

BEIJING'S "STARTER CARRIER" AND FUTURE STEPS

Alternatives and Implications

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Just as a newlywed couple wants a “starter home,” a new great power wants a “starter carrier.” China’s navy has finally realized its longtime dream of obtaining an aircraft carrier and sending it to sea. This is the first step in a long journey that will change China’s navy and how it relates to the world.

At 5:40 AM local time on Wednesday, 10 August 2011, more than eighty years after the idea was originally proposed, China’s first carrier disappeared into the fog under tight security from Dalian harbor’s Xianglujiao Port, in northeast Liaoning Province, to begin sea trials in the Bohai and northern Yellow Seas. This was yet another coming-out party for China as a great power on the rise. Upon its launch, the nation burst with patriotic pride over the achievement. Major General Luo Yuan, deputy secretary-general of the China Society of Military Sciences, declared, “Well begun is half done. . . . [T]he effect of having something is completely different from the effect of having nothing.”¹ Plans are under way to commemorate this new era of Chinese sea power, and to boost the economy further in the process. Tianjin, one of the country’s four municipalities, plans to do its part in October 2011 by opening China’s first aircraft carrier-themed hotel, based on *Kiev*, once the Soviet Pacific Fleet’s flagship and now the centerpiece of the Tianjin Binhai Aircraft Carrier Theme Park. A Chinese flagship as capable as *Kiev* once was remains far away, but Beijing has taken the first step and is already reaping added influence at home and abroad.

Before foreign strategists start hyperventilating about the “beginning of the end,” however, a deep breath is needed. China’s initial carrier foray followed a six-year refit and lasted only four days. China’s starter carrier—a vessel originally purchased incomplete from Ukraine in 1998—is of very limited military utility; it will serve primarily to confer prestige on a rising great power, help the Chinese

military master basic procedures of naval airpower, and project a bit of military power—perhaps especially against the smaller neighbors on the periphery of the South China Sea. This is not the beginning of the end; it is the end of the beginning. To realize its ambitions for the future, China had to start somewhere.

Late in 2010, Admiral Liu Huaqing, the father of China’s modern navy, passed away. Liu had sought to build China’s navy first into a “green water” force and thereafter, eventually, into a “blue water” navy capable of projecting power regionally, though not globally. He insisted that he was not China’s Alfred Thayer Mahan, but his concept of “Near Seas defense” was roughly comparable to Mahan’s views on U.S. naval strategic requirements (i.e., dominance of the Gulf of Mexico, the Caribbean, Panama, and Hawaii). The key to the realization of Liu’s vision was an aircraft carrier, and Liu reportedly vowed in 1987, “I will not die with my eyes closed if I do not see a Chinese aircraft carrier in front of me.”² Admiral Liu’s eyes can close now.

Much of the Asia-Pacific region, as well as the Asia-watching strategic community in the United States, is hotly debating the implications of Chinese aircraft-carrier development. Admiral Robert Willard, commander of U.S. Pacific Command, said in April 2011 that he was “not concerned” about China’s first carrier going to sea, but allowed, “Based on the feedback that we received from our partners and allies in the Pacific, I think the change in perception by the region will be significant.”³ Australian brigadier general John Frewen contends, “The unintended consequences of Chinese carriers pose the greatest threat to regional harmony in the decades ahead.”⁴ Former director of Defense Intelligence Headquarters in the Japan Defense Agency Admiral Fumio Ota, JMSDF (Ret.), asserts, “The trials of China’s first aircraft carrier . . . mark the beginning of a major transition in naval doctrine. . . . Aircraft carriers will provide Beijing with tremendous capabilities and flexibility. . . . [A] Chinese carrier could pose a serious threat to Japanese territorial integrity. . . . China’s new aircraft carrier increases its tactical abilities and the chances of a strategic overreach. Other countries in the region should be worried.”⁵

Yet while the Asia-Pacific region is hotly debating the implications of China’s aircraft carrier, there should be little surprise that a Chinese aircraft carrier has finally set sail. Indeed, what is most surprising about China’s aircraft carrier program is that it took this long to come to fruition. Given the discussions about an aircraft carrier that have percolated in China’s strategic community for decades, it should have been clear to the entire region that this was a long time coming.

CHINA’S LONG MARCH TO A CARRIER

It has been a long, winding road to *ex-Varyag*’s sea trials. For decades, the story of Chinese aircraft-carrier development was one of repeated rejection. In 1928, the

commander of China's British-trained navy, Chen Shaokuan, submitted a proposal that an aircraft carrier be obtained to the Guomindang government, which rejected it the following year. Through 1945 Chen made two more detailed requests, but wartime conditions thwarted them. After the founding of the People's Republic of China (PRC) in 1949, Premier Zhou Enlai and the first commander of the People's Liberation Army Navy (PLAN), Xiao Jinguang, supported aircraft carrier development; Mao Zedong himself declared in 1958 that China needed carriers.⁶ These efforts too were fruitless—China had finally consolidated control over its continental landmass but could not hope to project naval power into American- and Soviet-dominated waters just off its coast, particularly as Maoist excesses convulsed the nation from within.

Since then, Chinese aircraft-carrier development has been shrouded in internal indecision and external obfuscation. "China will never build an aircraft carrier," a senior Beijing official told a group of foreign visitors in 1971. "Aircraft carriers are tools of imperialism, and they're like sitting ducks waiting to be shot."⁷ Yet even as Beijing was officially denying categorically that it would engage in aircraft carrier construction, Liu Huaqing, then deputy chief of staff of the PLAN, was already examining this very possibility (see the sidebar).⁸ "As early as 1970 when I worked in the Office of the Leading Group for the Shipbuilding Industry," he would recall in his memoirs, "I organized a special feasibility study for building aircraft carriers as instructed by the higher authorities and submitted a project proposal to them."⁹

A former PLAN official has confirmed to one of the authors that his service was by that time already thinking about aircraft carriers. Before the Sino-Soviet split of 1960 and, because of technological and doctrinal inertia, for some time beyond that, he explained, the PLAN copied developments in the Soviet navy, because it purchased weapons systems from the Soviet Union. Following the Sino-Soviet split in the early 1960s, the People's Liberation Army (PLA) as a whole—forced to reconsider how it acquired military equipment—realized that it would have to rely on indigenous resources and innovation.

Unfortunately for PLAN leaders, however, China at that time was in the throes of the Cultural Revolution and had turned its back on the outside world. Its military was focused primarily on preserving internal stability and administering the last vestiges of a ravaged state system. The PLA's culture, like that of its civilian leadership, was overwhelmingly ground-centric, informed by experiences in the Chinese civil war and the Korean War. China was a traditional continental power; PLA leaders were groomed within the ground forces and looked down on their counterparts in the PLA's much smaller naval and air force components. Indeed, as late as the mid-1990s the PLAN was commanded by "generals," not "admirals."¹⁰ Thus, the PLAN's operations were constrained to littoral (*yanhai*, 沿海)

CHINA CARRIER DEVELOPMENT TIME LINE

- 1928 China's British-trained navy commander Chen Shaokuan submits China's first aircraft carrier proposal to the Guomindang government, which rejects it the following year. Chen's two subsequent requests through 1945 are likewise rejected.
- Post-1949 Premier Zhou Enlai and first PLAN commander Xiao Jinguang support aircraft carrier development, but conditions do not permit it.
- 1958 Chairman Mao Zedong declares at a 21 June CMC meeting that China needs "railways on the sea" of merchantmen escorted by aircraft carriers. Proposal dies due to a lack of funds.
- 1960 Sino-Soviet split. Reduces Soviet influence on Chinese naval development but also hinders it.
- 1970 As PLAN deputy chief of staff, Liu Huaqing organizes carrier feasibility study per higher authorities' instructions; financial constraints preclude implementation.
- Late 1970s Chairman Hua Guofeng expresses support for plans to import or jointly build an eighteen-thousand-ton STOVL carrier. Project founders when China feels that British suppliers are asking too high a price.
- 1978 Deng Xiaoping consolidates power, unleashes economic reforms that will greatly expand China's overseas and maritime interests.
- 1982–88 Adm. Liu Huaqing advocates for aircraft carrier construction during his term as PLAN chief, but political and financial support prove insufficient. Commissions PLAN Equipment Department to conduct a carrier development feasibility study, which concludes funding insufficient.
- 1985 China purchases former Australian carrier HMAS *Melbourne*.
- 1992–97 Adm. Liu continues to champion the establishment of a carrier program during his time as CMC vice chairman, but President Jiang Zemin, who chairs the CMC, disagrees because he fears carrier development will disturb the United States and China's neighbors.
- 1995 Beijing reportedly interested in purchasing *Clemenceau* from France.
- 1995–96 Taiwan Strait crisis underscores volatility of Taiwan's status, motivates Beijing to devote additional resources to PLAN antiaccess capabilities, further delays aircraft carrier prioritization.
- 1995–96 Having built Thailand's *Chakri Naruebet*, Spain's Empresa Nacional Bazán reportedly attempts to market its SAC-200 and -220 light CATOBAR designs, but apparently Beijing prefers design plans to a prebuilt carrier; no deal is reached.
- 1998 China purchases the former Soviet aircraft carrier *Minsk* from a South Korean firm.
- 1998 Chong Lot Travel Agency purchases incomplete *Varyag* carrier hull from Ukraine for U.S.\$20 million.
- 2000 China purchases the former Soviet carrier *Kiev* from Ukraine. It eventually becomes a tourist attraction at Tianjin Binhai Aircraft Carrier Theme Park.
- 2001 *Varyag* hull is towed to China, and arrives in 2002 after complex, costly voyage through Bosphorus, out the Strait of Gibraltar, and around southern Africa and through the Strait of Malacca.

- 2004 President Hu Jintao becomes CMC chairman; supports greater PLAN role, larger regional and global presence. At expanded CMC conference on 24 December, Hu introduces new military policy that defines PLA's four "new historic missions." Hu also later endorses a PLAN Far Seas operations concept entailing some increase in power-projection capabilities.
- 2004 China reportedly obtains an unlicensed copy of a Su-33 carrier aircraft from Ukraine.
- 2004–2005 U.S., Indian, and Japanese response to Indian Ocean tsunami demonstrates value of deck aviation assets (e.g., USS *Abraham Lincoln* carrier strike group) to humanitarian assistance and disaster relief; underscores Chinese inability to contribute in this area.
- 2005 First photos of *Varyag* in dry dock at Dalian shipyard.
- 2006 Press reports of impending Su-33 contract between Russia and China (never finalized).
- 2007 At a media briefing during the annual National People's Congress, a PLA lieutenant general tells reporters that China's aircraft carrier program is proceeding smoothly.
- 2009 First photos of J-15 prototype and Z-8 AEW prototype appear on Internet.
- 2010 Photos appear in late 2010 showing steam emanating from *Varyag*, suggesting that its main power plant is being tested.
- 2011 PLA chief of staff General Chen Bingde confirms that China is developing indigenous carriers. Ex-*Varyag* begins sea trials on 10 August.

Sources: Li and Weuve, "China's Aircraft Carrier Ambitions"; Reuters, *New York Times* (various articles); Chinese Internet (various sites); GlobalSecurity.org (various pages).

and coastal (*jin'an*, 近岸) areas. There was no development of aircraft carriers for a long time, as a result of the lack of priority given to their perceived purpose and to naval forces generally.

In the late 1970s Deng Xiaoping, chairman of the Communist Party's Central Advisory Commission and de facto leader of the PRC, launched a program of "reform and opening up," which had the effect of exposing China to the outside world and linking its rejuvenating economy to the global economy through exports, imports, and investment. China's national interests were no longer restricted to its 960 million square kilometers of claimed territory and surrounding territorial waters, but increasingly extended to foreign markets and resources. It is within this context that Admiral Liu Huaqing, as PLAN commander (1982–88), began thinking beyond coastal defense and called for a more expansive Near Seas defense strategy.

