Chinese Naval System Modernization Trends

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Introduction

Recent statements by paramount leader Hu Jintao and others indicate that China is now signaling its political intent, and indeed is beginning to assemble the naval forces, to begin to defend China's wide ranging interests further abroad. However, China does not provide for its citizens or for foreign parties, a clear explanation of its evolving maritime interests, naval doctrines and naval equipment modernization programs. Repeated calls for greater military transparency are largely ignored because the ruling Communist Party shares China's historical aversion to such, and it does not have to provide expansive details of the doctrine, strategies or hardware modernization objectives of the People's Liberation Army Navy (PLAN) to an adversarial legislature or press. The United States government offers frequent assessments of China's naval developments, but there is a sense that politics and a desire to protect sources inhibits the disclosure of more details to the public. In addition, analysts can also base their assessments on a large body of opaque literature from China, which includes official statements, strategy or hardware oriented academic and popular journals, plus interviews with Chinese officials or their military-commercial partners.

Another set of indicators are the ships and weapons the PLAN has or may purchase in the future. Despite their often classified nature, the examination naval weapon systems to some extent can provide more tangible indicators of potential trends in capabilities. It is also often the case that data is more easily obtained on foreign weapon systems sold to the PLAN, as well as on Chinese naval systems China wishes to sell. But it is important to stress that open sources often can only offer a limited basis upon which to derive conclusions about the People's Liberation Army.

That said, based on a long review of many of these opens sources[1] it is this analyst's conclusion that China is currently modernizing and expanding the PLAN to fulfill two broad goals. Initially China seeks to assemble new naval capabilities to contribute to new joint force capabilities which can first deny access to opposing naval forces to the Western Pacific, and then to exercise increasing military control over those regions to advance China's political-military objectives. This goal will be tied to development of China's naval nuclear missile forces. Second, China is now starting to build modern naval systems capable of increasingly global nuclear and non-nuclear power projection. The PLAN could have the wherewithal to begin to achieve the first goal by the middle of the next decade, and be well on its way to achieving the second by the middle of the 2020s.

China's reaching this level of maritime capability is dependent upon many factors, not the least of which is the survival of the Communist Party-People's Liberation Army ruling coalition and the continuation of their national and budgetary priorities of military expansion. Nevertheless,

the modernization and buildup of the PLAN is taking place today simultaneously with a broader Chinese military modernization that encompasses PLA investments in military-space power, 5th generation combat airpower, large aircraft and rapidly deployable mechanized army forces. If these investments continue and produce increasingly modern and capable PLA forces, it is not inconceivable that the PLA of the 2020s will have a broad global military projection capability.

By this period the PLAN may not be as large as the U.S. Navy, but it may possess a competitive array of high-technology capabilities, and be able to raise the costs to U.S. actions in ways that could result in damage to U.S. security interests and diminish Washington's ability to exercise international leadership. Absent an appropriate level of U.S. investment in its naval combat capabilities, and the strengthening of its Asian alliances and allied military capabilities, by the 2020s the PLA may be able to exercise increasing control over the Western Pacific. A brief list of possible dangers would include:

--Heightened threats to forward deployed U.S. carrier groups from an array of PLA anti-access forces, undermining a key pillar of the U.S. conventional deterrent in Asia, thus challenging the viability of U.S.-led alliance and defense networks.

--An increasing likelihood that forward deployed Chinese naval forces will be on hand to help U.S. forces, or to thwart U.S. influence over distant future crises that affect U.S. interests.

--China's increasing use of both naval and air-based power projection to foster new military coalitions that could exclude or diminish U.S. influence in regions of importance to China.

--A growing Chinese ability to reduce technology gaps, especially in terms of space systems, sensors, missiles, anti-missiles, energy-based weapons, combat aircraft and unmanned surveillance and combat systems.

--Additional challenges from China's increasing sale of advanced naval technologies to rogue states that may join China in seeking to undermine U.S. influence and interests.

But well before these dangers are realized, U.S. friends and allies may be forced to seek independent deterrent capabilities, raising the specter of arms races. By the 2020s, the U.S. may find itself competing or cooperating with China militarily far beyond the Asian region.

What follows is a brief review of China's naval hardware modernization trends.

Basis for Recent Naval Modernization

The most recent period of PLA modernization very likely began shortly after the 1989 Tiananmen Massacre, when the Chinese Communist Party leadership reversed the formerly low priority given to military modernization, in order to better defend the Party from perceived heighted internal and external threats. While former paramount leader Deng Xiaoping had hoped to delay such rearmament, he did initiate the critical 1986 "863 Program" for high-tech military research and development, which has profoundly affected China's current military-technical

progress. Many of the information, space, missile and energy-based weapon programs now benefitting PLAN modernization started with the 863 Program.

