proficiency. This is especially the case at sea, where, except for clear, moonlit nights, there is no discernible horizon to orient the pilot. Digital cockpits and heads-up displays consolidate information and ease the challenge quite a bit, but disorientation is still a constant threat, and any electronic or other system failure raises the risk level considerably. However, for night operations the Chinese at least have the leapfrog advantage of adopting the latest Western technology for cockpit displays, navigation, and precision final landing approach. Yet even with all this equipment, the U.S. Navy has experienced multiple losses of planes and aircrews: an aircraft launches, goes out on a mission, and is not heard from again. Pilot disorientation is a suspected cause. Moreover, ejection or ditching at night reduces the prospects for crew recovery.

Adverse weather is the real foe of carrier operations. Day or night, rough seas will cause even a hundred-thousand-ton *Nimitz*-class carrier to roll, pitch, and heave. The last-named term refers to the vertical up-and-down motion of a ship—the brute lifting and dropping of the ship by the sea. This movement creates difficulties for pilots on final approach, as optical glide-slope indicators, even if stabilized, have limited ability to compensate for heave. The ship's roll further complicates the difficulties of heave because the glide-slope indicator is located over a hundred feet from the ship's centerline. Pilots who "chase" the resulting errant glide-slope indications—a reflexive tendency—risk going too low and crashing into the ship's stern or going too high and missing the arresting wires.

In the U.S. Navy, a landing signal officer (LSO) is positioned near the landing area to talk the aircraft down under these conditions.[8] Still, even with a reasonably good landing approach, a little too much aircraft sink rate combined with an upward-moving ship's deck can collapse landing gear at touchdown.

The other hazard is missing the wires. Because fighter jets can only have so much fuel aboard when they land on a carrier and because they use that fuel rapidly, failure to catch a wire more than once can lead quickly to a fuel emergency. USN carriers have tanker aircraft that can conduct air-to-air refueling, and normally one orbits overhead during landing operations to refuel aircraft that have trouble getting aboard. If the Chinese do not have such a capability, the risks of operating at night or in rough seas escalate considerably. The alternative is to have a "divert airfield" available on shore. In this case a "bingo" fuel state is calculated that, when reached, causes the pilot to abandon attempts to land on the ship and instead head to shore. However, linking carrier operations to a divert field limits the operational maneuverability of the carrier.

In theory, U.S. carriers can operate in zero-ceiling, zero-visibility conditions. Whether owing to low clouds, fog, or heavy rain, pilots are unable to see the landing area until at or just before touchdown. They rely on a combination of radar guidance, a microwave glide-slope indicator, and verbal commands from the LSO, who actually can see the airplane's landing light well before the pilot can see the ship. In practice, carrier skippers are reluctant to operate in these conditions, because of the increased risks, but doing so is occasionally necessary if the weather worsens while aircraft are in the air. Even with the most sophisticated equipment, success requires the utmost in pilot proficiency and complete trust and confidence between pilots and LSOs. This results only from extensive experience. This is the problem: weather conditions can change rapidly at sea and the carrier moves, so unless a commander takes an ultraconservative approach to operations, at some point conditions likely will deteriorate while aircraft are airborne, and if the ship and air wing are not proficient, losses will result.

Although it occurred in 1950, an incident involving several U.S. carriers in the Far East is still a good illustration of how quickly things can go wrong. The battle force was attempting to swap out sixty-four jet fighters from one carrier to another when bad weather moved in, both at sea and at shore-divert fields. An officer who was on the battle group staff at the time relates: "We had a lot of these fighters in the air. Then we tried to bring them down and it was a tough job of getting them on board. They were running out of fuel and there was no base on the beach to send them to. We had to get them back on board those two carriers, and we broke up those planes in some numbers."[9]

The discussion of flying in adverse conditions leads to consideration of the matter of aircrew and ship's crew proficiency. To assess the overall capability of a force, it must be

understood as a system that is composed of both human and machine elements. The human element must be understood as a composite of selection, training, and culture—especially organizational culture. Proficiency at the "tip of the spear" is the result of the influences of all these factors, and more. This article will focus on just two. First, what degree of risk will the PLAN accept to generate true proficiency in its forces? Second, will the PLAN be able to move beyond a relatively small elite cadre of crews to a larger force that must count on "average" pilots?

Modern technology has produced high-quality aircraft simulators. These machines are being used more extensively all the time to substitute for actual flying time, and in some cases, especially in the airlines, crews can qualify on a new airplane using only simulators. In carrier operations, however, no simulator can substitute for the kind of actual situation described previously. Individuals can be partially trained in simulators of various kinds, but night and foul-weather operations at sea require the development of teamwork and confidence that only actual operations in these conditions can produce. This imposes on any navy the requirement to accept risk in a peacetime training environment. Conditioned by World War II to embrace risk, the U.S. Navy could tolerate the grievous losses experienced as its aviation arm endeavored during the 1950s to develop an endemic night/all-weather capability. The question is whether the PLAN organizational culture, corporately, is capable of accepting these risks, and whether, on an officer-by-officer basis, it can produce leaders with sufficient nerve to make risk-incurring decisions. If it cannot, PLAN naval aviation operations will be constrained severely.

The second issue includes but transcends night and foul-weather flying. It is one thing to have a small, elite cadre of highly selected and trained aircrews, but quite another to field a large force that is populated by average personnel. Military flying is a Darwinian activity; the weak or maladapted either die or drop out. The more challenging the flying environment, the fewer crews will make it to highly experienced and proficient status. The Israeli Air Force is an example of an almost pure meritocracy in which brutal selection, training, and evaluation produce a relatively small corps of truly outstanding fliers. Fielding one or two small air wings can be pursued on this basis, but at some larger force size the selection and evaluation criteria must be relaxed enough to produce sufficient training throughput.

The challenge then becomes how people with second- or third-tier talent levels can be made useful members of the force. Here again risk is introduced. It permeates decision making from top organizational levels down to unit commanding officers, and corporate culture is paramount. Is the PLAN still a centralized and risk-averse organization, or can it change its stripes and empower both itself as an institution and its individual leaders to accept risk? There is a recent Chinese movie called *Skyfighters* that is a knockoff of the American movie *Top Gun*. In it, the analogue of Tom Cruise's "Maverick" character is an

aggressive, risk-taking commander who tries to push the PLA Air Force (PLAAF) into becoming a more progressive organization. The fact that the PLAAF saw fit to sponsor such a film indicates that there are indeed cultural problems to overcome within the Chinese military.[10]

Armed with an understanding of how organizational culture, with its effect on training, can empower or constrain the proficiency of a carrier aviation force, we can evaluate better the prospects for PLAN carriers being able to adopt various operational roles and contribute to the achievement of presumed Chinese strategic missions.

Doctrinal Roles

Since the conversion of the collier *Jupiter* into the first U.S. aircraft carrier, *Langley,* the operational doctrinal roles of the ship type have evolved and proliferated. Aircraft carriers represent a concentration of both national resources and offensive combat power, so the conditions and circumstances under which they are committed to use and potentially subjected to risk must be understood clearly and reconciled with both their characteristics and the benefits to be gained from their use.[11] The articulation of doctrinal roles is a way of analyzing capabilities, benefits, and risks. While the U.S. Navy has never published such a categorization formally, most naval aviation flag officers have a tacit grasp of them. Whether PLAN leadership will develop a similar understanding is open to question at this point. U.S. aircraft carriers, over their history, have played six doctrinal roles. The prospects for the adoption of each role by a force of Chinese carriers will provide some insight into how the PLAN might use them and perhaps also about the practical limits of Chinese sea power.

The first doctrinal role to examine is that of capital ship. The term "capital ship" is used quite often in conjunction with aircraft carriers—naturally enough, given the history of the epic sea battles in the Pacific between the navies of Japan and the United States. Traditionally, the capital ship has been that ship type capable of defeating all other types—typically the ship with the most guns, in the age of sail, or the biggest guns, in the age of dreadnoughts. Once naval aircraft attained sufficient performance capability to deliver bombs that were the equivalent of major-caliber gun shells, the aircraft carrier became the principal arbiter of what floated and what did not, submarines notwithstanding. Aircraft carriers became true capital ships: those that, when concentrated, could defeat an opposing fleet and seize command of the sea.

After World War II, by virtue of America's unchallenged dominance of the seas and the particular characteristics of the Soviet Union and the Cold War, the nature of command of the sea and the concomitant role of capital ships changed. Instead of being concentrated to defeat an enemy fleet, U.S. aircraft carriers were dispersed along the Eurasian

littoral to deter war and to provide security for the international order.[12] Thus, the U.S. aircraft carrier became a capital ship insofar as it was a concentration of resources and power; but it was its ability to bombard inland targets, not its ability to sink other ships, that associated it with the exercise of command of the sea.[13]

In an age of nuclear submarines, long-range antiship missiles, and lethal antiaircraft defenses, it is hard to envision the PLAN being able to employ its carriers in the doctrinal role of capital ship in either sense of the term. Submarines are the likely arbiters of what floats and what does not. In addition, there is virtually no prospect of China finding itself in a set of strategic circumstances analogous to those of the United States in the post–World War II period. Thus, regardless of the number of aircraft carriers China builds or their pattern of operations, the doctrinal role of capital ship is likely to be irrelevant to them. Moreover, the risk profile of the capital ship role does not seem to be compatible with the risk-averse culture of the PLA. In the traditional capital ship mode, one must risk all to win all. In decisive sea battles from Salamis to Midway, at least one admiral was reluctant to seek battle but either was ambushed or was pushed into battle by a higher commander; or, when opportunity offered, as it did at Jutland in World War I, he bailed out. Given modern means of search, it is doubtful any Chinese admiral would allow himself to be drawn into a fight "for all the marbles," so the capital ship role has no strategic meaning for him.

The dropping of two nuclear bombs on Japan precipitated the end of World War II in the Pacific. After the war a nasty internecine struggle broke out within the U.S. military between airpower advocates and the Navy. The U.S. Navy—desperate to fend off the arguments of those who believed the strategic bomber would render the aircraft carrier obsolete, and possessing a genuine belief that the large, slow, long-range bomber would not survive Soviet air defenses—pushed ahead, at dreadful cost in aircraft and lives, to establish carriers as nuclear-strike platforms. By the late 1980s this role had been made obsolete by the robust nuclear triad, and nuclear weapons were removed from carrier magazines. However, this capability remains inherent in the aircraft carrier, and we cannot discount the possibility, admittedly highly unlikely, that a desperate future China might put nuclear bombs on its carriers, perhaps hoping that we would not consider this option, allowing them to sidestep robust U.S. missile defenses.

Early in World War II, U.S. carriers were dispatched on hit-and-run raids at various points within the Japanese oceanic defensive perimeter, the most notable being the Doolittle raid on Tokyo. These operations were meant to disrupt Japanese rear-area operations, provide intelligence on Japanese dispositions, and boost the morale of the American public. In this way the carriers functioned not unlike the cavalry of Civil War general Nathan Bedford Forrest. Although this doctrinal role slid into the background after the war, there were still instances during the Cold War when American carriers

would dodge around and show up by surprise somewhere within Soviet ocean surveillance zones in an effort to shake the USSR's confidence in its ability to find and attack U.S. naval forces. One also might regard the 1986 EL DORADO CANYON strike on Libya as a form of augmented cavalry raid from the air. PLAN carriers *might* be able to pull off this kind of raid on an unsuspecting neighbor; but it seems unlikely, as U.S. reconnaissance probably would be used to tip off the incipient victim. Generally speaking, a sky full of satellites, an increasingly instrumented ocean, and the proliferation of drones, cell phones, and over-the-horizon radar will make it very hard for any carriers to "get lost" at sea and show up by surprise somewhere. On the other hand, if the Chinese could manage the operational security and deception, this role is suited to a small, elite aircrew cadre, which would be easiest for the PLAN to establish.

The original doctrinal role envisioned for the aircraft carrier, especially by battleship officers, was to serve as the "eyes of the fleet." Carrier aircraft not only would scout ahead to locate the enemy fleet so our own battle line could maneuver to engage with advantage; they also would spot the fall of major-caliber shells so as to correct aim more rapidly and accurately. As the carrier assumed more-critical doctrinal roles, scouting was subsumed into the overall security posture of the carrier task force, where it remains to this day. However, the advent of networked warfare, with its dependency on satellites, may serve to resurrect this doctrinal role. Assuming a capable enemy can neutralize satellites, the need arises for line-of-sight relay services. It is not difficult to envision long-endurance drones being launched off carriers to provide these services as well as persistent, long-range reconnaissance and surveillance. Presumably the PLAN would be as interested in this role and as capable of performing it as the U.S. Navy, so we should not be surprised, given the superior agility of the Chinese procurement system, to see unmanned aircraft operating from PLAN carriers sooner rather than later.

Although Horatio, Lord Nelson, advised that "a ship's a fool to attack a fort," when conditions are right, i.e., there is little or no threat, the carrier may be employed usefully as an airfield at sea to support landward operations. The carrier's big advantage in this role is that it carries its own logistics, so it is "ready on arrival." This characteristic proved critical in the defense of the Pusan perimeter in the early going of the Korean War and in the first weeks of Operation DESERT SHIELD, right after Saddam invaded Kuwait. U.S. carriers functioned frequently in this role during the Vietnam War and Operations DESERT STORM, ENDURING FREEDOM, and IRAQI FREEDOM, among others. This could be a natural role for PLAN carriers—but they would have to deal with a number of caveats and challenges.

The first issue is the total force requirement. Unlike hit-and-run raids, an airfield at sea presumably either is supporting troops ashore or is conducting some type of air campaign. The amount of firepower the carrier can put over the beach per unit time must

be sufficient, and the level of effort must be sustained for a possibly indefinite period. To supply enough airpower, U.S. practice has been to group two to six carriers—but these carriers carry seventy to eighty aircraft, fifty of which are strikers. *Liaoning* can carry perhaps thirty planes—but not the additional support aircraft such as early warning, electronic warfare, and tanking. Such support functions, along with logistics and combat search and rescue, are critical for sea-based airfield combat operations. The first generation of Chinese carriers will fall short in this aspect. Moreover, depending on the nature of operations ashore, around-the-clock operations as well as sustained bad-weather flying may be required, thus invoking all the cultural and training issues previously discussed. Even to have a chance at successfully fulfilling this doctrinal role, the PLAN would need at least two and more likely three carriers operating as a cohesive group, something that is likely a decade or more away.