The "Near Seas" concept encompasses the Bohai Gulf, the Yellow Sea, the East China Sea, and the South China Sea (of which China claims the vast majority), as well as islands in all three seas. The Near Seas are thus seen as constituting a kind of naval defensive perimeter, one that both protects China's commercial fleet and

defends the mainland (especially the economically vital coastal areas) from foreign invasion. Therefore, the Near Seas are seen by Beijing as closely related to China's national interests. Yet China's maritime interests do not stop in the Near Seas but are increasingly seen as extending far beyond China's long coastline. As Rear Admiral Zhang Zhaozhang elaborated in April 2009, "In order to defend the security of the national territory, marine territories, and the waters within the First Island Chain, [China's] proactive defense strategy does not mean that our navy only stays within the First Island Chain. Only when the Chinese navy goes beyond the First Island Chain will China be able to expand its strategic depth of security for its marine territories."¹¹ The map depicts these features.

Admiral Liu considered the aircraft carrier question within this strategic context and put forward a concept based on the proposition that, given the geographic expansion of Chinese interests and naval requirements, the security of China's fleet could not be guaranteed by land-based aircraft alone. At Liu's direction, the PLAN Equipment Department researched the technological and resource demands of producing an aircraft carrier. This study concluded that the scope and complexity of the project, involving not only aircraft carriers but their support ships and aircraft as well, would pose a daunting challenge for China's still-nascent defense-industrial complex. It reviewed the following considerations:

- An aircraft carrier had first to meet PLAN requirements.
- China's science and technology levels would have to overcome serious developmental problems.
- China would have to achieve the capability to produce all the relevant vessels and aircraft.
- The PLAN would have to marshal the requisite resources necessary to produce the carrier.

Ultimately, the study concluded, the PLAN had great need for an aircraft carrier but funding was insufficient. The PLA budget suffered negative growth during this period; there was not enough money to build destroyers, let alone a carrier. But PLAN experts felt that their work was not in vain, as they had gained a much greater understanding of vital naval systems. They believed that the navy would ultimately build an aircraft carrier, but not for the time being. Prior to 1989, the PLA purchased limited amounts of equipment from the United States; after 1989 the PLAN purchased naval vessels from Russia (and systems from Ukraine), but aircraft carriers never came into play.

Calculations began to change after the turn of the century. China's economy had expanded sharply, as had its national interests in the outside world. Around 2000 the PLAN resumed consideration of an aircraft carrier program. Its experts

recognized that issues of complexity remained, but felt that China's newfound wealth and the concomitant rise in its external interests and international prestige called for a renewed effort. As the former PLAN official emphasized to one of the authors, "An aircraft carrier is a very complex weapons system, and demonstrates overall national strength. China is the only permanent member of the UN Security Council without an aircraft carrier; even Third World nations have aircraft carriers. The PLAN will build an aircraft carrier to fulfill a national task: to safeguard territorial sovereignty and national interests." Senior Captain Li Jie, a well-known analyst at the Naval Research Institute, the PLAN's strategic think tank, seconded this view: "No great power that has become a strong power has achieved this without developing carriers."¹²

In 2004 the president of the PRC and general secretary of the Chinese Communist Party, Hu Jintao, having recently become chairman of the Central Military Commission (CMC) as well, supported a larger regional and global presence for the PLAN. At an expanded CMC conference on 24 December 2004, Hu introduced new military policy that defined four "new historic missions" for the PLA: first, to serve as an "important source of strength" for the Chinese Communist Party (CCP) to "consolidate its ruling position"; second, to "provide a solid security guarantee for sustaining the important period of strategic opportunity for national development"; third, to "provide a strong strategic support for safeguarding national interests"; and fourth, to "play an important role in maintaining world peace and promoting common development."¹³ Hu has since endorsed a PLAN "Far Seas" operations (远海作战) concept entailing some increase in power-projection capabilities.¹⁴ The Far Seas, as employed in PLA theory, extend to the approaches to the Second Island Chain and beyond. Operating therein entails projecting power over a thousand nautical miles and more from China's territorial waters.¹⁵ (See the map for a graphical depiction of these areas.)

Beijing's long march toward aircraft carrier status began in earnest in 1998, when China's Chong Lot Travel Agency purchased from Ukraine the unfinished hull of the former Soviet carrier *Varyag* for U.S.\$20 million, initially claiming the hull would be used as a casino.¹⁶ Three years later the hull was towed through the Bosphorus, out the Strait of Gibraltar, around southern Africa, and through the Malacca Strait to its new home in northeast China. There ex-*Varyag* was outfitted, slowly but deliberately, not with slot machines or blackjack tables but with engines, radars, and weapons. There would be no gambling with this strategic opportunity.

Ten years after gliding ignominiously into Dalian harbor, ex-*Varyag* has left it again, reborn as a symbol of China as a rising naval power on the world scene. According to a PLAN officer with whom one of the authors has spoken, the ship will undergo sea trials for roughly a year and become fully operational no later





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than 2015. But questions remain. What are the new carrier's capabilities? How will China use its new carrier?

INTRODUCING CHINA'S STARTER CARRIER

Ex-*Varyag* is currently undergoing a series of predelivery tests and modifications by Dalian Naval Shipyard and the Chinese defense industry, including trials in a rectangular area off Dalian, within China's territorial waters. This has been an incremental process. First, under PLAN supervision, the shipyard checked all major systems and equipment (main propulsion, auxiliary, damage control, deck, electrical, interior environmental safety protection, navigation, and spares) to ensure that the carrier's hardware met contract requirements for sea trials. Testing of the engines, for instance, explained the appearance of smoke at the pier. Then, several days before the first sea trials, design and construction teams continued to work while PLAN personnel rehearsed the task of getting the ship under way as realistically as possible and made preparations.¹⁷

The PLAN is apparently satisfied now with the quality of the ship's refurbishment; China's defense industry and its oversight organizations have been restructured to address previous concerns about inadequacies in development and production of military systems. Following completion of the test and trial program, there will be a ceremony to name the vessel, and it will be commissioned and accepted into PLAN service. The crew members can then leave the auxiliary vessel (hull number 88), currently being used to house them and to serve as a base for their training, and take up residence on board the carrier itself.

Training

The carrier's series of sea trials are being conducted close to home in order both to make the vessel a bit less accessible to prying eyes (and unauthorized digital cameras), and to keep it near home port should mechanical problems materialize. For the next several years, the focus will be on testing equipment and getting the crew used to operating such a large ship and then, having achieved some proficiency in these basic skills, on flight testing and training. Key questions that may arise in the course of future sea trials include:

- How reliable is the vessel's propulsion system? The ship's main propulsion plant is the highest-probability risk factor for complications during trials.
- When will PLAN Aviation attempt to land aircraft on the ship at sea? Will China use its top J-15 pilot to achieve a landing for a quick publicity coup? Intermediate possibilities include helicopter operations (which could be facilitated by the availability of helicopter pilots with shipborne operating experience, courtesy of the Gulf of Aden antipiracy mission), or, in the case of fixed-wing aircraft, "touch and go" approaches.

Aircraft operations are of course the fundamental reason for having a carrier capability, but actual landings of fixed-wing aircraft (deck-handling practice and even takeoffs, by aircraft lifted on board by crane from a pier, represent a lower hurdle) will likely be accomplished gradually.¹⁸ This process could be protracted, particularly if initial, modest efforts run into problems. However, in determining possible operational-capability trajectories, one must consider China's deck aviation options broadly, taking into account particularly the experience of destroyers and frigates in the nine task forces sent to the Gulf of Aden to date. What is certain is that for any nation, mastering carrier operations requires mastering a complex system of systems that includes research and development, supply and logistics, training, combat air operations, maintenance, and personnel and facilities management.

Capabilities. While ex-*Varyag's* capabilities clearly represent a "work in progress," it is not just a "training carrier" per se, as USS *Lexington* (AVT 16) was in the last decades of its storied career. Its hardware does not need to be upgraded radically for operational service; it already possesses a Dragon Eye phased-array radar, a new point-defense missile system, and a new close-in weapon system. The Dragon Eye can reportedly track up to a hundred targets while engaging fifty simultaneously, detect targets out to sixty-five nautical miles (120 kilometers), and track targets out to 48.6 nautical miles (ninety kilometers).¹⁹ Together, no matter how it is portrayed officially, these factors make it more than a training ship and rather a modestly capable warship.

Trajectory. China's defense-industrial base, which has long favored pragmatic incrementalism, not surprisingly has adopted a "crawl, walk, run" approach to carrier development. By this logic, the first domestic aircraft carrier hull, already reportedly under construction (and perhaps others as well), will closely resemble the Russian *Kuznetsov* class (of which *Varyag* was originally a member), albeit with largely internal improvements that are invisible to casual observers. This would be not wholesale copying but emulation and incremental improvement.

According to the U.S. Department of Defense, "the PLA Navy will likely build several additional carriers in Chinese shipyards." Specifically, "construction of China's first indigenous carrier, which would likely have a . . . displacement and design [similar to those] of the [ex-*Varyag*], could begin as early as 2011. If China commences construction in 2011, the PLA Navy could have its first indigenous carrier achieving operational capability as early as 2015."²⁰ The nature of China's second domestic aircraft-carrier hull should offer a good indicator of where its program is headed overall: Will it suggest the breaking of new ground, a branching out, or a continuation of incremental improvements on a basic design?

Equipment. Not enough is known publicly about the original machinery or the ship's condition when the Chinese obtained it to make detailed judgments. But given China's strong and growing shipbuilding capabilities and the ultimate use of ex-*Varyag* as China's first aircraft carrier, it seems doubtful that anything was too problematic for Chinese technicians to work with effectively. Moreover, it seems unlikely that China would put so much work into ex-*Varyag* if the hull were fundamentally unsound. The engineering plant is now likely complete and fairly robust, although without firsthand accounts such conclusions are highly speculative. Any secondary systems associated with flight operations not yet installed should come shortly.

China's growing proficiency in building massive ore carriers and oil tankers suggests that Chinese yards can fabricate hulls up to supercarrier size. It is also very likely that China's burgeoning steel industry will be able to produce plating of sufficiently high quality to build carriers (in contrast to India, which has struggled to produce domestically high-quality steel for its indigenous carrier programs). As an example of the Chinese shipbuilding industry's rising ability to procure and assemble vessels from quality materials, the Japanese shipowner MOL has ordered four large liquefied-natural-gas (LNG) carriers from the Hudong-Zhonghua shipyard for delivery between 2014 and 2016.²¹ MOL's order is the first Japanese purchase of LNG carriers from a Chinese shipyard, but the vessels will be co-operated by Chinese firms and used to haul LNG from Papua New Guinea to terminals in China.²² The yard has already delivered five LNG carriers and had a sixth vessel under construction as of December 2010, scheduled for delivery in 2012.²³ Public sources currently do not say whether more LNG carriers are under construction in Chinese yards. However, the ability to fashion a carrier's hull has little bearing on capacity to build and integrate its systems, fittings, and machinery and then turn it into a floating air base that carries planes, fuel, munitions, catapults, and at least several hundred personnel. Perfecting the internal components of this immensely complex vessel and then learning to operate it as part of a battle group will likely require many years of trial and error, a process that cannot draw directly on China's growing shipyard capacity. It is also, however, a venture that will help China develop its defense shipbuilding industry more comprehensively, a concept supported by Li Jie, who notes that a carrier construction program benefits "the entire development of a nation's naval forces; with carriers, in fact all naval arms armament is led forward in systematized fashion."²⁴

Aircraft. News reports, as well as the former PLAN official, have confirmed that China has purchased from Ukraine the Su-27K carrier-capable fighter and that the indigenously produced J-15 Flying Shark fighter is based on the carrier-capable Sukhoi Su-33. In its latest report on China's military, the Defense Department states that the J-15 "is reportedly an unlicensed copy of a Russian Su-33,

which China obtained from Ukraine in 2004.”²⁵ Press reports indicate that the Su-33 was nonflyable;²⁶ China likely exploited this airframe extensively and applied to it the improved radar and avionics that it employs on the J-11B, the indigenous version of the Su-27. The J-15 is currently undergoing flight testing.²⁷

China currently possesses a small number of carrier-capable fighter prototypes, and Chinese media report that the PLAN has begun to train a first generation of naval aviators, presumably using runways on land. Additionally, at least one prototype *Shanying* (Mountain Eagle) JT-9 trainer exists with a tailhook (to engage flight-deck arresting gear). This aircraft is different from the grey-painted *Jiaolianji* (training aircraft) JJ-7B trainers currently in service with the PLAN’s 7th Air Division. The land-based JJ-7B is equipped with ventral fins but no hook and is thus equipped for land basing only; the prototype JT-9 version, with a tailhook and no ventral fins, suggests plans to field a carrier-capable trainer. The JJ-7B has an export designator, Fighter Trainer China (FTC)–2000, although none have been purchased by foreign militaries thus far.²⁸