However, PLAN modernization received greater attention under the leadership of General/Admiral Liu Huaqing, a former PLAN commander whose high-tech savvy impressed Deng enough to elevate Liu to the critical Principal Vice Chairman of the PLA's Central Military Commission (CMC) between 1992 and 1997. Liu accelerated the PLA's acquisition of many foreign naval systems like the *Kilo* conventional submarines and *Sovremenniy* class destroyers from Russia, and then the purchase of components and weapons technology that later emerged in the Type 052B and Type 052C air defense destroyers. Liu likely also played a major role in the acquisition of the uncompleted Russian carrier *Varyag* from the Ukraine, acquired in 2002, and was a major advocate for the current aircraft carrier program. The 2002 to 2004 launchings of China's two second generation Type 093 nuclear attack submarine (SSN) and the first second generation Type 094 nuclear ballistic missile submarine (SSBN) was also likely possible due to Liu's leadership.

During the period of the 10th and 11th Five Year Plans (2001-2010) the People's Liberation Army has demonstrated an increased ability to develop, build and sustain an increasing array of modern naval vessels armed with increasingly capable weapon systems. Foreign technology has still been critical during this period, from the modernization of China's shipyards during the 1990s following access to Japanese and South Korean shipbuilding technology, to the ability to develop more modern warships based on purchased or co-developed Russian weapon systems.
A testament to the capability of China's shipyards is that the first 20,000 ton Type 071 LPD was built in about six months in 2006. In 2005 the China State Shipbuilding Corporation started construction of a new Jiangnan Shipyard on Changxing Island near Shanghai. When additional facilities are complete in about 2015 the Changxing complex may become the world's largest shipyard. It now has a new drydock that measures 580m x 120m, and this yard is now able to start building carriers and other combat ships larger than the *Varyag*. According to Google Earth and DigitalGlobe satellite imagery obtained by the *Jane's Information Group*, the Dalian shipyard and drydock to which the *Varyag* moved on or about 25 April 2009, did not exist at all in 2007.[2] The movement of the *Varyag* to this yard for eventual completion may also mean that is carrier may serve as a template to assist the construction of a reported two similar follow-on carriers.

The PLAN's phased warship development was illustrated by the 2002-2004 construction of two air defense destroyers based on the same hull: the Type 052B which used largely purchased Russian weapons and systems, and then the Type 052C which uses a new phased array radar co-developed with Ukrainian help, and a surface-to-air missile (SAM) based on Russian technology. A second co-developed SAM equips the new Type 054A frigate. These new destroyers and frigates use new stealth shaping and feature new-generation electronic and Type 730 close-in-weapon system (CIWS) anti-missile systems. China's heavy investment in new aircraft turbofan engines is expected to result in early spin-offs of new marine gas turbine engines, to allow China to supplement turbines now purchased from the Ukraine. This decade has also seen the PLAN transition from the 1980s-level Type 093 *Song* non-nuclear submarine (SSK) design to the more advanced *Yuan* class, with rumors that a succeeding SSK design is in development. While less is

known about SSN development, a hiatus since 2003 in the production of Type 093 SSNs may indicate that an improved or successor class is under development.

In addition the PLA is investing heavily in new basing and naval logistic support capacities. In 2004 a PLA source confirmed to the author a previous report that China was at the time building up to five new naval bases and facilities. The most noteworthy has been a new large base near the resort city of Sanya on Hainan Island. This base features a prominent underground facility for submarines. In early 2008 *Jane's* was able to use DigitalGlobe imagery to identify progress on the main opening of this facility and to identify other access points. This base also features new large docks and a new loading pier capable of handling aircraft carrier size ships.[3] The construction of this base follows China's effort since the 1970s to assert control over the South China Sea by building military bases and outposts in the Paracel and Spratly Island groups. Also significant is China's building maritime relationships with Burma, Bangladesh, Sri Lanka, Pakistan and Iran. These most often involve the construction of new modern port facilities and/or the sale of modern naval warship technology.

Future issues: In the next decade it is likely that China will prove the capacity to develop and build world-class warships, and will strive to sell them to friendly states. China is now completing two major large modern shipyards that will be capable of the modular construction of warships as large as aircraft carriers. The new Jiangnan Changxing yard in Shanghai and the new Dalian yard are just now able to start large carrier-size warship construction, as well as large amphibious assault ships and large logistic support ships. The PLAN is now developing either improved models of the Type 093 and Type 094 nuclear submarines, or successor classes. The PLAN will also develop more capable destroyers, frigates, small combatants, and make increasing use of innovative hull forms like the wave piercing catamaran. After their extensive development, in the next decade new surface warships can be expected to incorporate better supersonic anti-ship missiles, to perhaps include versions of the new anti-ship ballistic missile (ASBM) and new energy based weapons like railguns and lasers.