Sustained airfield operations demand a constant flow of logistics. Nuclear-powered *Nimitz*-class carriers do not compete with their air wings for fuel tankage aboard, but the *Liaoning* class will. Refueling interrupts flight operations, and the smaller the total fuel capacity, the more often this happens. Assuming robust usage of weapons, these also will have to be replenished. If Chinese carriers operate relatively close to base, maintaining the supply train of fuel, weapons, food, and parts may be feasible; but any attempt to adopt this doctrinal role outside the first island chain would require a substantial logistics infrastructure. Aircraft maintenance and battle damage repair constitute another challenge of sustained airfield operations. A small wing of thirty fighters can shrink quickly to impotence through equipment malfunctions that cannot be made good.

Finally, there is the matter of force protection for the "sea base." When a carrier acts as an airfield at sea, it loses its protective mobility. Limited aircraft range imposed by ski-jump launch constricts movement even more, as does the requirement to turn into the wind at regular intervals for launch. The proliferation of modern area-denial weapons will make this role increasingly dangerous, at least in certain waters. In the Falklands War, the Royal Navy was forced to keep its carriers far enough from the amphibious landing site to avoid detection and attack by Argentine Exocet missiles. This meant that its Harriers were unable to set up defensive patrols and could launch only on alert, preventing them from intercepting Argentine air raids until after they pulled off target. There is increasing recognition even in USN circles that a carrier no longer may be able to set up in an optimum position to function as an airfield; PLAN carriers, with their short-range aircraft, will be in a worse situation.

The final role of the aircraft carrier is that of geopolitical chess piece. The symbolic nature of the aircraft carrier was well established over the course of the Cold War and afterward. President Obama directed the Navy to maintain eleven carrier groups despite the service's recommendation to drop to a lower number because, reportedly, he found

them "broadly useful." U.S. carriers have been a staple of naval diplomacy, and there is every reason to think that China eventually will use its carriers in a similar way. On the benign side of this role, port visits, joint exercises, disaster relief, and humanitarian assistance are all elements of naval diplomacy that can be undertaken without having to face the rigorous operational demands the other roles impose. *Liaoning* and its sisters can operate in conditions of their choosing, and the logistics are manageable wherever in the world they elect to cruise.

The coercive side of the role gets more complicated. The most benign element of this side of the role would be general deterrence deployments, and this is the most likely use of the Chinese carriers—to complicate the calculations of Vietnam, India, or other nations that have conflicting territorial claims or other issues with China. However, when a crisis erupts, the calculus gets more difficult for an aircraft carrier. To be effective at deterrence or posing a threat, the ship must be visible and in a position from which its airpower plausibly could be brought to bear. However, it is in precisely this position that it becomes vulnerable to the kinds of area-denial weapons that even a weak nation might bring to bear. This sets up a difficult dilemma for the nation using its carrier as a crisis-management tool. Keeping the carrier on the required station to threaten other states makes it vulnerable and potentially a political hostage. On the other hand, moving it to a safer position means abandoning, at least temporarily, the threat position, which may be seen as evidence of weakening resolve. During the 1973 Yom Kippur War, U.S. carrier groups found themselves in this kind of dilemma when face-to-face with a strong, missile-equipped Soviet fleet in the eastern Mediterranean. Whether Chinese naval and political leadership will be sufficiently astute to avoid such dilemmas or will have enough nerve to manage carrier movements properly during a crisis is anything but certain.

Building and maintaining a deck-aviation capability that is more than symbolic are an expensive and risky business, even with today's advanced technology. The United States committed to an aircraft carrier–centric fleet structure as a matter of strategic imperative, and now must decide whether that legacy structure will remain viable in the future. China is coming from the opposite direction. There is little in the way of external threat driving it toward deck aviation. Rather, it is a combination of nationalistic pride and niche functionality that seems to be propelling the development of Chinese aircraft carriers.[14] Once some minimum level of credible operational capability is attained—and that may await the launch of Chinese carriers with catapults—the push and pull of specific events will shape the trajectory of Chinese carrier aviation development thereafter. What that trajectory will look like is harder to predict than it would have been to forecast the vector of American carrier development during the 1920s.

Technology evolution tends to produce a seesaw relationship between defense and offense. George Friedman, in his book *The Future of War,* advanced the notion of weapons system senility: the erosive process in which the cost of protecting a weapons system such as an army tank or aircraft carrier comes to outweigh the value of the system's offensive capability.[15] The proliferation of quiet diesel submarines armed with potent antiship missiles, unmanned systems, smart mines, and other ambush-type weapons may constitute an environment, especially in the littorals, that brings on a case of aircraft carrier senility. If we took this seriously, we would seek ways of distributing naval power-projection capability into a larger number of smaller platforms—missile ships, perhaps—and cease building carriers. In any case, whether owing to increasing threat or increasing cost, it is hard to predict a future of ascendancy for the aircraft carrier. Thus we might envision a graph on which the horizontal axis is time and the vertical axis is aircraft carrier strategic utility. Following Friedman's argument, we would draw a line starting way up on the vertical axis and sloping down to the right over time to a point at which the carrier has gone the way of the dreadnought. A second line would start at the intersection of the two axes and slope up to the right, representing the thrust of Chinese carrier development. Where these lines cross would constitute the point at which China should cease investing in carriers.

Chinese geopolitical imperatives also will modulate the ultimate character of PLAN carrier aviation. The U.S. carrier force became a strategic tool for maintaining a liberal world order and defending the global system of commerce and security from various kinds of disruptions.[16] It is hard to envision any such expansive role for the PLAN's carriers. More likely, the PLAN will attempt to establish security barriers within the first or second island chain and support territorial claims. It also on occasion may sortie into the Indian Ocean to counter what China sees as threats to its interests. These strategic tasks require a lesser naval aviation establishment than that of the United States, and quite possibly one that is feasible, at least in structure, for China to build.

The Chinese Communist Party (CCP) has chosen to make the aircraft carrier a potent symbol of national pride. This will spur the construction of more and presumably more-advanced hulls and the development of more-balanced and more-capable air wings. We must understand that Chinese foreign policy and security strategy are intimately connected to a more central CCP objective: maintaining power. This connection deepens the influence of corporate culture and ethos on the difficult leadership decisions at all levels needed to move Chinese naval aviation from a symbolic and niche force to an actual operational and strategic fighting asset. This eventuality is anything but certain.

Notes

1. Adm. Robert Willard, quoted by Drew Thompson in "Think Again: China's Military," *Foreign Policy* (March/April 2010), available at www.foreignpolicy.com/articles/2010/02/22/think_again_chinas_military. On the Chinese side, see, for example, Xu Qi, "Enlisting of an Aircraft Carrier Starts a Blue Journey" [in Chinese], *Liaowang,* October 8, 2012, CPP20121018787020.
2. Robert Rubel, "The Transition to Swept-Wing Jets," in *One Hundred Years of U.S. Navy Air Power,* ed. Douglas Smith (Annapolis, MD: Naval Institute Press, 2010), p. 241.
3. John Garnaut, "Can China's Top Guns Fly?," *Foreign Policy*, April 30, 2013, foreignpolicy.com/2013/04/30/can-chinas-top-guns-fly/.
4. Rubel, "The Transition to Swept-Wing Jets," p. 242.
5. See YouTube video at www.youtube.com/watch?v=l9CDW4tlgOU.
6. Gerald O'Rourke [Capt., USN (Ret.)], "We Get Ours at Night," in *Into the Jet Age,* ed. E. T. Wooldridge [Capt., USN (Ret.)] (Annapolis, MD: Naval Institute Press, 1995), pp. 31–32.
7. The author has over three hundred night carrier landings.
8. The author also served as LSO.
9. Gerald E. Miller [Vice Adm., USN (Ret.)], "Transition to the Jet Age," in *Into the Jet Age,* ed. Wooldridge, pp. 12–13.
10. Garnaut, "Can China's Top Guns Fly?"
11. Robert C. Rubel, "The Future of Aircraft Carriers," *Naval War College Review* 64, no. 4 (Autumn 2011), pp. 13–27.
12. Samuel P. Huntington, "National Policy and the Transoceanic Navy," U.S. Naval Institute *Proceedings* 80/4/614 (May 1954), pp. 483–93.
13. Robert C. Rubel, "Command of the Sea: An Old Concept Resurfaces in a New Form," *Naval War College Review* 65, no. 4 (Autumn 2012), pp. 21–33.
14. Lyle J. Goldstein and Yuri M. Zhukov, "A Tale of Two Fleets: A Russian Perspective on the 1973 Naval Standoff in the Mediterranean," *Naval War College Review* 57, no. 2 (Spring 2004), pp. 27–63.
15. George Friedman, *The Future of War: Power, Technology and American World Dominance in the Twenty-First Century* (New York: Griffin, 1998).
16. Robert Rubel, "Show of Force—or Just for Show?," U.S. Naval Institute *Proceedings* 139/4/1,322 (April 2013), pp. 16–20.

China's Auxiliary Fleet

Supporting a Blue-Water Navy in the Far Seas?

Alexandre Sheldon-Duplaix

The People's Liberation Army Navy (PLAN) has the third-largest fleet of auxiliary and logistic-support vessels in the world, just behind those of the United States and Russia.[1] An examination of the PLAN's order of battle reveals that development of this fleet began more than three decades ago with the completion of four fleet-support ships and similar numbers of large submarine tenders and oceanographic vessels.[2] Despite the coastal and defensive nature of the Chinese navy, a number of oceangoing auxiliaries were needed to support growing numbers of destroyers, frigates, and submarines at their bases or at sea within their two-hundred-nautical-mile operational range.

For many years, this auxiliary fleet did not seem to change much. But in its 2009 public assessment of the PLAN, the U.S. Office of Naval Intelligence (ONI) noted an evolution over the previous decade, with newer and larger auxiliaries: Anwei (oceangoing hospital ship, for humanitarian relief), Danyun (for island resupply), Dalao (for submarine rescue), Wuhu (a test platform), and Fuchi (for fleet support).[3] The planned completion of four additional Fuchis in the 2013–16 period seems to confirm this trend and foretell more blue-water operations.

But for what purpose? Trends in naval auxiliary vessel construction appear to reflect both China's naval capabilities and its intentions. More fleet-support ships reveal China's commitment to robust naval diplomacy aimed at cultivating naval "soft power" while providing effective means to protect Chinese trade, as exemplified by the Gulf of Aden patrols since 2008. The trend toward larger intelligence-collection vessels points to a change in policy toward monitoring developments in distant waters, out of necessity or in retaliation for U.S. intelligence operations near China, or both. However, a lack of large, seagoing repair ships suggests that the PLAN, despite mounting far-seas operations, will continue to focus its combat capabilities on the near seas.

Categories of and Designations for PLAN Support Vessels

Chinese auxiliary vessels are divided into two main categories: large, oceangoing vessels—numbered since 2007 in the 800- and 80-block series—and smaller support vessels designated by function and fleet.

The large, oceangoing vessels are subdivided into six categories, with three-digit or two-digit numbers, all starting with 8:

- Intelligence and survey ships, named after planets and stars (numbers in the 850s, with one vessel in the 900s)
- Hospital ships and submarine tenders (潜艇招标), named after islands (860s)
- Oceanographic research ships, named after scientists (870s)
- Fleet-replenishment ships (补给舰) and supply ships, named after lakes (880s)
- Experimental ships, named after inventors and scientists (890s)
- Training vessels (in the 80 series)

This numbering system seems to restrict the large auxiliary category to a maximum of about fifty ships. So far, fewer than half of those numbers are being used, although the fleet-support ship category now seems to be full, the PLAN having so far not reused pennants of decommissioned ships.

The smaller, or coastal, support vessels are divided into categories whose characters follow the fleet designations *bei* (北), north; *dong* (东), east; and *nan* (南), south. Fifteen categories have been identified.

The PLAN also has a number of fishing vessels it uses for reconnaissance and intelligence. They wear pennant numbers with the prefix *zhanyu* (湛渔) for deepwater fishing.

Organization and Order of Battle

Overall, major auxiliary vessels are distributed equally among the three fleets. Missile-test ships are concentrated in the North Sea Fleet (NSF) and acoustic-research vessels in the South Sea Fleet (SSF). More reconnaissance vessels are based in the north and in the south, where they can deploy better (bearing in mind that the PLAN also fields a number of smaller trawlers dedicated to intelligence collection whose whereabouts are more difficult to follow).

In 2004, the PLAN altered its organizational structure to improve its logistics support to its combat units by creating one combat-support ship flotilla (作战支援舰支队) in each

Table 1. *Characters Displayed on the Hulls of Smaller Auxiliary Vessels*

Hull Pennant	Pinyin	Function	U.S. Designation	U.S. Abbreviation
测	ce	survey	surveying ship	AGS
测量	celiang	research/measure	oceanographic research ship	AGOR
调	diao	signal	intelligence collection ship	AGI
交	jiao	transport	cargo ship	AK
救	jiu	salvage	submarine tender	AS
浚	jun	dredge	dredger	
康	kang	hospital	hospital ship	AH
缆	lan	cable	cable repairing ship	ARC
勤	qin	degaussing	degaussing ship	ADG
水	shui	water	distilling ship	AWT
拖	tuo	tug	oceangoing tug	AT
修	xiu	repair	repair ship	AR
研究	yanjiu	research	surveying ship	AGS
油	you	oil	light oiler	AOL
运	yun	transport	torpedo retriever	AT/YT

fleet. Existing support-ship squadrons (大队) were resubordinated to combat-support ship flotillas to serve the PLAN's three fleets better.[4]

The NSF, headquartered in Qingdao, is responsible for the Bo Hai Sea, the Yellow Sea, and the northern portion of the East China Sea. Since 2004, the NSF has been supported by the 1st Combat Support Ship Flotilla, headquartered in Qingdao. This flotilla comprises five dedicated squadrons.[5] The Reconnaissance Squadron's presence in Qingdao gives it easier access to the Sea of Japan and the western Pacific.

The East Sea Fleet (ESF), headquartered in Ningbo, covers the majority of the East China Sea and the Taiwan Strait. Created in 2004, the ESF's 2nd Combat Support Ship Flotilla is headquartered in Zhoushan. It comprises five squadrons.