Personnel. Regarding aviators and “ship drivers” alike, it is first necessary to “train the trainers.” In keeping with the pattern observed in helicopter operations by initial Gulf of Aden counterpiracy task forces, China’s first batch of carrier pilots will almost certainly be experienced “high-powered sticks,” not “nuggets” fresh out of the flight school. When ex-*Varyag* first deploys with a contingent of (presumably) J-15s, perhaps about ten, all pilots will likely be commanders, captains, or senior captains. Likewise, particularly senior and distinguished officers will probably command both ex-*Varyag* and the first domestically built carrier and fill key billets in the programmatic aspects of China’s carrier program. Bai Yaoping, one of the nine graduates of China’s first aviator/ship commander class, has been listed among the top choices to command the country’s first carrier. Currently the assistant commandant of the Dalian Naval Academy, Bai reportedly has “specially handled the aircraft carrier command personnel and combat service personnel’s training.” Perhaps even more likely to be selected for this demanding responsibility is Bai’s classmate Li Xiaoyan. Hailed as a “celebrity captain” for his distinguished career, Li served in a South Sea Fleet destroyer division as executive-officer-in-training of *Nanning* and executive officer of *Nanchang*. He also served as captain of escort vessel *Jiangmen* and the destroyer *Shenzhen*. In 2000, while *Shenzhen*’s captain-in-training, Li “and his comrades in arms set records for the first navigation across the . . . Pacific Ocean, the Indian Ocean, and the Atlantic Ocean, the first crossing of the Indian Ocean, and the first time going around the Cape of Good Hope in a Chinese navy ship formation. In 2007, when he led the ship’s participation in multi-country maritime exercises, Li’s position was chief of staff of a certain South Sea Fleet destroyer division.”²⁹

In May 1987, with CMC approval, China convened its first, and to date only, class of “aircraft pilot vessel captains.”³⁰ A rigorous process selected, from nearly a thousand naval aviators, ten for a course of three and a half years at the Guangzhou Naval Arms Command College. The nine students who passed the course were awarded undergraduate degrees with specializations in vessel command in 1990. Subsequently assigned to destroyers and frigates, they reportedly represent the “backbone” of China’s carrier program. These elite graduates typically hold the rank of senior captain or rear admiral today, suggesting that the first genera-

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tion of Chinese carrier commanders will probably hold higher ranks than their American counterparts. The “top-heavy” leadership structure of initial Chinese carrier operations (to maximize the exposure of relevant personnel to them) will likely confuse

foreign observers.³¹ A weekly journal affiliated with the Guangdong Provincial CCP Committee attributes to Li Jie the idea that “we cannot eliminate the possibility of the navy borrowing from the first aircraft carrier using a rotation for training captains to do a good job of preparing for the reserves of aircraft carrier command operations that go into service later on.”³²

In 2008, a second group of fifty naval aircraft students entered Dalian Naval Academy for a four-year program in “ship-borne aircraft flight specialization in automation.”³³ In the past, Dalian has not trained pilots but rather surface warfare officers, engineers, and political officers; one of the degrees it offers is in “shipboard helicopter command.”³⁴ Dalian cannot be regarded as directly comparable to Annapolis; the PLAN has a more numerous and diverse set of naval education institutions than does the U.S. Navy. But Dalian is emerging as a cradle of deck-aviation integration; no other Chinese institution of professional military education offers the appropriate size or capabilities. A program of ship navigation and command automation (managing shipboard flight operations) at Dalian is apparently followed by flight training at Huludao Naval Flight Academy. Less clear is the division of labor between Huludao (at which officer candidates and lower-level naval aviation commanding officers pursue preassignment majors in naval aerial flight, command and staff, and shipborne helicopter command), and Yantai Naval Aviation Engineering Academy (at which officer candidates major in technical subjects involving aviation engineering).³⁵ At present, naval aviator candidates receive basic college education for two and a half years at Yantai followed by a year of specialized flight training at Huludao.³⁶

Regardless of the exact specifics, the Defense Department states, “The PLA Navy has initiated a land-based program to begin training navy pilots to operate fixed-wing aircraft from an aircraft carrier. This program will probably be followed in about three years by full-scale ship-borne training aboard [ex-*Varyag*].” In addition, “China is also looking abroad for operational expertise.” Interestingly, “in May 2009, Brazilian Defense Minister Nelson Jobim announced that the Brazilian Navy would provide training to PLA Navy officers in aircraft carrier operations. However, Brazil’s limited capabilities in this area and the extensive problems associated with Brazil’s own carrier program raise some questions as to the implications of the offer.”³⁷ However they are trained, China’s first-generation carrier pilots will likely be a small, elite team handpicked to develop and showcase Chinese capabilities. It will take years for China’s carrier community to populate full-size squadrons.

Accident Risks. Despite this methodical, high-level attention to deck aviation development, accidents are highly likely: carrier aviation is a risky, costly business. A former U.S. naval aviator, Captain Robert C. “Barney” Rubel, USN (Ret.), notes that between 1949, when jets started being deployed in large numbers by the Navy, and 1988, when the combined Navy/Marine Corps accident rate was reduced to the levels already achieved by the U.S. Air Force, the naval services lost almost twelve thousand aircraft and 8,500 aircrew.³⁸ In 1954 alone, the Navy and Marines lost 776 aircraft and 535 crewmen, and carrier-based tactical aviation suffered higher proportionate losses than the naval services as a whole.³⁹ To be sure, China has resolved some of the most fundamental physical issues involved in launching and landing aircraft from small, moving airfields, but the process remains immensely difficult, and even a less aggressive carrier operator than the United States is almost certain to suffer substantial unexpected losses as it builds its operational knowledge and human capital. It remains uncertain what financial and political costs China will incur, but clearly the first Chinese carrier aviators and ship captains face steep challenges.

Ex-*Varyag* itself is smaller than American carriers (roughly sixty-five thousand tons vice a hundred thousand—see the table). Also, instead of the catapult used by American carriers to launch planes into the air, China’s new carrier features a “ski jump,” a bow ramp that helps aircraft take off. Without catapults ex-*Varyag* will likely be unable to launch the heavier aircraft needed for ground strikes, intelligence collection, or midair refueling—relegating the ship primarily to extending air cover beyond China’s shores. This largely accords with Chinese writings on the utility of carriers, which emphasize their importance in providing air cover for naval operations. The “extended air cover” role indicated by the

technical aspects of ex-*Varyag* generally conforms to Admiral Liu's conception of Near Seas defense.

Aircraft Carrier Development Options

The smaller the carrier, the less capable and efficient it is likely to be. Any nation pursuing carrier development seriously may choose among several basic types. In descending order of size, technological sophistication, and operational capacity, they are the following.

Catapult-Assisted Takeoff but Arrested Recovery (CATOBAR). Originally created by the United Kingdom but perfected by the United States, this is what the Americans and French currently use for their aircraft carriers and what the British will use on their next design. It is considered necessary for heavy aircraft capable of long range or heavy payloads. China has no such capability at this time but would likely have to acquire it to achieve the means to conduct high-intensity carrier operations. Development of catapults would be a major new undertaking for China, far more challenging than refurbishing a former Soviet carrier or making its own version of a Russian fighter. Catapults have to be extremely well designed and constructed to function effectively—in the words of one American specialist that were relayed to the authors, “99 percent is a failing grade.”⁴⁰ A carrier also needs to be able to generate tremendous energy to power catapults while steaming into the wind for flight operations.

Embarking the highly capable J-15 airframe, a future Chinese CATOBAR carrier would likely have the physical capability to launch a long-range strike package. But although the J-15 has been modified to land on a ship, its front end has not been strengthened for catapult launch (and would likely rip right off if so stressed). Whether China can develop the combat and combat-support—such as tankers and airborne early warning (AEW)—airframes and train the pilots to perform these difficult missions in a high-stress environment remains to be seen, but acquiring the ship infrastructure would be a major necessary first step.

Short Takeoff but Arrested Recovery (STOBAR). This design combines an un-catapulted, rolling takeoff, typically assisted by a ski jump, with a traditional arrested recovery system, to maximize capacity to “bring back” aircraft laden with unexpended weapons and fuel.⁴¹ This is the system the Soviet Union used in the *Kuznetsov* class and hence is where China is starting its own carrier development efforts. The STOBAR design cannot launch the heavy aircraft that a catapult-equipped ship can, making it better suited for air defense or light-loaded, short-range strike. Given the complexity of carrier operations in general, particularly long-range strike missions, it would make sense for China's initial carrier operational concepts to focus more on the air-defense mission. This consideration also suggests that China's initial intention in terms of capability is to

acquire a ship that can credibly show the flag and launch large aircraft, however lightly loaded. It further suggests that heavy strike missions are not a major priority in the PLAN's initial carrier program.

Short Takeoff/Vertical Landing (STOVL). This design uses a rolling takeoff—again, often assisted by a ski-jump ramp—but brings aircraft back on board vertically. This is the system Spain and the United Kingdom have used on their most recent designs (though the British are moving back to CATOBAR). As a general rule, and speaking theoretically, aircraft capable of vertical landing can also take off vertically, but the performance penalty for doing so is high; load and range are far less than can be achieved with even rolling, ski jump–assisted takeoff. China may yet pursue this course, but only as a supplement to STOBAR and possibly CATOBAR. STOVL carriers would be excellent for supporting humanitarian and disaster-relief missions in the Asia-Pacific region or noncombatant evacuations farther away if China wished concurrently to make a show of force but in a less inflammatory way than a full-size, strike-capable STOBAR or CATOBAR carrier would represent.

The key variable to watch will be whether China develops a STOVL or vertical-takeoff aircraft like the “J-18” that is periodically mentioned in the media. A decision to devote significant resources to a STOVL carrier and aircraft program would suggest that China is more concerned about showing the flag, lower-intensity combat, and nontraditional security than it is about projecting substantial airpower far from home. Given China's rising naval budgets, its current program to build additional hulls of the seventeen-to-twenty-thousand-ton Type 071 landing platform dock (LPD), and its growing interest in nontraditional security, a Chinese STOVL carrier may well emerge in coming years. The vessel would likely resemble the U.S. *Wasp* class or new Japanese heavy helicopter destroyers (i.e., with a flat deck that would allow vertical takeoffs and landings).⁴² A key challenge, however, would be developing a STOVL aircraft and the accompanying propulsion systems. For example, Pratt & Whitney's F135 engine for the F-35 Lightning program cost roughly U.S.\$7.5 billion and suffered from delays, hinting at the technical challenges that exist even for one of the world's premier builders of military jet engines.

Vertical Takeoff and Landing (VTOL). Periodically proposed for U.S. aircraft carriers, to date this approach has been used by the United States only on amphibious assault ships. Unlike their STOVL counterparts, VTOL carriers cannot accommodate any type of fixed-wing aircraft, as they lack a ski-jump ramp at the bow and the ability to generate wind over the deck (i.e., to steam into the wind at high speed).⁴³ Beyond conduct of naval diplomacy and humanitarian operations, provision of close-in support for marines on shore, and limited convoy escort, VTOL

MAJOR TYPES OF AIRCRAFT CARRIERS

	Carrier Type	Typical Displacement (tons fully loaded) ^a	Example Vessel	Sample Aircraft	Max T/O Weight for Fixed-Wing A/C (lbs)
Capability	CATOBAR	80,000+	USS <i>Nimitz</i>	F/A-18E, E-2C, C-2	100,000 ^b
	STOBAR	67,500	<i>Varyag</i>	Su-33/J-15	~62,000 ^c
	STOVL	16,700	<i>Príncipe de Asturias</i> (Spain)	AV-8B, F-35B	~45,000
	VTOL/ Amphibious	13,950	<i>Hyuga</i> (Japan)	SH-60, AW-101 helos	~40,000

Sources: U.S. Navy, Spanish Navy, *New York Times*, Naval Air Warfare Center, IDSA, Sukhoi, Boeing, *Naval Technology*.