The PLAN's buildup at Sanya may soon lead to a greater effort by the PLA to militarily exploit its outposts in the Paracel and Spratly Islands, perhaps to sustain seabed and radar sensors to help create a "bastion" for the safe operation of new SSBNs. This would likely increase China's sensitivity over this region and perhaps lead to stronger efforts to exclude foreign naval forces from the critical sea lanes of the South China Sea. In addition, China's visible investment in new major port facilities in the Indian Ocean point to the likelihood that these states will increasingly grant access to the PLAN, as part of bi-lateral or multi-lateral military endeavors, perhaps under the aegis of the Shanghai Cooperation Organization. This will increase China's ability to affect critical sea lanes to the Persian Gulf and create increasing concern for India and for Asian states dependent upon Persian Gulf energy.

Information-Space-Missiles

Like the other PLA services the PLAN is moving to exploit a range of new information technologies, a doctrinal goal known as *informatiztion* in the PLA. Digital communication and training, as in the other PLA services, has enabled the PLAN to better implement new joint-

service doctrines and to better join new joint service region and theater command structures. Modern warships like the Type 052B and Type 039 submarines feature high levels of computerized automated controls to allow reductions in crew size. New computerized ship and submarine simulators also allow for greater training efficiencies. The PLAN even uses online connections to facilitate professional military education to its far-flung small island outposts in the disputed South China Sea.

In the last two years is has become apparent that the PLAN has increased its regional intelligence awareness by introducing new radar and undersea sensors. At the recent February 2009 IDEX arms show a Russians source confirmed the author's suspicion that Russia had sold long-range Over-the-Horizon radar systems to China, that had first been noted by an Asian military source to the author in 2007. Asian source also indicate that the PLAN has made some use of sea-bed sensors to monitor submarine and warship activity around Taiwan.

While the PLA considers whether it will form a new unique service to control space systems and space operations, it is likely that the PLAN will benefit and contribute to space operations as do other PLA services. The General Armaments Department of the CMC currently controls the PLA's growing constellation of optical and radar imagery, navigation, weather, communication, data-relay, electronic intelligence, and perhaps soon, deep space infrared early warning satellites. But all of these satellites will increasingly enable the PLAN to accomplish regional and extra-regional missions. Iridium satellite telephones are used by Maritime Militia to coordinate military operations by fishing ships.

Joint service coordination and space information systems are also allowing the PLAN to benefit from a novel naval weapon, the anti-ship ballistic missile (ASBM), and future cruise missiles and advanced SAMs. It is likely that the Second Artillery now controls emerging ASBMs, but when used in conjunction with the GAD's satellites they offer a potential revolutionary weapon, which poses a new threat to large U.S. Navy ships like aircraft carriers and critical air defense destroyers. A recent report from the National Air and Space Intelligence Center (NASIC) indicates that the initial DF-21 (CSS-5) based ASBM may have a range of 900+ miles (2,340+km).[4] But Asian military sources have indicated to the author that a new 3,000km range variant of the DF-21 may also have an anti-ship capability.

Space systems will also enable the PLAN to use longer range cruise missiles and new SAMs. While the PLAN uses a version of the 180km range YJ-82 anti-ship cruise missile from Type 039 SSKs, it can be expected to use sub-launched versions of the 500km-1,000km range YJ-62 and the smaller C-705 (YJ-75?), which is similar in size to the Russian Novator Club. The PLAN has purchased the Russian Altair Company's *Fort* SAM, the naval version of the Almaz-Antey S-300, which has a limited anti-tactical ballistic missile (ATBM) capability. The HHQ-9 missile that equips the new Type 052C destroyer may be the analogue to the ground-based FD-2000 SAM, which a Chinese source at the 2009 IDEX arms show told the author has been tested in an ATBM capacity.

Future issues: It can be expected that the PLAN will make greater use of radar, undersea and space information systems. The PLAN can be expected to make greater use of seabed sensors to

protect its future SSBN operating areas in the South China Sea and in areas around Taiwan and the East China Sea to counter U.S. and Japanese surface and submarine warships. It should be considered that the PLAN will benefit increasingly from PLA future developments in information, space and missile technology, and contribute to them as well. Some PLA academic literature suggests that PLAN SSBNs could become platforms for satellite launch and for direct ascent anti-satellite missile launches. China's significant investment in micro and nano satellites is also suited to enabling naval space operations.[5] It also has to be considered that the PLAN will eventually put smaller ASBMs on submarines and surface ships, as they can be cued and guided by the same satellite networks that enable cruise missiles and aircraft to accomplish their missions.