The 264th Auxiliary Squadron in Zhoushan is by far the largest in the PLAN. See "Main Auxiliary Vessels of the East Sea Fleet" in the sidebar for a list of ESF auxiliary vessels.

The SSF, headquartered in Zhanjiang, is responsible for the South China Sea. The SSF is assisted by the 3rd Combat Support Ship Flotilla. It is headquartered in Zhanjiang and comprises six squadrons.[6]

See "Main Auxiliary Vessels of the South Sea Fleet" for a list of SSF auxiliary vessels.

Table 2. *Distribution of PLAN Auxiliary Vessels*

Type	NSF	ESF	SSF
Replenishment oiler (AOR)	2	3	2
Oiler (AO)	—	5	2
Light oiler (AOL)	13	20	14
Repair ship (AR)	—	1	2
Submarine tender (AS)	9	7	8
Hospital ship (AH)	—	1	—
Ambulance vessel (YH)	1	2	4
Water tanker (AW)	6	10	7
Cargo ship (AK)	8	4/8?	3?
Oceanographic-survey-intelligence ship (AGOR/AGS/AGI)	7	5	9
Cable ship (ARC)	5	5	4
Degaussing vessel (ADG)	2	4	2
Torpedo retriever (AT/YT)	4	4	4
Test ship (AGE)	2	—	2
Fleet tug	4	—	3

Table 3. *NSF Auxiliary Organizational Units*

Squadron	Location
251st Reconnaissance/Survey Squadron (侦测船大队)	Qingdao
254th Auxiliary Squadron	Qingdao
188th (or unknown) Salvage Squadron	Qingdao
257th Auxiliary Squadron	Lüshun
188th (or unknown) Salvage Squadron	Lüshun

Table 4. *ESF Auxiliary Organizational Units*

Squadron	Location
264th Auxiliary Squadron	Zhoushan
223rd Reconnaissance/Survey Squadron	Ningbo
258th Auxiliary Ship Squadron	Shanghai
263rd Auxiliary Ship Squadron	Ningde
188th Salvage Squadron	Fenghua

Table 5. *SSF Auxiliary Organizational Units*

Squadron	Location
224th Reconnaissance Squadron	Zhanjiang
255th Auxiliary Squadron	Zhanjiang
225th Survey Squadron	Guangzhou
236th Auxiliary Squadron	Guangzhou
221st Auxiliary Squadron	Yulin
188th Salvage Squadron	Yulin

Main Auxiliary Vessels of the North Sea Fleet

Category (designation)	Class	Tons (full load)	Vessels (year commissioned, if known)
9 submarine tenders (AS)	1 Dajiang 925	11,975	*Changxingdao* 861 (1979)
	1 Zhonghua 922	3,400	Bei Jiu 403
	2 Dalang 922 II	4,200	Bei Jiu 122 (1987), 138 (1988)
	2 Dalao 926	9,500	*Haiyangdao* 864 (2010), *Liugongdao* 865 (2013)
	1 Dazhou 946	1,100	Bei Jiu 137 (1977)
2 replenishment oilers (AOR)	1 Fuqing 905	21,740	*Hongzehu* 881 (1979)
	1 Fuchi 903A	23,500	*Taihu* 889 (2013)
13 light oilers (AOL)	3 Fuzhou	2,100	Bei You 555, 560, 563
	10 various	2,200	Bei You 400, 561, 562, 565, 566, 571, 576, 581, 590, 593
6 water tankers (AW)	1 Fuzhou	2,100	Bei Shui 557
	5 various	2,200	Bei Shui 572, 576, 581, 582, 583
8 cargo ships (AK)	1 Yantai 073 II	2,000	*Luliangshan* 938 / *Lushun* (1979)
	2? Hongqi	1,950	Bei Yun 443, 528
	4? Danlin	1,290	Bei Yun 531, 591, 592, 594
	1 Sichang	9,105	*Dalian* 82 (1996)
1 carrier-support ship (AG)	1 Dagan	16,500	88
1 hospital ship (AH)	1 Nankang	300	Bei Yi / *Qingdao*
4 torpedo retrievers (AT)	4 Damen/ Dandao 917	1,600	Bei Yun 455, 484, 485, 529
5 cable ships (ARC)	2 Youdian 911 II	1,350	Bei Lan 764, 765
	3 Yunan	135	Bei Lan 767, 768, 769
2 degaussing vessels (ADG)	2 Yanci 912 III	750	Bei Qin 735, 736 (1976)
7 survey-intelligence ships (AGS/AGOR/AGI)	1 Yanlai 635 III	1,100	Bei Ce 943
	1 Type 639	1,500	Bei Diao 991
	1 Type 992		Bei Diao 992 / *Shiyan* 1
	1 Type 993	2,300	Bei Diao 993
	1 Type 814	2,500	Bei Diao 900 (1987)
	1 Type 636A	6,000	*Qian Sanqiang* 873
	1 Xiangyanghong	4,445	*Xiangyanghong* 09
2 test ships (AGE)	2 Dahua 909	6,000	*Bi Sheng* 891 (1997), *Hua Luogeng* 892 (2008)
4 tugs	1 Tuzhong	3,600	Bei Tuo 710
	3 Hujiu/Dinghai 837	1,500	Bei Tuo 622, 711, 717

Sources: Stephen Saunders, *IHS Jane's Fighting Ships 2014–15* (Coulsdon, Surrey, U.K.: IHS Jane's, 2015); Prézelin, *Flottes de Combat 2012*.

Main Auxiliary Vessels of the East Sea Fleet

Category (designation)	Class	Tons (full load)	Vessels (year commissioned, if known)
7 submarine tenders (AS)	1 Dajiang 925	11,975	*Chongmingdao* 862 (1976)
	2 Dalang 922	4,200	Dong Jiu 311 (1987), 332 (1989)
	1 Dadong 946A	2,800	Dong Jiu 304 (1982)
	3 various		Dong Jiu 331, 333, 334
3 replenishment oilers (AOR)	1 Fuqing 905	21,740	*Poyanghu* 882 (1979)
	2 Fuchi 903/ 903A	20,500 23,500	*Qiandaohu* 886 (2004), *Chaohu* 890 (2013)
5 oilers (AO)	3 Jinyou	4,800	Dong You 622, 625, 675 (1990)
	1 Type 640		Dong You 640 (2003)
	1 Dong You		Dong You 637 (2004)
20 light oilers (AOL)	1 Shengli	5,000	Dong You 620 (1981)
	5 Fuzhou	2,100	Dong You 606, 607, 626, 628, 629
	14 various	2,200	Dong You 609, 624, 630, 631, 632, 633, 634, 635, 636, 638, 639, 641, 642, 645
10 water tankers (AW)	2 Fuzhou	2,100	Dong Shui 643, 644
	8 various	2,200	Dong Shui 610, 636, 641, 648, 646, 647, 649, 650
4 (8?) cargo ships (AK)	1 Dayung 904	10,575	*Jingpo Hu* 884 (1992)
	1 Yantai 073 II	2,000	Dong Yun 757 (1979)
	2/3? Hongqi	1,950	Dong Yun 755, 756, 771
	3? Danlin	1,290	Dong Yun 827, 834, 835
3 hospital ships (AH)	1 Anwei 920	14,000	*Daishandao* 866 (2008)
	2 Nankang	150	Dong Yi 12, 13
4 torpedo retrievers (AT)	4 Damen/ Dandao 917	1,600	Dong Yun 758, 759, 802, 803
5 cable ships (ARC)	4 Youdian 911 II	1,350	Dong Lan 868, 873, 874, 882
	1 Yunan	135	Dong Lan 884
	2 Youzhong	750	N2304, N2404
1 repair ship (AR)	1 Type 648	3,500	Dong Xiu 911
4 degaussing vessels (ADG)	1 Type 911	2,000	Dong Qin 870
	3 Yanci 912 III	750	Dong Qin 860, 863, 864
5 survey-intelligence ships (AGOR/ AGS/AGI)	1 Type 636A	5,800	*Zhu Kezhen* 872
	2 Yanlai 635 III	1,100	Dong Ce 226, 227
	2 Dongdiao 815/815G	6,000	*Beijixing* 851 (2000), *Tiangwangxin* 853 (2013)

Sources: Saunders, *IHS Jane's Fighting Ships 2014–15;* Prézelin, *Flottes de Combat 2012*.

Main Auxiliary Vessels of the South Sea Fleet

Category (designation)	Class	Tons (full load)	Vessels (year commissioned, if known)
2 repair ships (AR)	2 Dayung 904A	10,975	*Yangcheng* 883, *Jingpo* 884
1 cargo ship (AK)	1 Dayung (Mod.) 904B	16,500	888 (ex-88)
8 submarine tenders (AS)	1 Dajiang 925	11,975	*Yongxingdao* 863 (1982)
	1 Dalang 922	4,200	Nan Jiu 510 (1990)
	1 Dalao 926	9,500	*Changdao* 867 (2012)
	1 Dazhou 946	1,100	Nan Jiu 502 (1977)
	1 Hudong 930	2,500	Nan Jiu 512
	3 various		Nan Jiu 507; *Yulin* 508, 509
2 replenishment oilers (AOR)	1 *Komandarm Fedko*	37,000	*Qinghaihu* 885 (1996)
	1 Fuchi 903A	23,500	*Weishanhu* 887 (2004)
2 oilers (AO)	2 Type 640		Nan You 968, 972 (2003)
14 light oilers (AOL)	3 Fuzhou	2,100	Nan You 932, 940, 941
	11 various	2,200	Nan You 954, 957, 958, 959, 961, 962, 963, 969, 970, 973, 976
7 water tankers (AW)	3 Fuzhou	2,100	Nan Shui 913, 937, 938
	4 various	2,200	Nan Shui 963, 964, 965, 967
3? cargo ships (AK)	1 Yantai 073 II	2,000	Nan Yun 745 (1979)
	1 Hongqi	1,950	Nan Yun 835
	1? Danlin	1,290	Nan Yun 975
4 hospital ships (AH)	2 Nankang	150	Nan Yi 10, 11
	2 Qiongsha	150	Nan Yi 9, 832
4 torpedo retrievers (AT)	3 Damen/ Dandao 917	1,600	Nan Yun 841, 844, 845
	1 various		Nan Yun 846
4 cable ships (ARC)	2 Youdian 911 II	1,350	Nan Lan 233, 234
	1 Yunan	135	Nan Lan 235
	1 Youzhong	750	G2693 (1982)
2 degaussing vessels (ADG)	2 Yanci 912 III	750	Nan Qin 203, 205
9 survey-intelligence ships (AGS/AGI)	1 Xiangyanghong 645/813	4,435	*Qimingxing* 852 (1982)
	1 Yanlai 635 III	1,100	Nan Ce 427
	3 Ganzhu 635 II	1,000	Nan Ce 420, 426, 428
	2 Type 625C	3,320	Nan Diao 411, 412
	1 Kanhai		Nan Ce 429
2 acoustic test ships (AGE)	2 Type?	5,800	*Zhan Tianyou* 893 (2012)
		6,080	*Li Siguang* 894 (2014)
3 tugs	1 Tuzhong	3,600	Nan Tuo 154
	1 Hujiu II (Mod.) 837	1,495	Nan Tuo 185
	1 Tuqian	3,800	Nan Tuo 181

Sources: Saunders, *IHS Jane's Fighting Ships 2014–15;* Prézelin, *Flottes de Combat 2012*.

Supporting Far-Seas Operations

Four classes of auxiliary ships provide especially useful insights into Chinese intentions in the far seas: replenishment ships, hospital ships, surveillance ships, and submarine tenders.

Replenishment Ships

China constructed its first fleet-support ships in the late 1970s. Each of the four 21,740-ton Fuqing-class replenishment oilers (AORs) is capable of carrying 10,550 tons of fuel oil, one thousand tons of diesel fuel, two hundred tons of feed water, two hundred tons of potable water, and fifty tons of lube oil. Four oil-refueling stations and two stores stations allow replenishment of three vessels simultaneously. However, China transferred one AOR to friendly Pakistan and another to the merchant fleet, signaling a relative lack of interest in blue-water operations.[7]

To have at least one large support ship in each fleet, in 1988 China launched a program to develop a new-generation multiproduct replenishment ship (AOE). According to retired chief designer Zhang Gang, costs delayed the program, so in November 1992 China decided instead to acquire a very capable uncompleted former Soviet *Komandarm Fedko*–class AOR from Ukraine. Towed to Dalian Shipyard in May 1993, the AOR was commissioned in 1996 as *Nancang* (later renamed *Qinghaihu*) and was transferred to the SSF.[8]

Thailand placed an order for China to build it a support ship for its light aircraft carrier group, giving chief designer Zhang Gang an opportunity to complete the designing of an AOE. Delivered in 1996, *Similan* served as a basis for China's current six Type 903/903A Fuchi-class AOEs, built in Shanghai and Guangzhou in 2004–2005 and 2011–15, respectively.[9] The Fuchis' primary role is to provide underway replenishment for destroyers and frigates. They are the first Chinese multiproduct replenishment ships capable of resupplying fuel, water, stores, and ammunition.

The Fuchis' main differences from ships of the Fuqing class lie in their multiple functions (missiles, ship and helicopter fuel), increased capacities (four times more solid cargo and three times more liquids), compartmented design (double-hull structure and separate, optimized ammo and oil compartments), and better equipment (stabilized cranes, advanced alongside-replenishment system). Notwithstanding the impressive capabilities of these six new ships, they are only up to the task of supporting near-seas operations, a conclusion made obvious when we consider the PLAN's large numbers of destroyers and frigates and the future enormous needs of the fossil-fueled aircraft carrier *Liaoning*.