Notes:

- There are exceptions to these overall figures, but they do represent a larger pattern. Mission drives size. Some of the elements that drive toward a larger size also drive toward CATOBAR, which itself drives toward a larger size.
- This is TC-13 steam catapult's highest capacity, but the heaviest aircraft actually launched from a CATOBAR vessel is the A-3 Skywarrior, with a maximum takeoff (T/O) weight of 82,000 lbs.
- Based on maximum takeoff weight of the Su-33, per correspondence with a retired Russian naval officer. This assumes launch from either of two normal positions on the carrier *Kuznetsov* (to provide a maximum takeoff distance of 345 feet), with 70 percent of internal fuel and four air-to-air missiles (typically two R-27 and two R-73) and without external fuel tanks. By contrast, launching from a third possible position—between the third and fourth arresting wires, closer to the port side of the deck, and with no deflector (maximum T/O distance 640 feet)—would preclude simultaneous landing operations. Moreover, Major General Timur Apakidze, the father of Russian STOBAR aviation, is said to have asserted unofficially that launching from this third position is foolhardy if wind over deck is less than fifty knots, a typical constraint as *Kuznetsov*'s poorly designed and maintained steam turbines could rarely propel the ship at more than twenty-five knots, with a typical maximum speed of eighteen to twenty knots. For these reasons, as of 2001 no launches had been made even from the third position of a fully loaded Su-33 (maximum payload 14,330 lbs., takeoff weight 73,850 lbs.). The officer believes that ski-jump launch and a T/O weight limit of 62,000 pounds would present even more challenges for China than for Russia: the Su-33's main design aim was to fit *Kuznetsov*'s deck, with weapon-carrying capabilities secondary; the J-15, by contrast, has apparently been designed to possess significant air-to-surface strike capabilities.

carriers have few operational uses. China may also pursue this course, but again only as a supplement to STOBAR, and possibly CATOBAR. Given that STOVL carriers can effectively operate helicopters, as well as STOVL/VTOL aircraft like the Harrier or F-35B, with heavier loads than would be possible on VTOL ships, if China desires this capability, STOVL would make far more sense than VTOL.

CONSTRUCTION PLANS

Given the sheer scale and historic significance of this undertaking, China's reticence regarding the purposes, and even the basic fact of the construction, of an aircraft carrier has been remarkable. When General Chen Bingde, chief of staff of the PLA, finally broke Beijing's official silence on the matter in June 2011 by remarking that "[an] aircraft carrier[s] [is/are] now under construction, but not yet completed," he raised far more questions than he answered.⁴⁴ General Chen's statement might indicate an intention to develop additional carriers, but the nature of the Chinese language, combined with ex-*Varyag*'s unofficial status at the time, adds uncertainty as to his intended meaning.

In its annual public reports on China's military power, the Defense Department has since 2006 addressed the possibility that China was actively working

to acquire an aircraft carrier. In its 2011 edition, the Pentagon projected that ex-*Varyag* “will likely serve initially as a training and evaluation platform, and eventually offer a limited operational capability.”⁴⁵ The report elaborates that “the ship could become operationally available, although without aircraft, by the end of 2012. However, it will take several years for an operationally viable air group of fixed and rotary wing aircraft to achieve even a minimal level of combat capability.”⁴⁶ The report adds, “China likely will build multiple aircraft carriers with support ships over the next decade.”⁴⁷

Li Jie says ex-*Varyag* will be a viable weapons system, albeit with much less operational capability than its American peers. He acknowledges that ski-jump carriers cannot launch aircraft that are as heavy, carrying as much fuel or weaponry, or do so at the same high rates as can a CATOBAR ship.⁴⁸ In fact, Rear Admiral Yin Zhuo calls ex-*Varyag*’s use of a ski jump a “mistake” because it precludes the ability to launch AEW aircraft.⁴⁹ Accordingly, and as noted, China’s second domestic (and third operational, after ex-*Varyag*) hull is likely to offer truer indications of where China is heading with carrier design.

Here China will face a dilemma common to militaries when fielding new systems: whether to stay on schedule by limiting capabilities or to pursue more complex, higher-performance technologies, for which foreign assistance is unavailable, and thereby risk jeopardizing the schedule. It has been argued above that China will tend toward the former—that it will “crawl, walk, run”—but if so, important questions arise. First, as long as China remains focused on STOBAR carriers, how will it provide airborne early warning, given that such ships cannot launch fixed-wing AEW aircraft?

Some form of air-based capability is likely needed to support C4ISR (command, control, communications, computers, intelligence, surveillance, and reconnaissance) capabilities, as a sufficient radar horizon would be very difficult to obtain from a sea-based platform.⁵⁰ Unmanned aerial vehicles (UAVs) might offer supplemental capacity. In April 2011 Japanese forces reportedly spotted a small Chinese drone (roughly the same size as the fourteen-foot-long U.S. RQ-2) overflying a PLAN frigate as a Chinese strike group sailed into the western Pacific.⁵¹ But a capable air-search radar would seem too large to put on a UAV or a ski jump-capable aircraft, and (pending major advances in miniaturization from China’s defense industry) must be ship based. For the Near Seas, then, China might for some time rely on land-based AEW and airborne-warning-and-control-system aircraft to support operations. This would likely necessitate interservice coordination, which has become a major PLA objective. For the time being, however, PLAN officials worry that their programmatic goals might be undermined; it is too early to tell how this complex operational sociology might play out.⁵² As

long as China is limited to STOBAR carriers, its deck-aviation air and surface pictures will be restricted by time on station or radar horizon.

Helicopters would appear to be the most obvious near-term approach, although they offer only limited capability. A U.S. E-2 Hawkeye aircraft enjoys a two-hundred-nautical-mile radar horizon at a twenty-five-thousand-foot elevation; a helicopter would likely have a substantially reduced horizon, as it would be unlikely to operate at over eight thousand feet. A Z-8 helicopter, previously seen only in prototype colors, has recently appeared in PLAN colors on the Internet,

The journey will be long and tortuous, but China must start somewhere if it hopes to become proficient in high-intensity carrier operation.

indicating some progress. A Z-8 AEW helicopter was also photographed hovering over ex-*Varyag* the day it left for sea trials, possibly making China's first "carrier landing."⁵³

That, in turn, raises the critical and underappreciated question of when China will build more helicopters. It currently lacks sufficient numbers to outfit its new frigates and destroyers or the aircraft carriers that it is starting to build now, let alone helicopter carriers and other types that it might add in time. Delays to date suggest that the PLAN is so dissatisfied with existing helicopters that it is willing to take risks in this area. The Z-8 has engine problems and is too large to embark on destroyers and frigates (it has participated in only one Gulf of Aden deployment, during which it operated from the Type 071 *Yuzhao*-class LPD *Kunlunshan*, hull 998). The Z-9 is too small and lacks both range and capacity. The Ka-27 and Ka-31 Helixes are imported from Russia, incurring a form of dependence that China does not want to sustain over the long term. The PLAN appears to be awaiting delivery of the Z-15, a Chinese version of the Eurocopter EC-175; a civilian variant is currently in testing. China's pursuit of two major AEW helicopter programs (the Z-8 and the Ka-31) simultaneously is further evidence that its first indigenous carrier will be a STOBAR design similar to ex-*Varyag*;⁵⁴ if moving straight to a carrier with catapults, China could save significant effort by importing Ka-31s from Russia. It has already acquired some (the late 2009 contract was for nine), and the first Internet photos appeared in late 2010.⁵⁵

More broadly, how much will China invest in aircraft suitable for STOBAR—a considerable sunk cost with path-dependent aspects—before it considers moving to CATOBAR?⁵⁶ To make such a transition, it would at a minimum have to perfect catapults and modify fighters significantly. An April 2011 article in *Liberation Army Daily* discusses the importance of strengthening aircraft landing gear, improving anticorrosion measures, and ensuring that aircraft can fold wings and otherwise minimize the space they take up.⁵⁷

Another key question is whether China will ultimately consider nuclear propulsion for larger future carriers. Space and acoustic challenges are not as pressing for them as they are for submarines, but the demands of nuclear-powered carriers can still preoccupy even formidable navies. The United States managed years of global deployments with conventionally powered carriers, albeit in an era of low fossil-fuel prices unlikely to be seen again.⁵⁸ For their part, fossil fuel-powered carriers have disadvantages vis-à-vis nuclear power, including lower limits on aviation fuel-carrying capacity. These are well chronicled by Chinese naval analysts. Rear Admiral Yin Zhuo, for one, believes that ex-*Varyag*'s use of "heavy" fuel oil is a major strategic mistake in the ship's design, pointing out that

it takes longer for the carrier to restock heavy oil, because its fuel stores are approximately 4,000 to 5,000 metric tons. . . . One can imagine that for this amount of fuel, pressurization alone would take several hours. Moreover, other vessels need to take on diesel or kerosene, because they are driven by gas turbines. The replenishment has to be done through different lines, making underway replenishment as a whole very complicated. If a vessel next to you is being replenished, you cannot launch any weapon, because the fuel vapor released is highly explosive and flammable, and safety is at risk. As a result, the combat effectiveness of the entire formation will be affected. Replenishment for a whole formation takes at least eight to twelve hours. During this twelve-hour period, the formation has no operational capability. For a conventional combat capacity of this size, it is a mistake at the decision-making level.⁵⁹

To be sure, even nuclear-powered carriers are dependent on conventionally powered escorts and aircraft, although the U.S. Navy is researching alternative fuels for even these platforms.

IMPLICATIONS FOR CHINA

In itself, the advent of a relatively small and underperforming aircraft carrier is of limited military significance. A single carrier will of necessity spend much of its time in port for maintenance, thus depriving its navy of any airpower-projection capability at all. Even while under way, ex-*Varyag* will require a coterie of escort and logistics ships for support and protection. Yet that protection would likely be insufficient in a conflict with the United States. Given the U.S. military's adeptness at long-range precision strike, the question would be not whether ex-*Varyag* would survive the war but whether it would survive the first day.

This is not to say that ex-*Varyag* will have no military utility for China. Indeed, the remarkable rapprochement enjoyed between the PRC and Taiwan since the 2008 election of Ma Ying-jeou as Taiwan's president has decreased Beijing's concern about Taiwan independence. Meanwhile, China's contested claims of sovereignty over almost the entire South China Sea, like China's increasing

entanglement with foreign resources and markets, have begun to shift the PLA's defense interests toward what the U.S. Office of Naval Intelligence terms "new but limited requirements for protection of the sea lanes beyond China's own waters, humanitarian assistance/disaster relief, and expanded naval diplomacy."⁶⁰

Farther afield, then, in the western Pacific and the Indian Ocean, China has not developed high-intensity military capabilities, instead projecting influence in the form of peacetime deployments.⁶¹ It is in connection with this more distant, lower-intensity effort that China is likely developing its naval aviation. The validity of that strategic assessment would be bolstered by China's indigenous development of additional, potentially larger and more capable, carriers (see below). Thus, it is incumbent to look beyond the significant limitations of ex-*Varyag* and consider the implications for China of a more robust and capable naval aviation arm.

Potential Missions

Chinese aircraft carriers could conceivably fulfill or contribute to a wide variety of missions. The former PLAN official previously quoted has argued that aircraft carriers in general will continue to constitute a central element of world naval operations for the foreseeable future. Part of this conviction likely stems from the PLAN's growing realization that nontraditional security missions—disaster relief or counterpiracy—account for the bulk of likely military contingencies and that aircraft carriers greatly aid responses to them. In addition, even a rudimentary naval aviation capability would enhance China's negotiating leverage in its various maritime disputes. While the number and capabilities of China's aircraft carriers will to some extent determine the missions they undertake, the decisive factor will likely be a political determination in Beijing as to how to use China's expanding naval power. In the order in which they are likely to be considered, beyond training and naval diplomacy, such missions include the following.