The next decade could also see the PLAN's rapid utilization of new long and short range unmanned aerial vehicles (UAVs) and unmanned underwater vehicles (UUVs) for surveillance and communication missions. The Chengdu Aircraft Corporation is developing a large UAV similar to the Northrop-Grumman *Global Hawk* while other Chinese companies are developing shorter range helicopter UAVs which could be used by large and small PLAN warships.[6] Since the mid-1990s China has also been developing autonomous UUVs, initially with Russian help.

Imagery, navigation, communication, data relay satellites and UAVs will eventually allow initial PLAN power projection missions, and may facilitate more capable naval anti-missile capabilities. Early power projection missions may take the form of global cruise missile strikes from SSNs, but later from larger aircraft carrier and amphibious formations. In the last two years the PLAN has launched two new large Space Events ships, part of a fleet of about seven such ships, which have assisted PLA-managed satellite and all of China's manned space missions. These ships could also contribute to tracking and even actual attack activities for space combat missions. China's longstanding interest in missile defenses, its demonstrated ASAT capability, plus comments by Asian sources, point to a possible PLA ABM capability in the early 2020s. It should be considered that the PLAN will naval versions of some of these systems to allow advanced ABM capabilities to be deployed on surface ships and perhaps submarines.

Submarines

The PLAN's traditional emphasis on submarines stems from early People's War doctrines that stressed coastal defense and sea denial to counter sea-borne invasion. PLAN non-nuclear submarines are expected to comprise about 50-60 modern to still-useful non-nuclear submarines (SSKs) by the middle of the next decade. The PLAN is expected to retain for some time most of the 19 or so Type 035 *Ming* class SSKs built mainly during the early 1990s, for secondary decoy, mining and Special Forces transport missions. But the 1990s saw a greatly increased investment by the PLA in both non-nuclear and nuclear powered submarines.

To achieve a rapid technology upgrade the PLAN has turned to Russia, for new non-nuclear submarines and technology, and technology for nuclear submarines. But Israel and perhaps others have provided submarine technology. However, the PLA has also made considerable strides in developing acoustic signature reduction technologies like advanced skewed propellers, engine isolation systems and anechoic hull coverings. In addition, academic technical literature

suggests the PLA has been developing multiple air independent propulsion (AIP) systems to include Sterling engines, fuel cells (with German inputs) and close cycle diesel engines similar to the French MESMA. These hold the potential for increasing submerged periods from one to two weeks, greatly increasing the tactical utility of SSKs.

To accelerate its modernization, in 1993 the PLAN ordered two Russian Project 877EMK *Kilo* class submarines, and two more advanced Project 636 *Kilos*. When the U.S. announced its intention in early 2001 to sell eight new SSKs to Taiwan, the PLAN responded in early 2002 by ordering eight more advanced Project 636M subs, armed with the Novator Club system of anti-ship, land-attack and anti-submarine cruise missiles. The anti-ship and land attack variants have a 200+km range, and the unique 3M54 variant uses a supersonic second stage to defeat CIWS defenses. Whereas Taipei and Washington have yet to begin construction of the first new SSK for Taiwan, the PLAN's eight new 636M *Kilos* were delivered by 2006. The PLAN's 12 *Kilos*, deployed to the East Sea and South Sea Fleets, now constitute a formidable, quiet, survivable (twin-hull construction) and well armed open-ocean capable SSK force.

After solving some developmental challenges by the late 1990s, by 2004 the PLAN had launched 13 of its Type 039 *Song* SSKs, similar in size and configuration to the 1980s level French *Agosta* SSK. The Type 039 marks a generational advance over the Type 035 by its greater use of digital ship control and combat systems, and its far better better sonar, weapons, and acoustic levels. While perhaps not quite as good as the *Kilo*, in late 2006 a *Song* SSK was now famously able to sneak up on the U.S.S. Kitty Hawk during an exercise near Japan. While reports contended the U.S. Navy was not watching for PLAN submarines, it is also well known that for decades, lesser capable but still quiet and well-captained SSKs have been able to penetrate U.S. carrier group defenses, highlighting a growing threat from PLAN SSKs.