The PLAN's distant deployments started in 1980 for research and development and missile tracking and increased in 1985 with the beginnings of China's naval diplomacy. With their large displacements and ability to operate helicopters, Fuqing supply ships and *Dajiang* submarine tenders were the PLAN's first auxiliaries to operate in the far seas. In May 1980, Fuqing X615 (ESF) and its sister ship X950 (NSF), together with the then J121 *Changxingdao* (NSF) and J302 *Chongmingdao* (ESF), participated in an eighteen-ship deployment to recover China's first DF-5 intercontinental ballistic missile in the South Pacific.[10] In November 1984, *Changxingdao* accompanied the research vessel *Xiangyanghong* 10 to Antarctica to establish China's first scientific station there.[11]

In November 1985, the Fuqing-class AOR X615 and two destroyers were the first PLAN vessels to cross the Strait of Malacca and enter the Indian Ocean, on an inaugural goodwill tour. Between 1985 and 2012, the PLAN made forty-eight deployments with one hundred port calls in forty-three countries.[12] Auxiliaries played a key role. Eighteen of those deployments were supported by an AOR, with eight deployments supported by an older Fuqing, five by newer Fuchis, and five by the former Soviet *Komandarm Fedko* / *Qinghaihu* (ex-*Nancang*). Since its commissioning, *Qinghaihu* has set sixteen PLAN records, including visiting twenty-five countries successively while completing China's first circumnavigation of the globe. On this voyage, stretching over 132 days from May to September 2002, the ship sailed a total of 33,000 nautical miles, during which it transited the Panama Canal, the first PLAN ship to do so.[13] Between 1989 and 2014, another auxiliary, the training ship *Zheng He,* made seven out-of-area cruises without a support ship.

Since 2008, consecutive antipiracy patrols have tested the PLAN's auxiliary fleet's ability to support long-distance deployments. Only the new Fuchi-class fleet-support ships and *Qinghaihu* have been used. The support ship generally remains in the Gulf of Aden for two consecutive tours. As of February 2015, AOR *Qinghaihu* (885) had made three deployments (ninth to tenth and thirteenth patrols); AOR Fuchi *Weishanhu* (887) had made seven (first to second, fifth to sixth, eleventh, fourteenth, and nineteenth); its sister ship *Qiandaohu* (886) had made five (third to fourth, seventh to eighth, and twelfth); and the newest, *Taihu* (889) and *Chaohu* (890), had made two each (fifteenth to sixteenth and seventeenth to eighteenth, respectively). The PLAN has combined its antipiracy missions with classic naval diplomacy, taking advantage of the deployment of its flotillas to send them to the Mediterranean as a symbolic gesture, including a single frigate's presence during the 2011 Libyan evacuation, and as ambassadors of goodwill in the Black Sea (2012), in the Mediterranean (April 2013), and around Europe (December 2014–February 2015).[14]

The PLAN's permanent antipiracy patrol has given and continues to give opportunities to expand China's soft power through naval diplomacy and military operations other than war (MOOTW). Liu Jingjin and Qiu Caizhen, from the Wuhan Naval University of

Engineering, explain that "escort operations have provided a new platform for the military diplomacy of our navy, helping to enhance trust and clear up doubt between China and other countries, furthering mutual understanding and cooperation and building the international image of China as a peace-loving and civilized force and as a responsible stakeholder."[15] Chinese researchers also point out the necessity of shaping an external environment favorable to the PLAN via the "harmonious ocean philosophy," in which the navy and its auxiliaries—including its hospital ships—play a central role.[16]

Hospital Ships

Following the 2004 tsunami in Southeast Asia, when the world was watching, China was unable to participate in the naval assistance effort led by the United States, which deployed one of two large *Mercy*-class hospital ships. This deficiency was remedied by the commissioning of the 23,369-ton *Anwei (Peace Ark)* hospital ship. Laid down in 2006, in the context of mounting pressure against independence-leaning Taiwan, *Anwei* apparently was not built with MOOTW as a primary focus. However, its MOOTW role was acknowledged at commissioning:

> In wartime, the "maritime field hospital" can provide early treatment and some special treatments to the wounded, while in peacetime, it can serve as a permanent medical mechanism for middle- and long-distance waters, being able to sail to military ports in various sea areas for medical exchanges, play an important role in supporting the local government in disaster rescue and relief, participate in international medical cooperation, fulfill international humanitarian aid missions, and undertake the task of international humanistic medical rescue [*sic*].[17]

On September 1, 2010, *Anwei* initiated this new kind of naval diplomacy during a three-month mission to the Gulf of Aden called Mission Harmony 2010. With its 428 crew members, including one hundred medical personnel, *Anwei* visited Djibouti, Kenya, Tanzania, Seychelles, and Bangladesh.[18] In October 2011, *Anwei* embarked on a three-month deployment to the Caribbean—Mission Harmony 2011—involving port calls in Cuba, Jamaica, Trinidad and Tobago, and Costa Rica.[19] In both instances, *Anwei* provided medical support to local populations, while collecting data on foreign blood-supply programs.[20] In November 2013, *Anwei* deployed to Tacloban, Philippines, to assist in the recovery from Typhoon Haiyan.[21] The ship also participated in exercises at RIMPAC 2014, alongside its American counterpart USNS *Mercy*.

According to Chi Zhiyan, Shao Ren, and Shi Jiazhu from the department of political science of the Dalian Naval Academy, *Anwei* inaugurated a new kind of naval diplomacy. These scholars see the "harmonious ocean philosophy"—exemplified by Mission Harmony 2010 and 2011—as "an ideological weapon for shaping a favorable environment for the PLAN."[22] Liu Hui and Liu Jiefeng from the Wuhan Naval University

of Engineering stress the need to develop military soft power in MOOTW to augment China's influence in the world and improve its standing in world opinion.[23]

Surveillance Ships

In response to the West's growing strategic submarine fleet and nuclear-armed aircraft carriers in the 1960s, the Soviet navy converted survey ships (AGSs) and fishing trawlers before building dedicated platforms to conduct ocean surveillance and reconnaissance. Displacing 1,200–5,000 tons, the new ships were seaworthy, relatively fast, and able to conduct long deployments. They packed aboard radio, electronic, acoustic, and non-acoustic sensors to intercept signals and signatures emitted by ships and submarines. From 1961 to 1975, the Soviet fleet of intelligence collectors (AGIs) grew from five to fifty, reaching over sixty by 1991. The results of their close-range surveillance off Western naval ports and other key facilities, such as Cape Canaveral, allowed the Soviet navy to monitor space launches and study Western tactics, operational patterns, underway replenishment, and carrier flight operations. The trawlers were tasked by their respective fleet intelligence departments with maritime reconnaissance or by the central Soviet military intelligence agency (known as the GRU) with general intelligence collection.[24]

By contrast, China's maritime intelligence surveillance has remained focused mainly on the country's immediate neighbors. In 1976, China's Central Military Commission and the State Council approved a project to build a dedicated electronic surveillance ship (Type 813) after a failed attempt at converting a survey ship.[25] Designed by the No. 708 Institute and completed at Hudong Shipyard in September 1980, the 4,445-ton *Xiangyanghong* 21 (later *Qimingxing* [852]) successfully completed its trials in April 1983 before joining the SSF (and later China Marine Surveillance).[26] On March 25, 1980, the PLAN agreed to a follow-on 1,500-ton (later 2,500-ton) project (Type 814 Dadie class), laid down on December 22, 1983, in Wuchang as *Xiangyanghong* 28 (now Bei Diao 900[27]) and completed in October 1986.[28] One hundred seventy specialists from the NSF and civilian agencies tested the ship's optical, acoustic, radar, and radio communications systems, drawing experience from the first two Yuanwang space-event ships to resolve acute electromagnetic compatibility issues. Commissioned in 1987, Dadies became frequent observers of U.S.–South Korean Team Spirit exercises.[29]

Follow-on reconnaissance vessels appeared less sophisticated. Completed during 1982–87, *Xing Fengshan* (5,500 tons) and the armed icebreakers Yanbing 723 and Yanha 519, 721, and 722 initiated regular patrols, including ice patrols, into the Sea of Japan and the Yellow Sea, monitoring U.S., South Korean, Japanese, and Russian naval activities, together with the NSF oceanographic vessel *Xiangyanghong* 09 (4,445 tons).[30]

Meanwhile, *Xiangyanghong* 14, attached to the South China Sea Branch of the State Oceanic Administration, focused on the Taiwan Strait. In 2002, *Xiangyanghong* 14 was

found inside Taiwanese waters and was driven away by the Republic of China's navy.[31] Deployed in October 1987 to the South China Sea together with *Xiangyanghong* 05, *Xiangyanghong* 09 played an important role in preparing for China's successful occupation of Yongshu / Fiery Cross Reef in March 1988. Operated in conjunction with the China Academy of Sciences, *Xiangyanghong* 10 (10,975 tons) occasionally used its large log-periodic antennae for communications intelligence (i.e., COMINT).[32] In July 1999, *Xiangyanghong* 10 was recommissioned as a space-tracking ship under the name of Yuanwang 4.

While junks and fishing boats long have constituted the core of Chinese coastal surveillance assets, survey vessels also have been used for oceanographic and acoustic research. The main classes of survey vessels were built in 1970–72 (Type 635 and Type 635 I [A] Yanlai class), 1975 (Type 635 II [B] Ganzhu class), 1982–83 (Type 635 III [C] Yanlai class, and Type 646 Yankang class),[33] and 1998–2008 for the three large (six-thousand-ton) Type 636As: *Li Siguang (*871), *Zhu Kezhen (*872), and *Qian Sanqiang (*873), one for each fleet. In February 2012, the catamaran survey ship Nan Ce 429 was commissioned into the Ocean Survey Squadron at Guangzhou. Three vessels built in Dalian—the catamarans Bei Diao 991, 992, and 993—are subjects of speculation. Their prefix—"diao" (调), instead of "ce" (测) for naval research vessels—suggests a role as acoustic intelligence vessels, the better to protect China's approaches in the context of reported American and Australian submarine activities in a very noisy underwater environment. Bei Diao 991, 992, and 993 and their towed arrays may operate in conjunction with the old Soviet Volkhov harbor defense active/passive sonar sensors (built for China by the Leningrad hydroacoustic institute Morphyspribor in 1959) or more likely with successor fixed-array systems on the sea bottom.[34] An interesting development would be future deployments near U.S., Japanese, South Korean, Vietnamese, and Indian submarine bases, following the practices of U.S. Military Sealift Command ocean surveillance (T-AGOS) vessels.

Since 1999, Japan's defense yearbook, published by the Japanese Foreign Ministry, has reported annually on Chinese reconnaissance activities taking place within forty nautical miles of Japan's coasts—well within the Japanese exclusive economic zone (EEZ), contravening China's own position rejecting foreign military activities in its EEZ. However, most of those activities have taken place near the Diaoyu/Senkaku Islands claimed by China and now are being performed by China's coast guard. Japan claimed that those patrols increased from four in 1997 to thirty in 1999.[35] In May 2000, Yangbing 723 passed for the first time through the Tsugaru Strait between Honshu and Hokkaido and through the Tsushima Strait off Kyushu, two very important international sea-lanes.[36]

In the last fifteen years, the PLAN has completed five state-of-the-art signals intelligence (i.e., SIGINT) and electronics intelligence (i.e., ELINT) collection vessels, and one more

may be under construction. Commissioned into the ESF and SSF in 1999 and 2009, respectively, the six-thousand-ton Dongdiao 851 (ex-232, renamed *Beijixing*) and *Tiangwangxin* 853 (Type 815 and 815G) are both capable of tracking missiles and satellites.[37]

In 2011, the Indian media accused China of sending trawlers as well as an unnamed larger intelligence-collection vessel to the Bay of Bengal to monitor India's missile tests. The unnamed alleged Chinese spy ship purportedly was detected in July near the coast of Little Andaman Island within India's EEZ—again, in contravention of China's own policy. Indian sources claimed the ship had spent more than twenty days in the sensitive location before being located. Then the ship—which had always remained in international waters—supposedly docked in Colombo. Again, neither the ship's name nor any photographs taken at sea or in Colombo were made public, although the ship was said to have had twenty-two laboratories, suggesting a large oceanographic vessel. An Indian television program added that the United States had warned India of the spy ship's presence.[38]

Beijixing frequently has operated near and within Japan's claimed EEZ and was an uninvited guest at RIMPAC 2014, in which three other Chinese vessels participated for the first time.[39] *Beijixing*'s deployment likely reflected a long-standing frustration at continual American maritime surveillance off Chinese coasts and a new policy of reciprocity despite the technological inferiority of the PLAN's surveillance platforms. Three more Type 815s were launched in 2014 at Hudong Shipyard in Shanghai, signaling a probable intention to conduct more intelligence collection in distant waters, most likely around Guam and Hawaii—within America's unclaimed EEZ.[40]

Submarine Tenders

With the largest conventional submarine force in the world—and the second largest during the last two decades of the Cold War—it is no surprise that the PLAN made a huge investment in submarine salvage vessels and tenders: sixteen major units have been completed since 1966, including three in the 2010–13 period. However, in tonnage, most of those tenders cannot compare to their U.S. and Soviet/Russian counterparts, confirming that China would use them mainly in its near seas.

The first purpose-built submarine tender was the Type 922 Bei Jiu 403, built by Zhonghua in 1966 (Zhonghua class), followed by the smaller Type 930 Nan Jiu 512, built by Hudong in 1969 (Hudong class).[41] Both were scrapped and succeeded by the Type 922 II Nan Jiu 503 (Dalang class).[42] Guangzhou built two smaller Type 946 (Dazhou class) in 1977–78, while Jiangnan produced the three largest Type 925s (Dajiang class, 11,975 tons)—*Changxingdao* (861), *Chongmingdao* (862), and *Yongxingdao* (863)—followed by four smaller Type 922 IIIs (Dalang class) and a single Type 946A (Dadong class) in

1982.[43] Zhonghua and Hudong also delivered twenty-five ocean salvage tugs (three Tuzhong class, fourteen Hujiu/Dinghais, five modified Hujiu IIs, and three Tuqians).[44] Construction resumed on larger submarine tenders late last decade at Guangzhou. The 9,500-ton *Haiyangdao* (864) (Type 926 Dalao class) was commissioned in 2010, followed by two more in 2013–15 to replace the Dazhou and Dadong classes. Despite these additions, the PLAN still lacks the numbers of oceangoing repair ships that would be necessary to establish distant stations and support combat operations in distant waters.