Asserting Maritime Claims in the South China Sea. Even a single carrier could extend the reach of China's airpower significantly and could be decisive against the smaller and less capable navies of Southeast Asia. Liu Huaqing envisioned the maintenance of China's claims in the South China Sea as a primary carrier mission. This task is certainly one in which a carrier flying modern strike fighters like the J-15 would have a much greater military and diplomatic impact than amphibious assault ships or helicopter carriers alone. Indeed, Liu worried that amphibious vessels did not provide adequate air cover and argued that carriers could fill this void.⁶² According to both the 2000 and 2006 editions of *Science of Campaigns*, an authoritative volume written by scholars at China's National Defense University, carriers can play a crucial role by providing air cover beyond the range of land-based air to support long-range landing operations against small islands, such as in the South China Sea: "Combat in the deep-sea island

and reef region is relatively more independent, without support from the land-based force and air force. Under this situation, an aircraft carrier is even more important in winning victory in the campaign.”⁶³ In November 2008 and June 2009 the amphibious assault ship *Kunlunshan*, together with destroyers, frigates, and supply ships, conducted long-distance patrols of the disputed waters in the Spratly Islands; PLAN marines executed at least one island-seizure exercise.⁶⁴ As one Chinese expert states, “Our carrier will definitely not engage with powerful U.S. aircraft carrier fighting groups. But it is enough to be a symbolic threat among neighboring countries like Vietnam, Indonesia, and the Philippines who have territorial disputes with China.”⁶⁵ Most recently, a senior *Liberation Army Daily* reporter, Senior Colonel Guo Jianyue, PLA, wrote on a news website run by China’s Ministry of National Defense and affiliated with his employer, “Why did we build it if we don’t have the courage and willingness to use the aircraft carrier to handle territorial disputes?”⁶⁶

Chinese carrier deployments into the South China Sea are therefore likely to be seen as threatening by neighboring countries like Vietnam and the Philippines, which assert competing territorial and maritime claims. Unable to match China’s land- or sea-based airpower, they are now seeking ways to protect themselves from what they fear will be increasing pressure from Beijing to compromise. Some of China’s neighbors, perceiving ex-*Varyag* as a confirmation of rising Chinese naval power and an erosion of the credibility of American security guarantees, may seek bilateral accommodations with China. Others may decide to deepen military-to-military engagement with the United States and enhance their own naval capabilities. For example, Hanoi’s recent decisions to expand cooperation with Washington and to purchase six Russian-built Kilo-class conventional submarines were, in part, direct responses to the potential threat posed by a Chinese aircraft carrier—as well as reflections of its loss of islands in skirmishes with China in the Paracels in 1974 and the Spratlys in 1988.

Supporting Sea-Lane Security Operations against Low-Intensity Threats. One such threat is piracy. Antipiracy missions emphasize helicopters and embarked special forces for boarding vessels but could be enhanced significantly by carrier-based, dedicated, airborne reconnaissance platforms. Carrier-borne strike fighters would also give China a credible way to deter and attack pirates, as well as any other elements that attempted to disrupt Chinese vessels in the South China Sea, the Indian Ocean, or beyond.

Humanitarian Assistance and Disaster Relief. Though it has not yet handled any disaster-relief missions abroad and may not be genuinely interested in doing so, the PLAN could reap substantial diplomatic benefits from a carrier that could support intensive helicopter operations following a disaster like the 2004 Indian

Ocean tsunami or Japan's 2011 earthquake. The United States, and to a lesser extent India and Japan, were given great credit for using deck-aviation assets for humanitarian assistance and disaster relief following the 2004 tsunami; China had no such option at the time. Such nontraditional security missions, emphasized in the Hu Jintao era as part of a set of "diversified military tasks," are regarded by many PLA experts as among the PLAN's best opportunities for training for local, limited wars under "informatized" conditions.⁶⁷

A Taiwan Contingency? Liu envisioned a cross-strait conflict scenario as a major rationale for carrier development and deftly marketed it to the PLA leadership as a cost-effective way to limit the need for new airfields.⁶⁸ Arguably, the prospect of U.S. intervention following Taiwan's democratization in the late 1980s rendered this vision obsolete and delayed Chinese carrier development. Yet despite recent cross-strait rapprochement, the PLAN remains focused primarily on enhancing regional "antiaccess/area denial" to prevent Taiwan from declaring independence and generally to defend the waters near the mainland from foreign intervention or invasion. In a Taiwan scenario, ex-*Varyag* would have no useful role east of the island—land-based aircraft can already cover the entire island, and attempts to use a single carrier of modest capabilities to deter or complicate the approach of an American naval task force would be ill-advised. South of Hainan, perhaps near the Paracels, backed up by land-based air cover, it could conceivably help protect China's southern approaches.

Establishing Sea Control in the First and Second Island Chains. Missile-centric as it is and concentrated on areas fairly close to the mainland, the PLA is still clearly sized and shaped chiefly to support China's claims on its maritime periphery, as opposed to extraregional, blue-water sea control. The PLA's current order of battle is based primarily on the world's foremost array of substrategic, land-based mobile missiles, such as the DF-21D antiship ballistic missile; on diesel submarines armed with cruise missiles, torpedoes, and sea mines; and on improved variants of surface ships and aircraft (such as the J-20, which may become China's first stealth fighter when operational, between about 2017 and 2019), outfitted with increasingly capable missiles.

Aircraft carriers could ultimately help the PLAN begin to shift its operational focus within the First and Second Island Chains from antiaccess and area denial to sea control. The primary distinction is that between the negative and the positive—whereas the former seeks to deny an adversary access to a specific area for a specific amount of time, sea control seeks to assert a navy's mastery over a given body of water in relative perpetuity. A Chinese carrier does have utility between the First and Second Island Chains but probably not in an American style. Instead, it would provide air cover to a surface group effectively enough to help get the antiship-cruise-missile "shooters" within range of the enemy.

In some cases, a Chinese carrier could thus facilitate an attack on a U.S. carrier, as suggested in a major doctrinal publication:

The naval fleet's long-range operational forces make up the important part of counterstrike operational forces. The joint anti-air raid commander, while organizing counterstrike operations, should give special attention to the use of naval forces. Particularly:

- A. Bomber and fighter-bomber airborne units can participate in airborne counterstrike operations; concretely, they can perform tasks of assaulting . . . sea-based targets.
- B. Fighter airborne units can perform vessel-guarding tasks.
- C. Naval vessel units can perform operational tasks of attacking the enemy's aircraft carriers.⁶⁹

Aircraft carriers may contribute to this strategy, by extending the range of China's heretofore land-based tactical air, long-range surveillance, anti-surface ship strike, air-defense interdiction, and early warning. Certainly additional capabilities, especially in the area of antisubmarine warfare, would also be required for this new mission, but an aircraft carrier, and especially multiple carriers, could put China on its way to achieving them. Still, China remains constrained significantly by geography and would face a very difficult, complex, protracted transition.

Extended-Range Power Projection. China's economic health and vitality is dependent on its reliable access to foreign markets and resources via maritime trade routes. The most vital of these routes run through the South China Sea and Indian Ocean, linking China to energy resources in the Middle East and Africa. Indeed, 95 percent of PRC exports to Europe, Africa, and the Middle East—and almost 100 percent of China's imports from Europe and the Middle East—flow through the Indian Ocean. Securing access to these resources and markets is therefore a top Chinese national interest, and an emerging mission for the PLAN.

Campaign Theory Study Guide, a textbook issued (like *Science of Campaigns*) by China's National Defense University, draws on a variety of high-quality doctrinal publications. To improve the protection of the nation's sea lines of communication in the Far Seas in the future, its authors hold, China should "endeavor to establish a contemporary, integrated and offensive, new, special mixed fleet with an aircraft carrier as core and missile destroyers (or cruisers) and nuclear attack submarines as backbone forces."⁷⁰

Over the long term, aircraft carriers will thus be essential to defending Chinese interests into the western Pacific and Indian Ocean. According to the former PLAN official already quoted, the future relative prioritization given by the PLAN to the Near Seas and the Indian Ocean is difficult to determine. "China will never change its defensive policy," in his view, "but the PLA must safeguard national

interests.” To this end, more than one carrier group would be required to sail regularly through these vital waterways and protect Chinese shipping.

Yet such missions are logistically taxing and operationally complex. To some extent, China’s rapidly improving constellation of space-based assets can facilitate long-distance operations without presence in other countries. But STOBAR carriers would likely be needed to provide sufficient AEW, given the lack of land-based options, and they would have to exist in sufficient numbers to ensure that other missions and refits could be accommodated. Moreover, the projection and sustainment of military power over vast distances require a robust support system that would likely include a network of military bases, or at least reliable “places” (e.g., supply depots), throughout the Indian Ocean. The development of such an infrastructure would require a dramatic shift in Chinese strategic thinking, which has long prided itself on its principles of “nonintervention” and its opposition to “hegemony,” a category in which foreign basing has long been included.⁷¹ How Beijing can adjust its force posture and traditional policies in this regard is apparently a matter of debate. There is also the question of what nations would be willing to host Chinese forces and under what conditions. Indian engagement throughout the region is extensive, and numerous other nations, such as the United States, France, Japan, Australia, and the United Kingdom, have substantial interests in the Indian Ocean as well. The fact that China has no present or prospective allies in the American sense means that it is far more geographically constrained than is generally appreciated.

Strategic Benefits

Among the likely strategic benefits for China is enhanced regional diplomatic influence. A carrier group would offer immense diplomatic payoff in visible naval presence in the South China Sea and Southeast Asia, along key sea-lanes in the Indian Ocean, and in humanitarian missions throughout the region. Simply steaming aircraft carriers anywhere in the Asia-Pacific would send a strong signal to the region that China’s power is significant. Visiting ports in the South China Sea and the Indian Ocean in particular would send a powerful political message of expanding Chinese military might.

A second potential strategic benefit is the protection, or if necessary rescue, of Chinese citizens or economic assets abroad. As Chinese businessmen spread throughout the world in pursuit of economic opportunities, they have become entangled in and endangered by instability. Safeguarding Chinese citizens has therefore become an increasingly important task for China’s government; aircraft carriers would improve China’s ability to defend its nationals and high-profile economic interests in volatile areas between the Red Sea and China’s coast.

In the future, China’s capabilities will likely be tailored specifically to handling threats to its citizens and economic interests abroad. These include such

nontraditional security threats as piracy and terrorism, as well as internal chaos in other nations, like that seen in Libya in 2011. This strategic choice would represent a contrast with the United States, whose military possesses truly global, and highly sustainable, expeditionary capabilities that enable it to fight large wars virtually anywhere in the world.

Modern carriers also offer multirole versatility, a scalable set of capabilities that can handle a range of contingencies. The platforms and operational infrastructure that make high-end missions possible can also be scaled down to deal with nontraditional security missions like disaster relief or the suppression of piracy. China's military is improving its capacity for dealing with relatively small-scale threats that do not involve potential forcible entry into a hostile area yet require long-range deployments. For example, Chinese analysts associated with Senior Captain Li Jie have noted how in 1994 the U.S. Army embarked helicopters on board USS *Dwight D. Eisenhower* (CVN 69) for transport and strike support in a peacekeeping mission in Haiti, an example that undoubtedly resonates in a country that is beginning to acquire the ability and perceive the need to conduct more noncombatant-evacuation operations in potentially hostile areas.⁷² Improved abilities to show the flag and assist in humanitarian missions and other military operations other than war can potentially allow a limited expeditionary military capacity to yield substantial diplomatic benefits. It is important, however, to understand that the PLA's naval, air, and ground capabilities for out-of-area operations are likely at least fifteen years away from the levels needed for the scalable responses to high- and low-intensity threats that the Defense Department possesses today.

Strategic Drawbacks

As Chinese analysts long insisted, aircraft carriers have their negative aspects, and the foremost of these is vulnerability—because of their size, configuration, and roles, carriers are disproportionately susceptible to attack. They arguably have not been tested in the missile age. Since World War II, the closest any carrier has come to high-intensity conflict where it faced a real threat of damage or sinking was during the 1982 Falklands War, when Exocet missiles disabled and later sank the destroyer HMS *Sheffield* and the containership SS *Atlantic Conveyor*. The British task force commander, Admiral Sandy Woodward, later acknowledged that had the carriers HMS *Hermes* or *Invincible* suffered a similar fate, the United Kingdom would have withdrawn them and likely lost the war.⁷³ Moreover, had the Argentines simply fused their bombs correctly (a number of bombs hit British ships but failed to explode, because they were improperly fused) the British might well have lost. In 1982, asked during a Senate hearing how long U.S. aircraft carriers would survive in a major war against Soviet forces, Admiral Hyman Rickover famously replied, “About two days.”⁷⁴ These facts are not lost on Chinese strategists, who have “transferred” and “reverse-engineered” history by

studying these and other conflicts for lessons and are pursuing what is arguably the world's most missile-centric approach to warfare today.

In a high-intensity confrontation against a foe with submarine, air, and surface-based antiship capabilities, the life expectancy of a Chinese carrier would probably be measured in hours. Chinese carriers will likely remain highly vulnerable for the foreseeable future, given what many see as a fundamental weakness in

As ever, the determining factor is not the weapons system itself but how it is used. As Major General Qian Lihua declared, "The question is not whether you have an aircraft carrier, but what you do with your aircraft carrier."

the PLA's antisubmarine warfare capabilities; the recent acquisition of, or expressions of interest in, submarines by Vietnam, Indonesia, and Malaysia; and the highly credible attack submarines of the U.S., Indian, Japanese, and Australian navies.

A second drawback is that carriers and their supporting ships and infrastructures are extremely expensive. This reality derives in part from the carrier's vulnerability to attack and in part from the supporting systems needed if it is to operate with maximum effectiveness. China's large and active shipbuilding infrastructure and labor base are likely to reduce its carrier construction and outfitting costs relative to those of, for example, the United States. Still, the final cost of a domestically built carrier will likely be equal to that of several Type 071 amphibious assault ships or helicopter carriers—which are very well suited for the contingencies China is most likely to face and would arouse less fear among its neighbors.

If the PLAN intends to conduct credible carrier operations in distant seas, it will need to acquire more advanced air-defense vessels and nuclear-powered attack submarines, enhance its at-sea replenishment capability, and better integrate land-based tanker aircraft and airborne warning and control with its carrier aviation. The cost of building a carrier similar to *Varyag* has been estimated at two billion dollars, the total cost of a battle group (including the carrier) at ten billion.⁷⁵ China's rising national power and defense budget (officially \$91.5 billion for 2011—the Pentagon estimates China's defense-related expenditures for 2010 at over \$160 billion) enable its navy to develop some level of deck aviation "on the side" without becoming "carrier-centric."⁷⁶ But the PLAN's personnel, equipment, and operational costs are all rising and may begin to compete with rapidly expanding nonmilitary budget priorities (e.g., infrastructure investment, social security, and other costs associated with managing a society that is rapidly urbanizing, globalizing, marketizing, informatizing, privatizing, and aging).⁷⁷

Furthermore, an operational Chinese aircraft carrier capability is likely to unnerve China's neighbors and may catalyze more formal security alignments aimed at counterbalancing China's growing military power. An aircraft carrier

is inherently a power-projection tool; even utilized in the most benign way, ex-*Varyag* will extend the range of Chinese airpower. China's neighbors and strategic competitors will likely seek to hedge against what they interpret as a signal of Beijing's desire for a robust naval capability that can shift quickly from soft- to hard-power missions. Regardless of its actual capabilities and vulnerabilities, a carrier is viewed by many as an instrument of the very "gunboat diplomacy" that Beijing decries. A Chinese carrier or carriers could in fact drive the defense spending and acquisitions of regional neighbors in a way that more deadly but less conspicuous systems like missiles and submarines do not. To the extent that China fails to derive significant strategic benefits from its carrier programs, it will suffer "the onus without the bonus."

Fourth, a carrier program yields results only slowly. The long lead time to actual operational capability of the ship itself gives potential adversaries time to build up countermeasures, which are likely to be much cheaper and available relatively quickly. Developing a robust carrier capability in the broader sense also takes time. Landing aircraft on a carrier is much more difficult than doing so on land. It took the former Soviet Union seven to ten years to make the Su-27K work well on its carriers. According to the former PLAN official quoted above, China will not need ten years, but it will need several years at least.

WHAT'S NEXT FOR CHINA'S CARRIER PROGRAM?

The former PLAN officer believes that China will eventually have three or four carrier groups, with one operating at any given time. Similarly, Li Jie says, "Ideally, there will be three or more aircraft carriers, even five or six."⁷⁸ Chinese state-connected media have speculated that China will eventually need at least three aircraft carriers in all.⁷⁹ Beijing's timetable for developing additional aircraft carriers domestically is unclear. As this article went to press, the existence of an indigenous Chinese aircraft carrier under construction remained unconfirmed.

Moreover, the ultimate number of carriers to be fielded by the PLAN is uncertain. Given the relatively limited scope of Chinese interests and obligations, the twelve of the U.S. Navy are certainly more than Beijing needs. In keeping with its usual ad hoc, pragmatic approach, China will likely make decisions regarding subsequent carriers after conducting trials and experiments with its first one (or first "batch"). A key question is, what constitutes an operational carrier? Where is the line to be drawn analytically between initial operational capability, however limited, and showy exercises for public consumption? Will the carrier become "operational" when a senior aviator with several thousand hours of flight time lands on its deck at sea? Will ex-*Varyag* become "operational" upon its initial "shakedown cruise," or "patrol," in the Near Seas outfitted with helicopters and J-15s and escorted by destroyers and oilers? China might conceivably put eight or

ten helicopters on ex-*Varyag*'s deck and send it down to the South China Sea with a few escorts far earlier than observers expect, or dispatch with a few helicopters and, say, two J-15s flown by top test pilots. Most likely, the true operational capability of China's carrier will remain ambiguous for some time, not only to foreign observers but to the PLAN itself. There is much to be learned and much to be done.

In any case, American experts should not expect China to mirror the U.S. Navy in the composition of its carrier groups. While U.S. carriers often sail with entourages of support and escort ships, a Chinese carrier may steam with a much leaner coterie.⁸⁰ Indeed, the number and type of escorts and support ships could be either significantly larger or smaller than the American model, depending on the expected operating environment and tempo. Yet there seems to be a minimal need for escort and supply ships during peacetime; the French *Charles de Gaulle* carrier was accompanied by a destroyer, a submarine, and a supply ship during an exercise with the Indian carrier *Viraat*, which was accompanied by two frigates and a submarine.⁸¹

A further potential difference is apparent in the fact that both ex-*Varyag* and Chinese destroyers possess phased-array radars, leaving uncertain which will play the general role handled in the U.S. Navy by Aegis destroyers and cruisers. China, apparently satisfied with its Luyang II (Type 052C) design, is building a substantial number of them, suggesting that it might soon possess sufficient ships for a variety of escort, detection, tracking, and missile-uplink functions. To this point, Li Jie believes that one purpose of China's Gulf of Aden antipiracy mission is to help select frigates for future carrier groups.⁸²

The issue of China's general capability to construct a carrier has been discussed above. With regard to shipyards specifically, however, it appears that the nation possesses a total of seven with berths large enough (three hundred meters or more). These yards are located in Dalian, Qingdao, Shanghai, Guangzhou, and Huludao. All are operated by either the China State Shipbuilding Corporation or the China Shipbuilding Industry Corporation, the two state-controlled giants that dominate the industry. There are other, private yards with supertanker-sized berths. However, the PLAN will most likely call on a state-owned yard to build its carriers, given the sensitivity of the project and the fact that all other major surface-combatant construction to date has been performed in state-owned yards.

Shipyards will almost certainly vie to be selected as carrier builders, due to the project's national prestige. The competition between them is unlikely to be as tightly cost based as commercial projects; experience in building military vessels and competence in systems integration will likely take precedence over price considerations. In that respect, Shanghai's Changxing Island Shipyard, Dalian, and the Bohai Shipbuilding Heavy Industry complex near Huludao (where many of

China's submarines are built) are strong candidates. Bohai has the added benefit of large, covered building sheds where carrier parts could be fabricated in modular fashion and out of the view of satellite surveillance. The company says it has the "largest indoor seven-step" ship construction facilities in China.⁸³

As for the potential configuration of indigenous carrier hulls, they are not likely to be catamarans or small-waterplane-area twin hulls, as artists' impressions currently being circulated around the Chinese Internet suggest. The reasons are fairly straightforward (aside from developmental risk aversion already discussed): while a multiple-hull design handles well at sea, it has a much lower hull volume than a monohull of comparable length and overall beam and correspondingly less space for fuel, weapons, aircraft, and propulsion systems. Also, a wave-piercing design may produce a very wet deck, creating corrosion and problems for aircraft operations and the safety of equipment and personnel on deck in heavy seas. Moreover, the radar cross section of such a configuration would be enormous.

IMPLICATIONS FOR THE UNITED STATES

Militarily, a single Chinese aircraft carrier is of minimal significance to America. Ex-*Varyag's* emerging capabilities will simply be too modest to challenge U.S. power projection in East Asia. Unlike China's robust, burgeoning missile, submarine, and sea-mine capabilities, it has no useful role in high-intensity major combat operations and will not for the foreseeable future. U.S. proficiency at long-range precision strike and submarine warfare make a single aircraft carrier highly vulnerable during wartime. Further, regular maintenance requirements mean a considerable amount of time in port.

Politically, however, even a single Chinese aircraft carrier could have significant implications for American interests in East Asia. The message to the region implicit in the sailing of a Chinese aircraft carrier—the existence of a rising China with increasingly capable naval power—will demand a still-more-compelling response from the United States. Regional leaders are nervous at the prospect of an overbearing or coercive China enabled by a strong naval presence and are looking to the United States as a hedge to preserve their independence of action. For America's allies, this has meant increasingly close cooperation on military issues. Moreover, several other states in the region, especially in Southeast Asia, have in recent years reached out to the United States as well, concerned about Chinese assertiveness. Chinese aircraft carrier development is already casting its first and largest strategic shadow in the South China Sea.

Yet American strategists must begin to plan for the near-inevitability of a PLAN equipped with multiple carriers, most of which will be far more advanced technologically than the starter ship. Complicating American planning, however,

is a remarkable degree of uncertainty surrounding Beijing's intended uses of its future carriers. Indeed, they could be either important bulwarks of international stability or fundamental challenges to American military presence in the region.

Given the Chinese economy's profound reliance on access to foreign resources and markets, Beijing has a substantial interest in the openness of maritime trade routes and the preservation of a stable international system. Chinese writings on carriers are replete with examples of their utility in nontraditional security situations. For example, they cite how USS *Lexington* was able to supply 30 percent of the power requirements of the city of Tacoma, Washington, during a power shortage in the winter of 1929–30. They write also of the roles carriers played in disaster relief in the Caribbean and Gulf of Mexico in the 1950s, an example that almost certainly resonates with a Chinese audience aware that the PLAN was able to do little after the 2004 Indian Ocean tsunami, while USS *Abraham Lincoln* (CVN 72), on the scene within days, provided relief. These analysts note how carriers' ability to rapidly swap their normal fixed-wing aircraft complements for helicopters enhances their multimission capabilities.⁸⁴ They overlook here the point that reconfiguring a deployed carrier's embarked air wing for humanitarian operations could require either foreign bases or substantial overseas base access.⁸⁵ That issue has still not been addressed fully in China, despite such small-scale precedents as the use of the Khartoum, Sudan, airport in March 2011 to refuel PLA Air Force Il-76 transports evacuating Chinese nationals trapped in Libya. Should civilian leaders press a reluctant PLAN to do so, Chinese aircraft carriers could contribute in such ways to global "public goods." Counterpiracy operations, global peacekeeping, humanitarian assistance, and disaster relief are all missions available to a Chinese carrier fleet that would be in concert with American interests.

Indeed, the U.S. Navy's concept of "global maritime partnerships" would be much closer to realization with the PLAN as a resourceful and reliable partner in preserving a stable and open international system. The prospect of the American and Chinese navies—along with those of several other rising Asian naval powers—working together to address shared challenges is in many ways the best possible outcome for an American fleet confronting a financially constrained future. In the words of Admiral Eric McVadon, USN (Ret.),

One can readily imagine a scenario in which U.S. Navy F-18s from carriers are in air-to-air combat with [PLAN] Su-30s over the Taiwan Strait. One can just as readily imagine those same F-18s along with U.S. Navy P-3Cs providing air cover and search capability, respectively, for PLAN and other ships of an international naval force protecting sea lanes from pirates and terrorists in the Gulf of Aden or even the Pacific Ocean sea lanes as oil bound for China is imperiled by some future development.⁸⁶

Such an arrangement would reduce a burden currently borne almost entirely by American naval power by distributing it through a new, twenty-first-century form of collective security in which a great power's prestige is proportional to the public goods it provides. A carrier would allow China (like France with *Charles de Gaulle*) to “punch above its weight,” to make a visible contribution—even if flying only a modest number of sorties—that destroyers and frigates simply cannot.