When the Soviet navy started to deploy overseas in 1964, it had many more repair ships than the PLAN currently possesses. These included six *Don*-class, nine-thousand-ton submarine tenders (supplemented during 1963–72 by seven *Ugra*-class, 9,500-ton variants), five *Dniepr*-class (5,300-ton) repair ships, supplemented by forty-one follow-on ships of the *Oskol* and *Amur* classes during 1964–88, fifteen small rescue ships (supplemented by four more during 1964–68), and six 6,700-ton *Andizhan*-class missile transports (supplemented by eleven more of the *Lama, Amga,* and *Brykin* classes during 1964–87).[45] Chinese submarines now have been deployed at least three times to the Indian Ocean, with the second Han nuclear attack submarine calling in Colombo, Sri Lanka, in November 2014, together with one of the three largest submarine tenders, the Dajiang-class *Changxingdao*.[46] While the PLAN's newest class of submarine tenders (the 9,500-ton *Haiyangdao*/Dalao class) matches in tonnage the Soviet *Don* and *Ugra* classes, the ship's low freeboard and high superstructure do not suggest the good sea-keeping qualities that characterized its Soviet equivalents in their day, nor those of the three Dajiangs.

At first glance, the PLAN's current situation appears similar to that of the Soviet navy in 1964 when Moscow started to deploy its forces worldwide. Both navies were born as coastal-defense forces, progressively expanding their areas of operations by use of large auxiliary vessels that made up for a lack of foreign bases. Soviet out-of-area operations grew from fewer than four thousand ship-days in 1964 to about 48,000 in 1976.[47] With China's permanent deployment of three vessels to the Gulf of Aden and its hyperactive naval diplomacy, the PLAN's current out-of-area deployments probably approach the 1964 Soviet figure of four thousand ship-days.

But will the PLAN follow the Soviet curve? Despite a shortage of large AORs in 1964, the Soviet auxiliary fleet was by then three to four times the size of the current Chinese auxiliary fleet, with numerous oceangoing tenders and repair ships that could support continuous nuclear and conventional submarine deployments.

At this point, the PLAN does not have sufficient support ships to help sustain a permanent combat-ready presence in distant waters, starting with the Indian Ocean and the eastern and western coasts of Africa. While the newest Fuchis may be replacements for

the older Fuqings, the construction of a follow-on AOR/AOE in Shanghai (perhaps of the rumored forty-thousand-ton class) would allow the PLAN to match the numbers of its destroyer/frigate flotillas and help support the deployment of one carrier group. If China wishes to acquire three to four carriers, as rumored, it would need at least one dedicated AOR/AOE per carrier group, and more if China wanted to change its self-imposed restrictive policies and maintain fleets in distant waters. The PLAN also would need more and larger submarine tenders and rescue ships if it wished to deploy submarines overseas continuously.

On the basis of currently available evidence, China's ultimate aspirations may align most closely with the French model: supporting a distant presence for low-tier police operations that can be augmented in times of need to deal with a regional crisis via deployment of a carrier air group. Such a model is not sufficient to support an overseas confrontation with the surface fleet of a major international actor such as the United States, or even a major regional actor such as India.

The PLAN surveillance fleet also has a long way to go to achieve the capabilities of the Soviet Union in the Cold War era. With about twenty AGIs/AGSs, mainly used for coastal surveillance or operations against its neighbors, China has not yet embarked on the massive maritime collection effort that characterized the Soviet navy and that indicated global operations. China's AGI deployments in the Bay of Bengal or off Hawaii mark a departure from the self-imposed restrictive policy that conformed to China's interpretation of the UN Convention on the Law of the Sea and the country's opposition to intelligence operations in its EEZ. And yet it can be argued that those Chinese AGI deployments serve defensive purposes against India's new nuclear strategic submarine program and U.S. maritime dominance in the western Pacific.

Notes

1. The French biennial volume by Bernard Prézelin, *Flottes de Combat* 2012 (Rennes: Editions Ouest-France, 2012), p. 20, even rates the Chinese auxiliary fleet as the second largest. It lists eighteen major Chinese auxiliary vessels displacing a total of 206,930 tons, putting China in the world's second position—in front of Russia's forty-one auxiliary vessels in tonnage (203,020 tons), but still far behind the United States' thirty-five vessels representing 494,360 tons.
2. The author is grateful to Birger Graae and Werner Globke for sharing their research on the PLAN's organization and order of battle.
3. Office of Naval Intelligence, *The People's Liberation Army Navy: A Modern Navy with Chinese Characteristics* (Suitland, MD: 2009), available at www.fas.org/irp/agency/oni/pla-navy.pdf.
4. Ibid.; Birger Graae, "2014 PLAN Order of Battle" (unpublished manuscript).
5. Graae, "2014 PLAN Order of Battle."
6. Ibid.
7. Two of four ships remain in service: *Hongzehu* (881) (ex–Dong Yun 615, ex-X615, ex-*Fengcang*); *Poyanghu* (882) (ex–Bei Yun 575, ex-X575, ex-*Taicang*); Nan Yun 950 (ex-X950)—decommissioned; *Nasr* (A47)—Pakistani navy.
8. Johnathan Weng, "Chief Designer Talks about PLA Navy Replenishment Ship," *China Defense Mashup Report Beijing,* February 12, 2009, www.china-defense-mashup.com/chief-designer-talks-about-pla-navy-replenishment-ship.html.

9. *Qiandaohu* (886) and *Weishanhu* (887) were built in Shanghai, with *Taihu* (889), *Shaohu* (890), and two more launched or building in Guangzhou.
10. Bruce Swanson, *Eighth Voyage of the Dragon: A History of China's Quest for Seapower* (Annapolis, MD: Naval Institute Press, 1982), p. 285; Christopher D. Yung and Ross Rustici, with Isaac Kardon and Joshua Wiseman, *China's Out of Area Naval Operations: Case Studies, Trajectories, Obstacles, and Potential Solutions* (Washington, DC: National Defense Univ., Institute for National Strategic Studies, 2010), pp. 9–11.
11. Yung and Rustici, *China's Out of Area Naval Operations,* p. 12.
12. Ibid., p. 13.
13. Ibid., p. 15.
14. "19th Chinese Naval Escort Task Force Sets Sail from Qingdao," *China Military Online,* December 3, 2014, english.chinamil.com.cn/news-channels/china-military-news/2014-12/03/content_6253028.htm.
15. Zhao Lei, "Setting Sail against a Sea of Troubles," *China Daily,* February 12, 2015, available at www.chinadaily.com.cn/china/2015-02/12/content_19561275.htm.
16. 迟志艳 [Chi Zhiyan], 邵仁 [Shao Ren], and 石家铸 [Shi Jiazhu], 以和谐海洋理念塑造人民海军发展有利外部环境 ["On Shaping a Favorable External Environment for the PLAN with the Harmonious Ocean Philosophy"], 海军工程大学学报(综合版) [*Journal of Naval Engineering (Comprehensive Edition)*] 2 (2012), pp. 67–70.
17. "First China-Made 10,000-DWT Hospital Ship Sails to Sea," *PLA Daily,* December 5, 2008, english.pladaily.com.cn/site2/news-channels/2008-12/05/content_1573778.htm.
18. "Chinese Navy Hospital Ship *Peace Ark* Concludes 'Mission Harmony–2010,'" *People's Daily Online,* November 15, 2010, en.people.cn/90001/90783/91300/7199893.html.
19. Xinhua, "PLA Naval Hospital Ship to Provide Medical Treatment to Latin American Nations: Spokesman," *People's Daily,* November 30, 2011, english.people.com.cn/90786/7661785.html.
20. 成海 [Cheng Hai] et al., "和谐使命-2011"对外医疗服务中血液保障方案的研究 ["Research on Blood Supply Program in Overseas Medical Support during 'Mission Harmony–2011'"], 海军医学杂志 [*Journal of Navy Medicine*] 2 (2014), pp. 108–10.
21. "Chinese Hospital Ship *Peace Ark*'s on 'Friendship' Mission to Philippines," *South China Morning Post,* November 21, 2013.
22. Chi, Shao, and Shi, "On Shaping a Favorable External Environment for the PLAN," pp. 67–70.
23. 刘慧 [Liu Hui] and 刘杰峰 [Liu Jiefeng], 提高国际舆论影响力 推进我军"软实力"建设 ["Enhancing the World Opinion Influence to Develop Military Soft Power"], 海军工程大学学报(综合版) [*Journal of Naval Engineering (Comprehensive Edition)*] 4 (2011), pp. 13–16.
24. Peter A. Huchthausen and Alexandre Sheldon-Duplaix, *Hide and Seek* (Hoboken, NJ: Wiley, 2008), pp. 181–88.
25. A Type 812 on the hull of a Type 635 (1,100 tons). 军事论坛 » 三军论坛 » 海军版 » 精! 中国舰艇锦集 ["Military Forum—Armed Forces Forum—Navy Version—Fine Chinese Warships!"], *Sina,* p. 4, club.mil.news.sina.com.cn/thread-87564-4-7.html; Desmond Ball, *Signals Intelligence in the Post–Cold War Era: Developments in the Asia-Pacific Region* (Singapore: Institute of Southeast Asian Studies, Regional Strategic Studies Programme, 1993), pp. 53–56.
26. Ex-V350; excessive vibrations led to cancellation of the project.
27. Ex-814.
28. "Fine Chinese Warships!"; Ball, *Signals Intelligence,* pp. 53–56.
29. "Fine Chinese Warships!"
30. Ibid. *Xing Fengshan* is ex-V856.
31. Ibid.
32. Ball, *Signals Intelligence,* p. 54.
33. Built respectively at Zhonghua (Dong Ce 226, 227), Guangzhou (Nan Ce 420), Jiangzhou/Jiangxi (Nan Ce 427, Bei Ce 943), and Guijiang/Wuzhou (Nan Ce 426, 428).
34. Oleg A. Godin and David R Palmer, *History of Russian Underwater Acoustics* (Singapore: World Scientific Publishing, 2008), p. 612.
35. Japan Defense Agency, *Defense of Japan 2003* (Tokyo: 2003), pp. 67–68.
36. Ibid.
37. A laser electro-optical turret was visible forward of the bridge of 853 before its refit. "Fine Chinese Warships!"
38. Sudhi Ranjan Sen, "Chinese Ship Caught Spying on India," *NDTV,* August 31, 2011, www.ndtv.com/article/india/china-ship-with-22-labs-spied-on-india-130174; "Navy Spots Chinese 'Spy' Ship near Andamans," YouTube video, 4:27, posted by "inKhabar," April 7, 2013, www.youtube.com/watch?v=0VCaUA7mFC8.

39. Andrew S. Erickson and Emily de La Bruyere, "Crashing Its Own Party: China's Unusual Decision to Spy On Joint Naval Exercises," *China Real Time Report* (blog), *Wall Street Journal,* July 19, 2014, blogs.wsj.com/chinarealtime/2014/07/19/crashing-its-own-party-chinas-unusual-decision-to-spy-on-joint-naval-exercises/.
40. 专家:中国新电子侦察船下水猛增远海斗争优势 ["Expert: China's New Electronic Surveillance Ship Launched for Sea Superiority Struggle"], China.com, January 29, 2015, military.china.com/important/11132797/201501.
41. Ex–Dong Jiu 301.
42. Transferred to China Fisheries Law Enforcement in 2008 as Yu Zheng 311.
43. Dazhou class: Nan Jiu 502 and Bei Jiu 137, ex–Nan Jiu 504. Dajiang class: ex–Bei Jiu 121, ex–Dong Jiu 302, ex–Nan Jiu 506. Dalang class: Bei Jiu 122, Bei Jiu 138, Dong Jiu 332, and Nan Jiu 510. Dadong class: Dong Jiu 304.
44. Tuzhong class: Nan Tuo 154, Bei Tuo 710, and Dong Tuo 830. Hujiu/Dinghais: Nan Tuo 147, 155, 156, 164, 174, and 175; Bei Tuo 622, 711, and 717; and Dong Tuo 837, 842, 843, 875, and 877. Hujiu IIs: Nan Tuo 185; Bei Tuo 635, 712, and 715; and Dong Tuo 836. Tuqians: Nan Tuo 181, Bei Tuo 721, and Nan Tuo 189.
45. Norman Polmar, *The Naval Institute Guide to the Soviet Navy,* 5th ed. (Annapolis, MD: Naval Institute Press, 1991).
46. "Chinese Submarine Docks in Sri Lanka despite Indian Concerns," Reuters, November 3, 2014.
47. Bradford Dismukes and James M. McConnell, *Soviet Naval Diplomacy* (New York: Pergamon, 1979).

CHAPTER NINE

Sustaining the Surface Force

Developments in PLAN Logistics and Maintenance

Dale C. Rielage

As the People's Liberation Army (PLA) Navy (PLAN) works to meet the PLA's "New Historic Missions" and protect Chinese interests abroad, the PLAN surface force has confronted the challenge of sustaining a growing number of ships on extended operations away from home port. Since 2008, the PLAN has supported units in operational deployments lasting, in some cases, over six months without the benefit of a network of permanent overseas bases. Images of PLAN logistics vessels replenishing PLAN surface combatants under way at sea, seldom seen before 2010, have become routine, a staple of PLA press releases.

Most studies of PLAN sustainment have focused on either PLAN mastery of underway replenishment techniques or the adequacy of the logistics vessels that support underway delivery of fuel and stores. These units are the critical last step in delivering logistics support at sea, and the ability to employ them consistently represents a fundamental level of seamanship accomplishment. However, mobile logistics forces are only the most visible expression of the PLAN's efforts to adapt its logistics support to a higher tempo of operations at greater distances from the Chinese mainland. The PLA recognizes that changes in the logistics-support structure ashore are also a key part of meeting this challenge. The service's official newspaper, *People's Navy,* describes the overall PLAN support construct as "a shore-sea integrated support system with strategic home ports at the core and with at-sea comprehensive support groups as the focal points."[1]

Extended deployments and an increasing emphasis on regular, year-round surface-force readiness have placed new demands on the PLAN surface-force maintenance system as well. Combined with the growing technical complexity of PLAN surface-force payloads and platforms, these extended deployments have caused the PLAN to develop new maintenance approaches. This chapter examines the PLAN's systematic effort to address its logistics and maintenance challenges and the place of these initiatives within larger efforts to improve logistics and maintenance throughout the PLA.

In studying recent conflicts, the PLA has recognized the centrality of logistics and maintenance support to modern combat operations.[2] Chinese military studies of the British

naval campaign to retake the Falkland Islands discuss the importance of the Royal Navy logistics train in supporting combat operations.[3] The U.S. ability to amass an "iron mountain" of supplies before each Gulf war, much of which was transported by sea, as well as the ability of the U.S. Navy and other coalition navies to sustain naval forces on sanctions duty indefinitely, reinforced the PLA's impression that its logistics support required a new reach and tempo. "Winning local wars under the conditions of informatization" is only possible if the PLA can deliver material support to the fight of the type and quantity that modern operations require. The Chinese military press reported that the PLA made logistics reform a key element of the eleventh five-year plan (2006–10). In 2007, the Central Military Commission (CMC) issued an *Outline for Building Modern Logistics in an All-Around Way*. The document remains the senior-level guidance to the PLA on logistics support. Many key PLAN reform initiatives—including informatization of logistics functions and "military support socialization"—are guided by this document.[4]

The PLAN faces an additional challenge distinct from the overall question of support modernization that the PLA faces. The PLA is still wedded to a geographic command structure. Despite the promise of recent reforms to the PLA's organizational structure, it remains a challenge to support robust operations away from China's coastline.[5] Other than the most basic coastal-defense functions, the PLAN's missions—whether characterized as New Historic Missions or as traditional naval missions in "distant seas"—take place at increasing ranges from the Chinese mainland and require surface forces to remain on station for extended periods. These new requirements must be met with forces that deploy from all three fleets, crossing oceans and sometimes combining forces to carry out their missions. Even regional surface-force missions, such as assertion of Chinese maritime claims in the South and East China Seas, require year-round responsiveness and sustained operations beyond what is required of other arms of the PLA. PLAN surface-force support must move beyond the strictures of the larger PLA system if it is to enable these mobile operations.

Taking its guidance from larger efforts to reform PLA logistics, the PLAN has focused since 2006 on creating administrative frameworks, shore structures, and at-sea capabilities that allow its forces, including the surface force, to conduct a full range of missions. Both PLA and PLAN logistics and maintenance efforts have been characterized by three significant lines of effort:

- Informatization. The PLAN recognizes that modern information technology enables logistics and maintenance agility and efficiency. The 2011 PLAN work plan called for the PLAN to "quicken the process of logistics informatization building in the Navy."[6]

- Attention to regulatory, budget, and audit controls. PLAN logistics and maintenance modernization has included efforts to create a regulatory framework to guide PLAN efforts, apportion resources, and monitor the use of money and assets.
- Reliance on civilian support. For its first fifty years, China's low level of development and the Maoist "People's War" doctrine placed the PLA in the position of manufacturing and supplying its own stores and arms. Since the end of "PLA Inc." in the late 1990s, the PLA has moved away from being the creator of its own support to managing the acquisition of support from other sectors of society. In recent years the PLAN has embraced "military support socialization"—essentially privatization—of key support services as a means of creating efficiencies and improving service to the fleet.

Service-Level Logistics

The PLAN Headquarters Logistics Department establishes policy and regulations for budgets and resources and thus is a critical node in modernizing the naval logistics system. During the eleventh five-year plan, the department reported that it "implemented reform of the budget system, centralized the disbursal of funds, and tied together asset management and budget management."[7] The theme of administrative rectification continued in the twelfth five-year plan (2011–15). In 2011, the CMC issued "opinions on further strengthening the military's asset management" that provided direction to the PLA on the administration of military resources, both physical and budgetary.[8] In a late 2011 interview, Chen Yihao, director of financial affairs in the Navy Logistics Department, explained that the PLAN's goal in implementing this CMC guidance was more-efficient use of existing resources and control and supervision of assets. This effort was challenged by what Chen called "prominent contradictions in budgetary supply and demand"—budget shortfalls—that required improved efficiency. Toward that end, the director indicated that the PLAN Logistics Department would standardize support measures for major tasks, such as antipiracy deployments, extended operations, and joint military exercises.[9]

Conservation of Resources—Addressing Corruption

The handling of money and resources naturally creates opportunities for illegal personal enrichment. Most Western observers agree that corruption within the People's Liberation Army is endemic and has a significant impact on resources and personnel policy, and thus military readiness.

The PLAN is no stranger to high-level corruption. In 2006, Vice Adm. Wang Shouye, PLAN deputy commander, was arrested for "economic crimes" allegedly involving land deals. Wang was sentenced to death, a penalty later commuted to life imprisonment.[10]

Chinese sources on naval logistics only hint at corruption issues, but a measure of official concern can be found in their reports of ongoing progress against corrupt practices. For example, a 2009 report noted that the Navy Logistics Department had "banned and punished the lawbreaking activities of issuing and using false purchase receipts and invoices, examined and rectified the practice of handling and managing assets, [and] tightened supervision over financial management."[11] The management of military real estate, a key element of numerous military corruption scandals, appeared to receive special attention. One of the key tasks completed in 2009 was a review of unused PLAN real estate, followed by realignment of these assets under correct management. The PLAN reported that these efforts "returned 1,600 units of housing inappropriately occupied by cadres and other personnel at and below the division level."[12]

President Xi Jinping has made the fight against official extravagance one of his most public policy initiatives. His most prominent efforts to curb PLA abuses have centered on lavish official entertainment and abuse of military license plates. However, an expanded government-wide anticorruption campaign will both push PLAN headquarters logisticians to take a more central role in regulating PLAN assets and place the regulators themselves under increased scrutiny.

Fleet-Level Logistics Support

In late 2011 the PLAN established a fleet logistics department in each of its three fleets. In many ways, this reform marked a return to a previous pattern of PLAN organization. The three fleets had logistics departments until 1985, when PLAN commander Adm. Liu Huaqing ordered them disestablished. Liu also moved responsibility for shore installations as well as surface-force shore support to shore-based support commands, allowing fleet headquarters and subordinate operational units to focus on at-sea operations.[13] This construct functioned well in a service that was tied closely to shore, conducting distant voyages only in exceptional cases. People's War coastal-defense concepts emphasized small combatants conducting operations from numerous dispersed locations along the entire coast; specialized, geographically based support commands could focus on mobilizing wartime resources. However, the increase in PLAN distant-seas operations argues strongly for integrating logistics by operation rather than geography. Establishing fleet logistics departments while reducing the shore logistics command structure aligns logistics support directly with the commanders responsible for conducting naval operations.

The task of integrating logistics with operations is challenging in any navy, and the new fleet logistics departments have confronted issues of authority, duplication, and training. One of the new East Sea Fleet Logistics Department's first tasks was to issue regulations establishing the relationship among the fleet, the shore-based vessel-service commands, and the subordinate operational units. The department reported that many cadres

initially did not believe the new department would lead to fundamental changes in the logistics process. Reportedly, efforts to introduce new directives rapidly changed this view.[14]

Centralized control of fleet logistics also appears to be driving centralization of some support functions. In one example, the East Sea Fleet Logistics Department assessed that among members of medical staffs assigned to afloat units "enthusiasm toward their work was low." Given their extended at-sea assignments, afloat medical cadre had no opportunities for advanced education. In response, the new logistics department removed afloat medical personnel from surface units and assigned them to two local hospitals, dispatching them to afloat units as required to support operations.[15]

The fleet logistics departments also focused on increasing the level and fidelity of logistics play in PLAN exercises. *People's Navy* reported that only two weeks after its establishment the East Sea Fleet Logistics Department confronted a major exercise in which most logistics support was assumed or scripted rather than exercised in earnest. Participating vessels would be supplied fully before departing port and would not require resupply during the exercise. While the exercise plan called for logistics personnel to accompany the ships, the exercise manning document was incomplete. The exercise was cited in the official PLA press as an example of the scope of change necessary for the PLA to implement the training required to conduct modern logistics operations.[16]

Development of the Comprehensive Support Base

Shortly after the reestablishment of the fleet logistics departments the PLAN created a number of comprehensive support bases. The exact number of these new commands is unclear, but there is likely at least one per fleet. The North Sea Fleet Comprehensive Support Base, headquartered in Qingdao, has received the most attention in the Chinese military press, largely owing to its mission of supporting the new aircraft carrier *Liaoning*.

The comprehensive support bases differ from the bases established in the mid-1980s. Until recently, bases formed the bulk of the PLAN surface-force shore-support structure. These older-pattern bases could be compared more properly to a U.S. naval district or maritime defense zone. They controlled not only installations and tenant logistics units but also small combatants, and appeared to have a coastal-defense function.

In contrast, the comprehensive support bases have been modeled on the "large strategic mother ports" that major foreign navies tend to use. *People's Navy* reported that the staff of the North Sea Fleet Comprehensive Support Base repeatedly consulted an intelligence database on foreign ports to discern the essential functions the new PLAN base would need to provide.[17]

Investment in Shore Support to the Surface Force

In setting out to provide *Liaoning,* the PLAN's highest-profile surface platform, with a world-class level of support infrastructure, the PLAN is continuing a long-term investment in improving surface-ship shore support. Modern naval bases provide to ships not only moorage and shelter from the sea but utilities necessary for basic maintenance and housekeeping on board. During the eleventh five-year plan, the PLAN established the goal of providing these utilities (commonly referred to as shore services) to PLAN surface units in their home ports. The PLAN dubbed these services—fuel oil, potable water, shore electrical power, heat (steam), high-pressure air, and air-conditioning—the "six supplies."[18] *People's Navy* emphasized that providing the six supplies in PLAN ports was a personal goal of PLAN commander Adm. Wu Shengli. In many cases, the provision of these services required extensive renovation or complete replacement of piers, as well as construction of central facilities for utilities management and distribution.[19]

Providing these essential services from central locations has a number of advantages for the surface force. First, it reduces wear and tear on the ships' own equipment. In its extensive coverage of this effort, *People's Navy* suggested that, prior to these improvements, much of the surface force was continually "auxiliary steaming": generating its own utility services using the ship's engineering plant. Second, central utilities reduce crew workload. If electrical power or water is provided from a pierside connection, the crew is not required to maintain an around-the-clock watch on generators or distilling plants. Third, shore services allow ships to resupply faster. In one case, hard potable water lines replaced two trucks that had shuttled water to surface ships, allowing the units to resupply with water in half the time. Fourth, the six supplies save money. Bases reported consistent savings under the new program, largely because central production of utilities is more efficient than burning fuel oil on board each vessel to provide services. In a number of cases, shore-power risers are connected to centralized energy-management systems. Shipboard personnel use smart cards to authorize closing the breakers after connecting shore-power cables, and the base centrally monitors the amount of power each unit uses. If the central base notes excessive consumption, it notifies the shore support centers in near-real time and puts controls in place. By 2011, the PLAN could report with pride that "six-supply support" was available for all major combatants at their home ports.[20]

Beyond providing better support to PLAN surface units, the PLAN recognizes the role of its bases in supporting the quality of life for its personnel. In an increasingly prosperous China, PLAN personnel have expectations for their material comfort and standard of living that are vastly different from those of their Maoist-era predecessors. As the PLAN works to attract high-quality volunteers to replace its conscript personnel, it recognizes that quality-of-life matters affect the retention of long-service personnel.

Housing is recognized as an important quality-of-life element. When not at sea, PLAN surface-force sailors are housed in barracks ashore. A retrospective of the accomplishments during the eleventh five-year plan noted significant improvement in these facilities: the PLAN reported completion of 244 billeting-support projects in sixty-three different units. *People's Navy* reported that the investment in these quarters had "brought to an end the era of officers and sailors from surface ships 'arriving in port but not going ashore, eating while squatting on deck, hanging up a hammock to sleep.'"[21] However, room for improvement remains, and the 2011 PLAN logistics work meeting made improving living-support conditions for personnel one of the five priority areas for the year.

In addition to housing, the PLAN's efforts to improve base infrastructure have included better laundry facilities—in some cases, covered areas to line-dry laundry—as well as telephone and Internet access. In many cases, provision of these amenities has been contracted to civilian providers.

Food services—both dining facilities and supplying of food to naval units—have been a focus of logistics-improvement efforts, with fifty-six new-model canteens built in nineteen naval units during 2009 alone.[22] Since military food services have few unique requirements not found in civilian institutional food services, there are few barriers to PLAN units "relying on society for support." During the eleventh five-year plan, the PLAN civilianized seventy dining facilities located in thirty-three units.[23] Food services have been cited consistently as a successful example of military-support socialization.

However, reliance on civilian suppliers makes food services more sensitive to increases in food prices. In late 2011, *People's Navy* reported that at some PLAN commands inflation in food prices had caused meals to be reduced from the normal three meats and two vegetables to two meats and two vegetables. In this case, *People's Navy* commended the solution of one East Sea Fleet unit, which lowered its food costs through open bidding with local firms and supermarkets, gaining the added benefit of direct delivery of food to the units.[24]

Relying on the civilian food supply carries real concerns over quality and safety. Underscoring its concern for the welfare of sailors, the Yulin Support Base Coastal Logistics Department reported in 2011 that it had issued food-testing devices at the unit level. Additionally, the base employed eight food inspectors and had a military depot doing some food processing for the service. While having military facilities pickling vegetables for the PLAN is contrary to the idea of military-support socialization, it may increase the confidence of the troops that their food is safe, fresh, and professionally prepared.[25]

Asset Management

Like any military, the PLAN faces the challenge of efficiently and effectively managing large amounts of property and equipment. Chinese businesses export goods to cost-conscious importers across the globe and have developed logistics expertise while participating in highly developed state-of-the-art global logistics chains. The PLA is interested in applying this commercial expertise to military asset management.

Key to commercial logistics agility is maintaining real-time visibility on the total assets of an organization through modern information technology. One of the PLAN's goals in the twelfth five-year plan was to implement a Navy Asset Management Informatization System that integrates the inventory management functions of all levels of command.[26]

At the base level, the system appears to be managed by the base Integrated Support Command Center. This center, which monitors and coordinates all logistics functions, is the same base center that monitors electrical power consumption and other six-support services to surface units. To illustrate the center's role in resolving routine logistics problems, a reporter recounted that during his visit to the center the watch received a report that a computer belonging to the political department of a flotilla had broken. After receiving the application for a new computer, the base finance section checked the Navy Asset Management Informatization System, discovered the computer was past its service life, and approved the new purchase in about thirty seconds.[27]

Maintenance Support to the Surface Force

The growing technical complexity of PLAN surface vessels and the requirement to conduct year-round operations have increased demands on the PLAN maintenance system. In 2011, the PLAN put in place a "Ship Support Path with Chinese Characteristics." This plan outlined responsibilities for both maintenance management and the conduct of the actual maintenance across the PLAN.[28]

Maintenance management is conducted at three levels within the PLAN. At the highest level—likely within the Naval Armament Department—the PLAN conducts the policy and force-wide planning work that facilitates maintenance across all three fleets. These efforts include the following:

- Programmatic planning
- Equipment work program planning
- Issuance of rules and regulations
- Aircraft carrier repairs at the ship-equipment level
- Plans for major ship repairs

- Coordination of major imported and domestic parts and materials

The national importance of the PLAN aircraft carrier program is reflected in the fact that ship-equipment-level repairs for *Liaoning* are managed at the navy headquarters level.