But Beijing could also use aircraft carriers in a negative, exclusionary manner that would place China in opposition to the continued military presence of the United States in East Asia, and more generally to the international status quo. For this purpose a Chinese carrier group need not be designed to oppose U.S. forces directly—China is developing a wide range of antiaccess weapons systems, many missile-focused, for that task—but rather to provide, in a variety of Near Seas scenarios, including a conflict over Taiwan, air defense to surface vessels (e.g., Luyang II destroyers) that can shoot large numbers of antiship cruise missiles. A second role for a Chinese carrier group has been outlined in a variety of Chinese doctrinal publications: flying air cover for an amphibious invasion of islands and reefs beyond the range of land bases, a scenario that would clearly be relevant in a South China Sea conflict.⁸⁷

Were China to decide to use its carrier force in an attempt to exclude American naval power, the results would be disastrous for regional stability and, ultimately, for China itself. The United States has a long history of using military force to preserve its access to international sea-lanes; it fought its first four wars after independence—the naval war with France in the 1790s, the First Barbary War (1801–1805), the War of 1812, and the Second Barbary War (1815)—at least in part over just that.⁸⁸ While reactions are impossible to predict exactly, it is clear that Washington would view most gravely any effort to restrict its access to foreign sea-lanes. Indeed, Secretary of State Hillary Clinton described freedom of navigation in the South China Sea as a “national interest” when she addressed the Association of Southeast Asian Nations Regional Forum in 2010.

While much will depend on how China decides to use its new and future carriers, American strategists should formulate both short- and long-term responses to protect American interests and, if possible, avoid competition or conflict with China. While immediate actions should focus primarily on political shifts, a long-term shift in military posture, engagement with the PLAN, and changes to alliances and partnerships in East and South Asia will all be required to respond adequately to the prospect of multiple Chinese carriers operating throughout the Asia-Pacific.

In the short and middle terms, American reactions to China's new carrier should focus primarily on shifts in military and political posture. While existing military

contingency plans and exercises should be reexamined to take account of a Chinese aircraft carrier, few explicit military adjustments will be necessary immediately. The former secretary of defense, Robert Gates, signaled America's intention to increase its military presence in Southeast Asia in his 2011 speech at the Shangri-La Dialogue in Singapore, where he announced the future stationing of American littoral combat ships in that island nation and, more generally, America's intention to increase its activity in the region. Secretary of Defense Leon Panetta has signaled his

Senior Liberation Army Daily reporter, Sr. Col. Guo Jianyue, PLA: "Why did we build it if we don't have the courage and willingness to use the aircraft carrier to handle territorial disputes?"

intent to continue this approach, informing the Senate Armed Services Committee that "[the Defense Department] should maintain an enduring military presence in the Asia-Pacific region that provides a tangible reassurance that the United

States is committed to Asia's security, economic development, and the prosperity essential to the region's success."⁸⁹

Just as a Chinese aircraft carrier sailing and visiting ports throughout the Asia-Pacific would send a message, an increase in naval presence by the U.S. Navy would likewise reassure the region of America's ability and will to sustain its regional engagement. That presence should be expanded especially in the South China Sea and Indian Ocean; indeed, Gates's 2011 announcement should be regarded as a first step in a broader effort to sustain American military presence in the region. The frequency of port visits and freedom-of-navigation exercises should be increased, and naval engagement with new and existing partners should be regularly and responsibly strengthened.

The long-term challenges potentially posed by China's aircraft carrier ambitions, however, demand also a concerted examination of political strategy toward China and of military posture in the Asia-Pacific. First, a powerful China that contributes to the international system is overwhelmingly in the interests of the United States in particular and of regional stability and prosperity in general. Military engagement with China, especially with the PLAN, must therefore be of a top priority for U.S. military and political leadership. The benefits of naval cooperation and the dangers of confrontation should become core subjects of U.S.-Chinese dialogues at all levels. Responsible engagement and substantial progress should be goals for both sides. To that end, the U.S. military should work with its allies and partners in the region to identify opportunities for naval cooperation with the PLAN. Humanitarian assistance and disaster relief, counterpiracy operations, and search and rescue all offer opportunities to promote habits of cooperation and reduce strategic mistrust—provided the PLAN's civilian masters are willing to make such contributions to the larger good.

But American strategists must also plan and account for more negative possibilities. America's network of foreign bases in Japan and the Republic of Korea has traditionally been the foundation of its access to East Asia, and the three nations concerned are currently examining how to adapt basing arrangements to twenty-first-century challenges. Yet more must be done—the United States should examine possibilities for military access in South and Southeast Asia as well.

The Pentagon has deftly characterized desirable future access arrangements as “geographically distributed, operationally resilient and politically sustainable.”⁹⁰ In South and Southeast Asia, meeting these criteria will likely mean agreements that are less formalized and more implicit than the explicit, treaty-based arrangements familiar in Northeast Asia. While states like Vietnam, Indonesia, and India are concerned about China's rising naval power and will likely seek to help sustain American access to the region, they have no interest at all in hosting American bases and fear being entangled in a future U.S.-Chinese conflict. Agreements will therefore focus on facility capabilities rather than basing agreements, with access to be determined by host nations in times of crisis or conflict, on the basis of their own political and military calculations.

The one likely exception would be America's Australian ally. Canberra has signaled its concern about China's rising naval capabilities and has identified the United States as its key ally for the twenty-first century.⁹¹ Given the closeness of the two nations and their shared perceptions of potential future security challenges involving the PLAN, Washington should seek to make Australia a new cornerstone of American posture in the Asia-Pacific, almost on a par with Japan or Korea. Access to and facility support by Australia is forthcoming, and will likely be crucial in the coming years.⁹²

{LINE-SPACE}

China's aircraft carrier development path follows the Chinese philosopher Laozi's logic that “a journey of a thousand miles begins with a single step.” The journey will be long and tortuous, but China must start somewhere if it hopes to become proficient in high-intensity carrier operations—hence the need for a starter carrier, ex-*Varyag*.

Deng Xiaoping, describing his plan to reform and open China in the late 1970s, declared that China would “cross the river by feeling the stones,” meaning that he had no overarching plan but would remain flexible and adapt to events as they happened, while maintaining a general course forward. Beijing's approach to aircraft carriers appears to be taking a similar path—there seems to be no overriding design for what shape an aircraft carrier force would ultimately take and what missions it would undertake. Instead, the PLAN seems to be adaptive and flexible in its approach—purchasing carriers as they become available, while gradually

working up its first, refurbished one, slowly assembling the components of an escort group, and quietly training its first generation of carrier aviators.

In the nearer term, with respect to its starter carrier, China will likely follow the same course. The PLAN will learn a great deal from it and seek to apply the lessons to forthcoming platforms. Future iterations will therefore likely be more capable and utilized more effectively in operational terms. Similarly, the missions these ships are assigned will likely evolve over time, gradually testing the abilities of their technologies and crews. Just as the first generations of American naval aviators were far different from their descendants today, so too will future generations of Chinese naval aviators be more professionally sophisticated and capable than their predecessors. Having waited over eight decades for a carrier of its own, China can afford to be patient and methodical in mastering its operation.

China has every sovereign right to invest its newfound wealth in an aircraft carrier or even several. The strategically significant questions concern not the number and capabilities of these ships but how they will be employed. If Beijing chooses to use its carriers to cooperate with its neighbors and the United States and contribute thereby to the health and success of the international system, it will likely inaugurate a new era of strategic collaboration. If, on the other hand, Beijing chooses to use its carriers to intimidate or threaten its neighbors and the United States, to challenge the fundamental openness and stability of the international system, great-power competition and conflict will become more likely.

As ever, the determining factor is not the weapons system itself but how it is used. As Major General Qian Lihua declared in November 2008, “The question is not whether you have an aircraft carrier, but what you do with your aircraft carrier.”⁹³

NOTES

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1. 罗援 [Luo Yuan], “谨防航母报道中的浮躁现象” [Strictly Guard against Impulse Reporting on the Aircraft Carrier], 人民网 [People’s Net], 16 August 2011, military.people.com.cn/.
 2. William Choong, “Reasons to Fear China’s Aircraft Carrier,” *Straits Times*, 19 August 2011, www.asianewsn.net/.
 3. Viola Gienger and Tony Capaccio, “China’s Carrier Poses Mostly Symbolic Threat, U.S. Admiral Says,” *Bloomberg*, 12 April 2011, www.bloomberg.com/.
 4. John Frewen, “Harmonious Ocean? Chinese Aircraft Carriers and the Australia-U.S. Alliance,” *Joint Force Quarterly*, no. 59 (4th Quarter 2010), www.ndu.edu/press/.
 5. Fumio Ota, “The Carrier of Asia-Pacific Troubles,” *Wall Street Journal*, 11 August 2011.
 6. Hu Yinan and Li Xiaokun, “Carrier Set for Maiden Voyage,” *China Daily*, 28 July 2011, www.chinadaily.com.cn/.
 7. Jaime FlorCruz, “China’s Military Modernization a Cause for Concern?,” CNN.com, 17 June 2011, articles.cnn.com/.

8. Office of Naval Intelligence [hereafter ONI], *The People's Liberation Army Navy: A Modern Navy with Chinese Characteristics* (Suitland, Md.: August 2009), www.oni.navy.mil/.
9. 刘华清 [Liu Huaqing], 刘华清回忆录 [The Memoirs of Liu Huaqing] (Beijing: People's Liberation Army, 2004), p. 477.
10. Liu Huaqing was technically still a general and spent most of his career in army billets. The first PLAN commander who was a career navy man was Shi Yunsheng (1996–2003). ONI, *China's Navy 2007*, available at www.fas.org/.
11. Cai Wei, “礼仪帅的航母梦” [Dream of the Military of Courtesy for Aircraft Carriers], 三联生活周刊 [Sanlian Life Weekly], 27 April 2009, pp. 50–57.
12. “中国的海洋权益和海军” [China's Maritime Rights and Navy], 世界知识 [World Knowledge] (January 2009), pp. 16–25.
13. “Earnestly Step Up Ability Building within CPC Organizations of Armed Forces,” 解放军报 [Liberation Army Daily], 13 December 2004, available at www.chinamil.com.cn/; “三个提供, 一个发挥” [Three Provides and One Bring into Play], 新浪 [Sina], news.sina.com.cn/.
14. Hu Jintao, as cited in Tang Fuquan and Wu Yi, “A Study of China's Sea Defense Strategy,” 中国军事科学 [China Military Science], no. 5 (2007), p. 93; Nan Li and Christopher Weuve, “China's Aircraft Carrier Ambitions: An Update,” *Naval War College Review* 63, no. 1 (Winter 2010), p. 15.
15. 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 (June 2009), p. 160.
16. 海韬, 梁嘉文 [Hai Tao and Liang Jiawen], “中国首艘航母‘诞生’记” [A Record of the “Birth” of the First Chinese Aircraft Carrier], 国际先驱导报 [International Herald Leader], 19 April 2011.
17. “中国航母试航共解决9项内容” [China's Aircraft Carrier Trials Resolved 9 Content Areas], 中评社 [China Review News], 19 August 2011, gb.chinareviewnews.com/.
18. Deck handling of aircraft alone is an important, complex issue that could require extensive Chinese practice, procedure development, codification, and training. Nothing can be taken for granted in at-sea operations. PLAN personnel will need to learn how to stand watch; master damage-control procedures; connect aircraft to auxiliary electrical power, move them around the flight deck, send them up and down elevators to and from the hangar deck, tie them down to keep them from sliding into the sea when the carrier heels in a sharp turn, and then untie, unchock, and move them into takeoff position; and operate command and control and radars—under all possible conditions, including heavy seas.
19. “HHQ-9,” *Jane's Strategic Weapon Systems*, jsws.janes.com/; “HHQ-9A,” Deagel.com.
20. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2011: Annual Report to Congress* (Washington, D.C.: August 2011), p. 46, available at www.defense.gov/.
21. “China Hudong Zhonghua Wins \$1 Billion LNG Ship Orders,” Reuters, 17 July 2011, www.reuters.com/.
22. Ibid.
23. “Hudong to Build Four LNG Carriers for MOL (China),” *LNG World News*, 10 December 2010, www.lngworldnews.com/.
24. “China's Maritime Rights and Navy,” pp. 16–25.
25. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2011*, p. 46.
26. ONI, *People's Liberation Army Navy*, p. 19.
27. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2011*, p. 46.
28. “GAIC JJ-7B and JT-9,” *Jane's All the World's Aircraft*, 17 October 2011, www.janes.com/.
29. 西岗 [Xi Gang], “谁来支撑航母编队?” [Who Will Support the Aircraft Carrier Formation?], 南方周末 [Southern Weekend], 11 August 2011, available at news.sina.com.cn/.
30. 李菁 [Li Qing], “航母一代: 带领中国走向深蓝” [A First-Generation Aircraft Carrier: Taking China into the Deep Blue], 三联生活周刊 [Sanlian Life Weekly], 17 June 2011, pp. 52–60.
31. See Kenneth Allen and Aaron Shraberg, “Assessing the Grade Structure for China's