Each fleet has a fleet armament department that implements PLAN policy and plans for its assigned forces. These functions include these elements:

- Planning management
- Planning of campaign-oriented equipment work
- Refinement and execution of rules and regulations
- Implementation of repairs
- Organization of materials sourcing

The fleet armament departments were established in late 2011 at the same time as the fleet logistics departments. They have similar responsibilities for integrating support with military operational planning for both peacetime and wartime operations. The East Sea Fleet's Fleet Armament Department has established three major "expert groups" to manage fleet-support operations: two equipment technical support groups, dedicated to surface ships and submarines, respectively, and a ship-equipment repair office. In February 2013, these three groups were augmented by six system-technology units, each dedicated to the inspection and assessment of a specific category of shipboard equipment. These six units comprised over 180 experts and technicians.[29]

Under the fleet armament departments, individual units manage the execution of planned and emergent repairs. This includes both execution management and ship-level repair work through at-sea support. Under the 2011 system, actual maintenance is conducted at three levels, paralleling the maintenance-management system. In this construct, bases provide the highest level of maintenance support. Assigned tasks include these:

- Dry dock repairs
- Assistance to "relay-level" repairs
- Embarking support ships accompanying ships carrying out major missions
- Undertaking wartime repairs, as directed by higher authorities

The "relay level" likely refers to specialized personnel from ship-equipment repair offices. While these units are subordinate to the fleet armament departments, there may be a separation between fleet-subordinate planning functions and base-subordinate maintenance execution. The relay level will

- Use shore bases to provide at-sea mobile repairs

- Work difficult issues that are beyond a ship's force
- Machine parts for crew-level repairs
- Repair equipment removed and turned in by a ship's force
- Provide initial charge to and overhaul of storage batteries
- Assist ship's force maintenance
- Embark in support ships accompanying ships carrying out major missions

A number of PLAN sources reference the responsibility of ship-equipment repair offices to provide specialists to deploying ships. It is not clear to what extent this reflects internal assessment that PLAN crews have a limited capability to conduct their own maintenance. In the case of the PLAN, it appears that these specialists will deploy both to support vessels and to deploying combatants, augmenting their ability to assess and repair equipment casualties. While it is possible that PLAN surface ships are limited by their onboard repair capabilities, it is also important to remember that most navies rely on shore assistance for complex surface-ship repairs and scheduled maintenance.

Members of the crew of each PLAN surface vessel are the critical deckplate-level stewards of their ship and equipment. Shipboard personnel are tasked with conducting maintenance in accordance with the *Naval Vessel Repair Regulations* and the *Naval Vessel Equipment and Technology Management Work Regulations*. Accounts of shipboard maintenance suggest that there are three levels of ship's force repairs: peacetime maintenance, repair-period maintenance, and "wartime crew-level maintenance." The latter suggests that PLAN surface units are authorized in combat situations to undertake maintenance that otherwise would be referred to a higher-level maintenance organization.[30]

When official Chinese media discuss surface-ship maintenance, their stories generally center on "heroic repairs" a ship's crew has made in the face of considerable challenges or urgent operational need. For example, in 2012 *People's Navy* highlighted Jiangkai II guided-missile frigate (FFG) 572. Frigate 572 suffered a casualty to its number 2 auxiliary engine, resulting in excessive vibration and high exhaust temperature. The crew spent nine hours in a successful effort to repair the machinery, allowing the ship to make a scheduled replenishment the next day.[31]

While heroic repairs make good headlines, good maintenance management seeks to minimize catastrophic equipment failure and maximize equipment availability. It is not clear from PLAN accounts to what extent the PLAN has implemented a system of planned scheduled maintenance, or whether such a system is standardized across surface platforms. A planned-maintenance regime can be implemented with little or no automation, but requires a high degree of attention to the administration of the work at the unit level.

What is clear from PLAN sources is that surface-force maintenance in the future increasingly will be based on automated equipment diagnostics. The Luyang-class destroyers, and likely the Jiangkai II–class frigates, are equipped with an electronic equipment-management system, and such systems likely will be standard on all future PLAN surface combatants. The system monitors and collects key equipment parameters such as oil quality, bearing vibration, noise, temperature, and rotation rate. The maintenance history files are used to provide feedback to equipment manufacturers.[32] Shore-based equipment technical-support groups also can access this information and manage dynamically the maintenance requirements of key pieces of shipboard equipment. In one East Sea Fleet frigate flotilla, implementation of this dynamic maintenance management model reportedly increased equipment readiness rates by 20 percent.[33]

When equipment does fail unexpectedly, the crew may not have the expertise to effect repairs. In some cases, it may not be able even to determine the nature of the fault. When the ship is in port, expert assistance can be accessed from higher-level maintenance activities or industry. Coordinating access to these experts is the responsibility of the fleet armament departments. In March 2012, the East Sea Fleet Armament Department signed an agreement with thirty-six local support units. It also established relationships with more than a hundred civilian firms and institutions for on-call equipment support. These firms are "able to quickly transition from peacetime to wartime activities to serve as a backup force for when emergencies arise." A Fleet Civil-Military Combined Equipment Support Command Center provides access to these resources when required.[34]

During at-sea operations, these shore-based experts are not close at hand. In these cases, the PLAN surface force is increasingly able to rely on "reach back" support using modern communications links to provide virtual assistance. The PLAN maintains a "blueprint and information center" that is able to provide repair blueprints electronically to deployed units.[35] For more-complex repairs, assistance from shore-based naval experts and manufacturers is available. One South Sea Fleet–associated electronics factory established an "emergency response support team" that could assemble within ten minutes to provide remote technical support to PLAN surface units deployed to the Gulf of Aden. In 2010, the factory reported providing remote assistance for ten technical casualties on units conducting distant operations. The North Sea Fleet reported that prior to supporting its first Gulf of Aden deployment it worked with the PLAN Navy Equipment Department to assemble a network of over four hundred technical experts from military shore commands, institutes, and industry who were available to provide remote maintenance advice. As a result, when the Jiangkai II FFG *Yantai* suffered an automatic radar plotting-aid failure while in the Gulf of Aden in May 2012, experts based in Shanghai—outside the North Sea Fleet's usual support base—were available to assist in resolving the fault.[36]

As *People's Navy* crowed, "the use of long-distance diagnosis is like putting wings on the factory."[37]

Underway Support

To provide both logistics and maintenance support to deployed units, the PLAN is moving to comprehensive support groups. Called the "focal points" of the "shore-sea integrated support system," these groups appear to integrate shoreside support centers with an at-sea component of underway logistics vessels and support ships. Their development is a key element of improving all aspects of surface-force combat support.

Each comprehensive support group is intended to integrate multiple support specialties within its afloat group. This includes logistics, maintenance technical support, and medical services as well as reconnaissance, survey, and search-and-rescue functions. Support-group units will vary their support pattern to fit the operational requirement, in some cases accompanying combat formations and in other cases acting as a logistics shuttle between the underway formation and the shore infrastructure. PLAN commentators note that for the units to integrate with combat formations, they must possess a command-and-control capability that integrates seamlessly with the operations command system.

Support groups also must be prepared to embed with combat forces operating in high-threat environments and to share in the force's defense. One East Sea Fleet Comprehensive Support Group political officer noted, "In a condition of fighting against an opponent that uses large quantities of long-range precision-guided weapons . . . the maritime operation logistic support forces may be facing serious threats. . . . It is necessary to establish an integrated defense system to merge the operation logistic support forces and the combat forces into a whole entity."[38]

Logistics and Maintenance in Combat

A key distinguishing characteristic of PLAN logistics and maintenance planning is its emphasis on carrying out support functions while under direct attack. Judging from the official press, PLAN logistics and maintenance exercises routinely are carried out under conditions of simulated air raids in which key roads and piers are destroyed or damaged. In other cases, simulated special operations forces menace the prompt deployment of critical support to PLAN units. In one case, *People's Navy* cited the increased integration fostered by the new East Sea Fleet Logistics Department as essential for success in a base damage-repair exercise that featured bomb damage affecting pierside services.[39]

This emphasis on support under direct attack creates an ongoing emphasis on deployable support services. To some extent, this emphasis is likely a legacy of a heritage of

supporting a navy comprising mainly small coastal patrol boats. Under the Maoist People's War at Sea model, during a conflict these small combatants would disperse away from their bases, requiring their support to travel to them and operate from crude or unimproved coastal locations. However, the PLAN continues to invest in deployable support systems, indicating a belief that offering a potential adversary a moving target and having the ability to reconstitute damaged services remain worthwhile investments. Naval logistics units possess at least one mobile field headquarters, and such complex services as degaussing have been made mobile and can be offered when piers are not available.[40]

Ship-repair shelters are a key element of deployable maintenance support. Managed by the ship equipment–repair offices, these modified shipping containers appear to be deployed by truck in groups to offer advanced repair capabilities in remote locations. One South Sea Fleet group reportedly included ten trucks and sixty personnel. The shelters offered hull repair and welding capability as well as the ability to conduct specialized repairs of weapons and electronics. While the shelters could have a role in bringing advanced repair equipment pierside during routine operations, PLAN media emphasize these systems' capabilities for conducting battle-damage repair.[41] As the PLAN surface-force shore-maintenance infrastructure becomes more advanced, these shelters likely will shift to a strict battle-damage repair role.

Embarked Aviation Support

As the PLAN builds larger, multimission surface combatants equipped with flight decks and hangars, embarked aviation support has become a critical function for the PLAN surface force. In earlier years, helicopters were visitors, spending minimal time aboard the surface unit and drawing their logistics and maintenance support from their home airfields. Today, surface action groups conducting operations beyond the "first island chain" or in fleet training areas routinely feature embarked helicopters and, in some cases, unmanned aerial vehicles, all of which must be supported for months on board.[42] Successful maintenance and logistics support requires cooperation between the aviation and surface forces.

In any navy, small aviation-capable vessels are challenged to hold sufficient spare parts on board to keep their helicopters operational. After two years of antipiracy operations, the South Sea Fleet made a concerted effort to rationalize the spare parts supply on board its deploying units. The fleet realized that deploying units too often were requiring repair parts to be sent from China to repair aircraft. Less than 10 percent of the spare parts held on board were being expended during a deployment, but the availability rate of the helicopters suggested much more extensive repairs. In one case, an aircraft cracked a tail-drive shaft. The replacement was sent from China. When the same aircraft

cracked a tail-drive shaft again, a spare still was not held on board. Aircrews were taking as many spare parts as possible—even spare engines and rotor blades—but were not taking the *correct* parts. In many cases, items with limited shelf lives were being wasted because they "expired" before being used. On the basis of lessons learned, the South Sea Fleet compiled a detailed plan for spares support. This *Standards for Helicopter Parts, Components, and Material to Be Taken on Long Voyages* is now the standard reference for surface units preparing for antipiracy operations.[43]

In the ability of shipboard personnel to support flight operations—representing a more complex challenge than stocking the right spare parts—the PLAN surface force has faced fundamental shortcomings. For example, ship's company personnel have been unfamiliar with the exacting fuel-testing requirements necessary to ensure the quality of aviation fuels delivered to embarked aircraft. In a shipboard environment, it is easy for fuel to become contaminated, which becomes a serious safety problem that can result in the loss of aircraft and lives at sea. The PLAN's solution has been to embark an aviation-fuels expert from the fuels department of the helicopter unit's home airfield. However, surface units on extended operations struggled because airfield personnel were not part of the helicopter unit and there were no regulations covering their deployment to the surface vessel. While this problem was addressed on a case-by-case basis, similar problems were encountered supporting flight meteorology, aviation medicine, communications, and navigation for embarked flight crews—all essential functions of an air-capable surface unit.

Ultimately, the PLAN recognizes that these problems represent a surface-force training issue. Ensuring that PLAN surface units have the ability to embark and support helicopters without dedicated personnel augmentation means the PLAN must—in the words of one South Sea Fleet aviation political commissar—"get one person to act as two." Until that is achieved, guided improvisation appears to be the order of the day.[44]

How Effective Is PLAN Surface Logistics and Maintenance?

The most difficult question in assessing PLAN surface-force logistics and maintenance is effectiveness. Short of gaining access to the PLAN equivalent of the U.S. Navy's Board of Inspection and Survey reports, estimates of PLAN logistics and maintenance rely on impressions, anecdotes, and Chinese accounts of the navy's efforts to improve its systems.

In the end, the measure of maintenance and logistics is in the sustainment of fleet operations. Since the first task force left China on December 26, 2008, the PLAN has sustained a constant deployed presence supporting antipiracy efforts in the Gulf of Aden. While the PLAN had conducted previous long-range "goodwill" cruises, the antipiracy operations represented China's first-ever effort to maintain a naval presence beyond its

own coast. Not surprisingly, initial efforts to sustain the formation did not go well. Basic lessons about food preservation, overseas support contracting, and replenishment methods were learned through hard experience. Through this process, the PLAN avoided catastrophic material casualties or complete logistics failure, while improvising a support system on the fly. The ultimate arrangement, characterized by *People's Navy* as "supply ships as the platform, foreign ports as the backing, domestic cargo ships as the supplement," has become routine. In many ways, the system is as robust as those of U.S. allies deployed to the region, if not more so.[45]

It is possible, however, that operations in the Gulf of Aden represent an exceptional case, a single focus of national effort that is not reflective of the PLAN surface force's capabilities. However, the scope and tempo of recent PLAN surface operations belie that suggestion.