- Aircraft Carriers: Parts 1 and 2,” *China Brief*, 15 and 29 July 2011, www.jamestown.org/.
32. Xi Gang, “Who Will Support the Aircraft Carrier Formation?”
 33. 邓佑标 [Deng Youbiao], “海军大连舰艇学院首次招收飞行学员” [Dalian Naval Vessel Academy Recruits Flight Students for the First Time], *Liberation Army Daily*, 5 September 2008, p. 5.
 34. *Dalian Naval Academy* (海军大连舰艇学院), www.dljj.edu.cn/.
 35. Nan Li, “Similarities and Differences in American and Chinese Naval Education: Implications for Cooperation,” in *China, the United States, and 21st Century Sea Power: Defining a Maritime Security Partnership*, ed. Andrew Erickson, Lyle Goldstein, and Nan Li (Annapolis, Md.: Naval Institute Press, 2010), p. 416.
 36. *Ibid.*, p. 421.
 37. U.S. Defense Dept., *Military and Security Developments Involving the People’s Republic of China 2011*, p. 46.
 38. Robert C. Rubel, “The U.S. Navy’s Transition to Jets,” *Naval War College Review* 63, no. 2 (Spring 2010), p. 51.
 39. *Ibid.*, p. 52.
 40. A catapult must be reset constantly to accommodate given aircraft types and gross weights: too much steam and the launch gear will rip off, too little and the aircraft will fall into the sea.
 41. Like catapults, arresting gear must be reset constantly based on aircraft type and “bring aboard” weight on landing; the aircraft’s weight must be calculated to ensure that it does not exceed the “max trap,” and payload must be jettisoned if necessary.
 42. For the new Japanese design, see Yoji Koda, “A New Carrier Race? Strategy, Force Planning, and JS *Hyuga*,” *Naval War College Review* 64, no. 3 (Summer 2011), pp. 31–60.
 43. Catapults enable aircraft to take off without wind, even slightly downwind in the case of *Nimitz*-class aircraft carriers with their powerful catapults. Aircraft on ski-jump carriers must take off straight into the wind, placing a premium on monitoring changing wave action and wind conditions. The ski jump itself may produce a “bubble” of turbulence that must be factored in. In either case, crosswinds and tailwinds must be avoided.
 44. 胡威 [Hu Wei], “中國航母在建 不會駛入他國” [Aircraft Carrier under Construction in China Will Not Enter Another Country], 香港商報訊 [Hong Kong Commercial Daily], 7 June 2011, www.hkcd.com.hk/.
 45. U.S. Defense Dept., *Military and Security Developments Involving the People’s Republic of China 2011*, p. 3.
 46. *Ibid.*, p. 46.
 47. *Ibid.*, p. 3.
 48. Li Qing, “First-Generation Aircraft Carrier,” pp. 52–60.
 49. “著名军事专家尹卓少将谈航空母舰与现代战争” [Renowned Military Expert Rear Admiral Yin Zhuo Comments on Aircraft Carriers and Modern Warfare], 人民网强国论坛 [Strong Nation Forum, People’s Daily Online], 14 April 2011, www.people.com.cn/.
 50. A carrier has a radar horizon of roughly thirty nautical miles; this could in theory allow data-linked UAVs to connect it with escort ships as far as sixty nautical miles out, but an unrealistic number of ships would be required to support 360-degree coverage. Single-axis support would be more feasible.
 51. David Axe, “Chinese Navy Drone Spotted,” *Diplomat*, 26 June 2011, the-diplomat.com/.
 52. The authors are indebted to Robert Rubel for his input concerning this section.
 53. “中国航母或于6日试航” [Chinese Aircraft Carrier Begins Six Days of Sea Trials], 共同网 [Kyodo News], china.kyodonews.jp/.
 54. 龙腾, 日月 [Long Teng and Ri Yue], “直-8雷达机的性能和装备价值” [The Performance and Equipment Value of the Zhi-8 Radar Helicopter], 现代舰船 [Modern Ships] (January 2011), pp. 12–16.
 55. “Surveillance Aircraft,” *Chinese Military Aviation*, s.v. “Ka-31,” cnair.top81.cn/.
 56. In this context, “path-dependent” means that future development decisions will be limited by those being made at present, even after the conditions that motivated the original decisions may no longer be operative.
 57. 任旭, 侯亚铭 [Ren Xu and Hou Yaming], “舰载机: 航母的‘手臂’” [Carrier-borne

- Aircraft: The Aircraft Carrier's "Arm"], *Liberation Army Daily*, 11 April 2011, p. 8.
58. After *Enterprise* the United States built four conventionally powered carriers (the *Kitty Hawk* class) before going back to nuclear power in the 1970s, during a major energy crisis.
 59. "Renowned Military Expert Rear Admiral Yin Zhuo Comments on Aircraft Carriers and Modern Warfare."
 60. ONI, *People's Liberation Army Navy*, p. 45.
 61. See Daniel J. Kostecka, "Places and Bases: The Chinese Navy's Emerging Support Network in the Indian Ocean," *Naval War College Review* 64, no. 1 (Winter 2011), pp. 59–78.
 62. The authors thank Nan Li for these points.
 63. Zhang Yuliang et al., 战役学 [Science of Campaigns] (Beijing: National Defense Univ. Press, 2006).
 64. Pan Xiaomin and Wu Chao, "Fierce Tigers of Land Warfare Quietly Invade Unnamed Reef," 人民海军 [People's Navy], 17 December 2008; Wei Gang, Li Yanlin, and Wu Chao, "A Chinese Naval Ship Formation Conducts the First Long-Voyage Training Sail around the South China Sea," *People's Navy*, 2 December 2008; Bai Yang, "Three Underway Replenishment Records Have Been Reset," *People's Navy*, 22 June 2009.
 65. Minnie Chan, "Challenge Will Be Training Pilots, Ex-general Says," *South China Morning Post*, 1 April 2010.
 66. 解放军报记者郭建跃 [*Liberation Army Daily* Special Reporter Guo Jianyue], "军报: 若没勇气用航母解决领土争端造它干啥?" [Military Newspaper: Why Build an Aircraft Carrier If We Lack the Courage to Use It to Resolve Territorial Disputes?], 中国军网 [China Military Online], 10 August 2011, jz.chinamil.com.cn/.
 67. Capt. Xu Ping, "Tentative Analysis of Hu Jintao's Strategic Thinking on Accomplishing Diversified Military Tasks," 中国军事科学 [China Military Science] (March 2010).
 68. The authors are indebted to Nan Li for this point.
 69. "B. Active Participation in Counterstrike Operations," in *Air Raid and Anti-Air Raid in the 21st Century* (Beijing: Liberation Army Press, May 2002).
 70. 薛兴林 [Bi Xinglin], ed., 战役理论学习指南 [Campaign Theory Study Guide] (Beijing: National Defense Univ. Press, 2002), pp. 107, 228–56.
 71. See Kostecka, "Places and Bases."
 72. Li Jie, "How Big a Role Do Aircraft Carriers Play in Noncombat Operations? Part 1," 当代海军 [Modern Navy] (January 2009), and "How Big a Role Do Aircraft Carriers Play in Noncombat Operations? Part 2," *Modern Navy* (February 2009). Li is a research fellow of the Naval Research Institute.
 73. Sandy Woodward and Patrick Robinson, *One Hundred Days: The Memoirs of the Falklands Battle Group Commander* (Annapolis, Md.: Naval Institute Press, 1997).
 74. Quoted widely. See, for example, Ens. D. S. Dees, "A Billion Dollar Blunder," U.S. Naval Institute *Proceedings* 123/7/1,133 (July 1997).
 75. Li and Weuve, "China's Aircraft Carrier Ambitions," pp. 16–17.
 76. U.S. Defense Dept., *Military and Security Developments Involving the People's Republic of China 2011*, p. 41.
 77. This formulation of the dramatic challenges facing China was coined by Kenneth Lieberthal. See Lieberthal, *Testimony to the House Committee on Foreign Affairs*, 23 July 2008, available at foreignaffairs.house.gov/.
 78. Li Jie, "How Big a Role Do Aircraft Carriers Play in Noncombat Operations?," parts 1 and 2.
 79. Ji Beibei, "Military Needs at Least Three Aircraft Carriers, Says Expert," *Global Times*, 11 July 2011, www.globaltimes.cn/.
 80. U.S. carriers are not always accompanied by all of their escorts. They deploy in large battle groups, but ships are often detached on individual taskings.
 81. *Joint Press Release: Indo-French Bilateral Naval Exercise: Varuna 1*, 4 January 2011, indiannavy.nic.in/.
 82. Li Jie, "How Big a Role Do Aircraft Carriers Play in Noncombat Operations?," parts 1 and 2.
 83. *Bohai Shipbuilding Heavy Industry Company*, www.bshic.com/gsjj/.
 84. Li Jie, "How Big a Role Do Aircraft Carriers Play in Noncombat Operations?," parts 1 and

2. See also Bruce A. Elleman, *Waves of Hope: The U.S. Navy's Response to the Tsunami in Northern Indonesia*, Newport Paper 28 (Newport, R.I.: Naval War College Press, 2007), available at www.usnwc.edu/press/.
85. This might be particularly important for ambitious long-distance operations. If sailing from home port, and if fixed-wing aircraft not needed for the mission could be stowed below deck while leaving sufficient space for helicopter operations on the flight deck, access to overseas facilities to park unused aircraft might not be necessary.
86. Eric McVadon, "The U.S. Navy and the Chinese Aerospace Challenge," in *Chinese Aerospace Power: Evolving Maritime Roles*, ed. Andrew S. Erickson and Lyle Goldstein (Annapolis, Md.: Naval Institute Press, 2011), p. 478.
87. See Wang Houqing, 战役学 [Science of Campaigns] (Beijing: May 2000); and Zhang Yuliang et al., *Science of Campaigns*.
88. For the naval war with France, see Donald R. Hickey, "The Quasi-War: America's First Limited War, 1798–1801," *Northern Mariner/Le marin du nord* 18, nos. 3–4 (July–October 2008), pp. 67–77, available at www.cnrs-scrn.org/.
89. "Advance Policy Questions for the Honorable Leon Panetta Nominee to Be Secretary of Defense," p. 45, available at armed-services.senate.gov/.
90. John D. Banusiewicz, "Gates Describes U.S. Approach to Deterrence in Asia," American Forces Press Service, 5 June 2010, www.defense.gov/.
91. Government of Australia, *Defending Australia in the Asia Pacific Century: Force 2030* (Canberra: Department of Defence, 2009), available at www.defence.gov.au/.
92. Andrew Shearer, "The Yanks are Welcome in Oz," *Wall Street Journal Asia*, 15 September 2011, p. 15.
93. Mure Dickie and Martin Dickson, "China Hints at an Aircraft Carrier," *Financial Times*, 16 November 2008, us.ft.com/. For similar logic from Maj. Gen. Huang Guozhu, editor in chief of the PLA's newspaper, see "Put China's Aircraft Carrier into Perspective," *Liberation Army Daily*, 25 August 2011, eng.mod.gov.cn/.



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