In March and April 2013, a four-ship task force made up of the Yuzhao (Type 071)–class dock landing ship *Jinggangshan,* the Luyang II–class destroyer *Lanzhou* (DDG 170), and the Jiangkai II–class frigates *Hengshui* (FFG 572) and *Yulin* (FFG 569) made an extended patrol in the South China Sea. The force conducted a well-publicized small-island seizure exercise and a ceremony at James Shoal—the submerged feature that marks the southernmost limit of China's South China Sea claims. On their return, the ships were visited by President Xi Jinping and PLAN commander Wu Shengli. Seven days later, *Lanzhou* and *Hengshui* departed port for an eleven-day patrol that included passage through the Miyako Strait and near the disputed Senkaku Islands.

Lanzhou's political officer recalled to *People's Navy* that in the 1990s ships were permitted an extended in-port period to prepare for each underway operation. "Now, our high-sea training missions are all scheduled so densely that we are required to have sustained combat capabilities."[46]

The ability to support a rapid turnaround of high-end naval combatants in support of national requirements—in this case, enforcement of Chinese maritime claims—is an indication that the PLAN surface force is increasingly ready to conduct operations. That force will continue to be challenged by the level of maintenance its complex new systems require, as well as by the logistics demands imposed by increasing operations in distant seas. These are, however, challenges that the PLAN has identified and will address on a basis of solid progress established over the last two decades.

Notes

1. 余华梁 [Yu Hualiang], 现代保障直通海天—“十一五”期间海军后勤建设成就回眸 [“A Look Back at Achievements in the Navy’s Logistical Construction during the 11th Five-Year Program: Modern Support Connects Directly with the Sea and Sky”], 人民海军 [*People’s Navy*], October 29, 2010, p. 7.
2. See Lonnie Henley, “PLA Logistics and Doctrine Reform, 1999–2009,” in *People’s Liberation Army after Next,* ed. Susan M. Puska (Carlisle, PA: U.S. Army War College, Strategic Studies Institute, 2000), pp. 55–77; and Abraham M. Denmark, “PLA Logistics 2004–11: Lessons Learned in the Field,” in *Learning by Doing: The PLA Trains at Home and Abroad,* ed. Roy Kamphausen, David Lai, and Travis Tanner (Carlisle, PA: U.S. Army War College, Strategic Studies Institute, 2012), pp. 297–335.
3. Christopher D. Yung, “Sinica Rules the Waves? The People’s Liberation Army Navy’s Power Projection and Anti-access/Area Denial Lessons from the Falklands/Malvinas Conflict,” in *Chinese Lessons from Other People’s Wars,* ed. Andrew Scobell, David Lai, and Roy Kamphausen (Carlisle, PA: U.S. Army War College, Strategic Studies Institute, 2011), pp. 75–114.
4. 徐壮志 [Xu Zhuangzhi], 国防新成就之一: 战斗力, 在变革中跃升 [“Achievements in National Defense: Raising PLA Combat Power”], 新华网 [*Xinhua*], June 12, 2012, news.xinhuanet.com/mil/2012-06/12/c_123270605.htm; see also 廖锡龙 [Liao Xilong], 加快推进军队保障社会化走出一条军民融合式发展路子 [“Accelerate Promotion of Military Support Socialization and Take the Development Path of Civil-Military Integration”], 求是 [*Qiushi*], May 16, 2012, www.qstheory.cn/zxdk/2012/201210/201205/t20120511_157242.htm.
5. For more on PLA reforms, see Phillip C. Saunders and Joel Wuthnow, “China’s Goldwater-Nichols? Assessing PLA Organizational Reforms,” *Strategic Forum,* no. 294 (April 2016), available at inss.ndu.edu/Portals/68/Documents/stratforum/SF-294.pdf.
6. 加快海军发展, 建设强大海军—2011年海军机关四大部工作展望 [“Quicken the Navy’s Development, Build a Powerful Navy—Preview of the 2011 Work for the Four Primary Departments of the Navy”], 人民海军 [*People’s Navy*], December 31, 2010, p. 1.
7. Ibid.
8. 杜龙 [Du Long] and 刘文平 [Liu Wenping], 切实提高海军资产管理效益—就贯彻落实《关于进一步加强军队资产管理的意见》访海后财务部陈义浩部长 [“Earnestly Raising the Efficacy of the Navy’s Asset Management—Interview with Chen Yihao, Director of Financial Affairs at the Navy Logistics Department, on Implementing the ‘Opinions on Further Strengthening the Military’s Asset Management’”], 人民海军 [*People’s Navy*], December 30, 2011, p. 3.
9. Ibid.
10. James Mulvenon, “So Crooked They Have to Screw Their Pants On: New Trends in Chinese Military Corruption,” *China Leadership Monitor,* no. 19 (Fall 2006), www.hoover.org/.
11. 王伟亚 [Wang Weiya] and 余华梁 [Yu Hualiang], 直面海战场提升保障力—2009年海军后勤工作综述 [“Raising Support Capability with Endeavor Being Oriented to Maritime Battlefields—Comprehensive Review of the Navy’s Logistic Work in 2009”], 人民海军 [*People’s Navy*], January 6, 2010, p. 1.
12. Ibid.
13. 刘华清 [Liu Huaqing], 刘华清回忆录 [*Memoir of Liu Huaqing*] (Beijing: People’s Liberation Army Press, 2004), p. 429.
14. 封志远 [Feng Zhiyuan] and 谭依娜 [Tan Yina], 而今迈步从头—东海舰队后勤部加快破解后勤保障难题纪史 [“Stride Forward Now to Surpass What Was Achieved in the Beginning—an Eyewitness Account of the Efforts Made by the East Sea Fleet Logistics Department to Speed Up the Resolution of Challenging Problems Related to the Provision of Logistic Support”], 人民海军 [*People’s Navy*], March 30, 2012, p. 1.
15. Ibid.
16. 封志远 [Feng Zhiyuan], 方立华 [Fang Lihua], and 谭依娜 [Tan Yina], 巧借东风破浪行 [“Cleverly Borrow East Wind to Sail by Cleaving through Waves”], 解放军报 [*PLA Daily*], October 27, 2012, p. 6.
17. 刘黎新 [Liu Lixin] and 王鹏 [Wang Peng], 锤炼铁肩担重任—北海舰队某综合保障基地加强保障能力建设纪事 [“Temper the Troops to Enable Them to Competently Shoulder Heavy Responsibilities—an Account of the Efforts Made by a North Sea Fleet Comprehensive Support Base to Strengthen Its Support-Providing Capability”], 人民海军 [*People’s Navy*], November 28, 2012, p. 3.
18. While *People’s Navy* consistently refers to potable water, context suggests that, at least in some cases, the base is providing feed water for surface-ship propulsion boilers. Naval boilers require treated, distilled water for proper function,

some of which is lost in normal operations and must be replenished.

19. 李义军 [Li Yijun], 李瑞祥 [Li Ruixiang], and 杨玉文 [Yang Yuwen], 给 "蓝鲸" 输送源源不断的动力 ["Infuse Impetus for the 'Blue Whale'"], 人民海军 [*People's Navy*], September 10, 2008, p. 2.
20. Yu, "A Look Back at Achievements."
21. Ibid.
22. Wang and Yu, "Raising Support Capability."
23. Yu, "A Look Back at Achievements."
24. 刘春晖 [Liu Chunhui] and 贾永强 [Jia Yongqiang], 巧解物资采购中的不等式 ["Skillfully Resolving Inequalities in Supply Procurement"], 人民海军 [*People's Navy*], September 2, 2011, p. 1.
25. 鲁鹏程 [Lu Pengcheng], 榆林保障基地岸勤部 严防劣质食品流进军营 ["Yulin Support Base Coastal Logistics Department Takes Strict Precautions against Inferior Food Coming into the Barracks"], 人民海军 [*People's Navy*], July 15, 2011, p. 2.
26. 刘鸿 [Liu Hong] and 胡天祥 [Hu Tianxiang], 海军召开后勤工作会议 ["Navy Holds Logistics Work Conference"], 人民海军 [*People's Navy*], January 17, 2011, p. 1.
27. 由利生 [You Lisheng], 阎勇政 [Yan Yongzheng], and 王亚军 [Wang Yajun], 在创新发展中提升保障力—喜看海军推进现代后勤建设试点新成效 ["Enhance Support-Providing Capability amid Innovations and Development—Looking with Delight at the New and Marked Successes Achieved by the PLAN in Pushing Forward Modern Logistics Building"], 人民海军 [*People's Navy*], March 9, 2012, p. 3.
28. 我国特色的舰船保障之路 ["A Ship Support Path with Chinese Characteristics"], 人民海军 [*People's Navy*], December 11, 2012, p. 4.
29. 陈雄 [Chen Xiong] et al., 砺剑, 在制胜航线上: 东海舰队装备部发挥新体制优势提高装备保障能力纪实 ["Sharpening Their Sword, on Course for Victory: An Account of the Armament Department of the East Sea Fleet Leveraging the Advantages of the New System in Order to Improve Equipment Support Abilities"], 解放军画报 [*PLA Pictorial*], no. 7b (2013), pp. 6–17.
30. "A Ship Support Path with Chinese Characteristics," p. 4.
31. 计如林 [Ji Rulin], 何巍 [He Wei], and 王亚军 [Wang Yajun], 大海上犁出忠诚航迹—北海舰队某大队572船远海执勤纪事 ["Sailing Tracks of Loyalty Are Left at Sea—a Record of Events When Ship 572 in a Certain North Sea Fleet Group Is on Duty in Distant Seas"], 人民海军 [*People's Navy*], August 20, 2012, p. 2.
32. 乔昶超 [Qiao Changchao] and 肖德伦 [Xiao Delun], "广州"舰装备管理走进"电子时代"—精细化呵护, 现代战舰亮剑信息战场 ["'Guangzhou' Ship Enters 'Electronic Era' in Equipment Management—With Sophisticated Protection, Modern Warship Flashes Sword on Information Battlefield"], 人民海军 [*People's Navy*], October 26, 2011, p. 1.
33. 方钊 [Fang Zhao] and 王春风 [Wang Chunfeng], 东海舰队某大队研发装备信息监测与管理系统, 为远洋装备保障注入信息元素 ["East Sea Fleet Flotilla Researches and Develops Equipment Information Monitoring and Management System, Adding an Information Component to Open-Ocean Equipment Support"], 人民海军 [*People's Navy*], November 27, 2012, p. 3.
34. Chen et al., "Sharpening Their Sword," pp. 6–17.
35. 于洋 [Yu Yang] and 周怀平 [Zhou Huaiping], 海军建成装备维修远程技术支援系统 ["Navy Builds Long-Distance Technical Support System for Armaments Maintenance and Repair"], 人民海军 [*People's Navy*], August 30, 2011, p. 1.
36. "Long-Range Diagnosis Done for Chinese Naval Escort Ship," *People's Daily,* May 28, 2012, english.peopledaily.com.cn/90786/7827774.html.
37. 古领华 [Gu Linghua], 黄海鹏 [Huang Haipeng], and 胡志亮 [Hu Zhiliang], 让战舰时刻 "耳聪目明"—湛江保障基地705厂提升装备保障能力纪实 ["Letting Battleships Always 'See and Hear Clearly'—Record on Zhanjiang Support Base No. 705 Factory's Improvement to Technical Support Capability"], 人民海军 [*People's Navy*], April 2, 2010, p. 3.
38. 雷根法 [Lei Genfa], 加强海上作战支援力量建设的思考 ["Thoughts on Strengthening the Building of the Maritime Operation Support Forces"], 人民海军 [*People's Navy*], January 28, 2011, p. 3.
39. 沙志亮 [Sha Zhiliang], 险象环生—目击海后某基地支援保障远程指挥演练 ["Fraught with Danger—Seeking with One's Own Eyes the Long-Distance Assistance and Support Commander Exercise of a Certain Naval Logistics Base"], 人民海军 [*People's Navy*], November 8, 2010, p. 2; see also Feng, Fang, and Tan, "Cleverly Borrow East Wind," p. 6.
40. "China's New Vehicle-Mounted Degaussing Station Enters Naval Service," *PLA Daily,* May 24, 2011, accessed via *China Defense* (blog), china-defense.blogspot.com/2011/05/larger-navy-requires-greater-logistic.html.

41. 南海舰队配新型舰艇修理方舱装备抢修时间缩1/3 ["South China Sea Fleet New Equipment Shelters Reduce Repair Time by 1/3"], 新浪 [*Sina*], October 19, 2009, mil.news.sina.com.cn/2009-10-19/0652570525.html.
42. National Institute for Defense Studies, Japan, *NIDS China Security Report 2011* (Tokyo: 2012), p. 11, www.nids.mod.go.jp/english/publication/chinareport/pdf/china_report_EN_web_2011_A01.pdf.
43. 杨斌 [Yang Bin] and 蔻永强 [Kou Yongqiang], 保障线, 飞越障碍向深蓝—南航破解舰载机远航保障难题提升保障力纪实 ["South Sea Fleet Aviation Solves Tough Problems in Long-Range Support to Shipborne Aircraft, Upgrades Support Capabilities"], 人民海军 [*People's Navy*], March 22, 2011, p. 3.
44. Ibid.
45. 郭益科 [Guo Yike], 曹海华 [Cao Haihua], and 侯亚铭 [Hou Yaming], 远洋保障之路越走越宽敞—海军赴亚索海域护航编队后勤保障启示录 ["The Path of Oceangoing Support Is Getting Broader—a Record of Lessons Learned about Logistics Support by the Escort Task Force Operating in Somali Waters"], 人民海军 [*People's Navy*], July 22, 2009, p. 3. For a detailed examination of the PLAN's Gulf of Aden operations and associated support, see Andrew S. Erickson and Austin M. Strange, "Learning the Ropes in Blue Water: The Chinese Navy's Gulf of Aden Deployments Have Borne Worthwhile Lessons in Far-Seas Operations—Lessons That Go beyond the Antipiracy Mission," U.S. Naval Institute *Proceedings* 139/4/1,322 (April 2013), pp. 34–38, and Andrew S. Erickson and Austin M. Strange, *No Substitute for Experience: Chinese Antipiracy Operations in the Gulf of Aden,* China Maritime Study 10 (Newport, RI: Naval War College Press, 2013), available at www.usnwc.edu/Research---Gaming/China-Maritime-Studies-Institute/Publications.aspx.
46. "Chinese Navy Continues High-Sea Training," *China Military Online,* April 16, 2013, en.people.cn/90786/8208844.html.

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