Then in 2004 the PLAN reportedly caught U.S. intelligence services by surprise with the launch of the first *Yuan* (possibly Type 041) class SSK. So far about four have been launched, though the 2009 Department of Defense PLA report estimates up to 15 will be built. This SSK shows a dimensional similarity to the *Kilo* but differs in the placement of its forward hull horizontal fins. The *Yuan* may also incorporate double-hull construction and may be the first PLAN SSK class to use an AIP system. It features a cleaner hull form than the *Song*, and may also have better sonar and combat systems. There are also unconfirmed rumors that the PLAN has developed an additional SSK class which shows some similarity to the German Type 212 SSK class.

SSNs: The PLAN is expected to operate the three first generation Type 091 *Han* class that were updated between 1998 and 2002, perhaps increasingly for secondary and training missions. The 2002 launch of the first Type 093 *Shang* followed nearly a decade of great effort, followed by a second in 2003. There is some unconfirmed reporting that four more have been launched, for a total of six. Should such reports be false, then the production hiatus may be explained by preparations for a successor class, usually referred to as the Type 095. Chinese source images of the Type 093 indicate that it is a measured development the first generation 091, with a more hydrodynamic hull form, though the presence of air vents may generate some noise. Earlier estimates by the U.S. Office of Naval Intelligence compared the performance of the Type 093 to the late Soviet era Russian *Victor-III* SSN. If true, this would constitute a steep advance for

PLAN SSNs, bringing them to a level comparable to early U.S. *Los Angeles* class SSNs, but not as capable of the latest U.S., Russian and British SSN. This potential gap in performance may help explain a possible low production for the Type 093. The ultimate number of SSNs the PLA plans to build is not known, but might be determined by the size of the PLAN's SSBN and carrier forces.

SSBNs: In 2004 the PLAN launched its first Type 094 *Jin* class second generation SSBN. The 094's development extends back to the 1960s and several Chinese internet images show that it not a radical departure from the design of the solitary Type 091 *Xia* first generation SSBN. It is reasonable to expect it features improved sonar, combat and quieting systems. In 2007 the Department of Defense PLA report estimated the PLA would build up to five 094s, though Chinese sources sometimes note the total number may be six—the PLA has not disclosed its planned construction. Again, the hiatus in SSBN production may indicate the PLA is developing an improved version. Chinese internet commentary sometimes raises the possibility that future versions may have 16 submarine launched ballistic missiles (SLBMs) vice the current 12.

While the first Type 094 may not be operational until 2010, the expected service entry of the second generation JL-2 SLBM, it has been deployed to its likely new base near Sanya, including one 2008 visit to this base by PLA and Communist Party leader Hu Jintao. Some Asian sources have commented that the JL-2 has yet to overcome some developmental issues, but Chinese CCTV television coverage in late April 2009 indicated the JL-2 was "cold launched" from a Type 094 in 2005.

China's possible adoption of a "bastion" strategy for its new SSBNs may depend in part on success in extending the range of the JL-2. The U.S. intelligence community reports a current range of 7,200+km. From Hainan this is enough to reach Moscow and Canberra, but the 094 would have launch near Shanghai in order to reach Anchorage, Alaska. Chinese internet commentary sometimes mentions the possibility of a future 12,000km range JL-2, which would be sufficient to reach Seattle and Los Angeles from just east of Hainan Island, or Chicago if launched near Shanghai. NASIC has reported that the JL-2 may currently be armed with a single warhead, though Asian military sources have noted to the author that it may eventually carry 3 to 4 warheads. The 2005 "cold launch" image of the JL-2 shows that it has a blunt nosecone shape, which would be consistent with multiple warhead carriage.

Future issues: If current estimates hold, the PLAN could have about twice the number of SSKs as are in both the South Korean and Japanese navies, or over three times that in the Japanese or the Australian Navy. The high likelihood that later *Yuan* or successor classes of SSKs will feature an AIP system points to an increased ability of PLAN SSKs to conduct offensive as well as defensive missions in higher threat environments. A very quiet AIP powered SSK will also pose an increased risk to U.S. and Russian SSNs.

The future number of PLAN SSNs and SSBNs is a critical issue as it may affect other aspects of fleet size and the degree of aggressiveness that China may show in asserting control over some disputed maritime territories. Based on available open sources this analyst estimates tentatively that the PLA may be seeking a rough division in the number of long range nuclear missiles that it

assigns to the Second Artillery and to the PLAN. If one assumes that a notional size for a land-based ICBM type will be about "20," and that Type 094s will continue to have 12-16 SLBMs, that points to a potential early nuclear missile force increase to about 60-70+ missile each for ICBMs and SLBMs.

Should this estimate prove plausible, it would then follow that the PLAN would seek to justify greater resources and political considerations in order to protect the critical SSBNs. This would be increasingly necessary if the Type 094 suffers from an acoustic disadvantage compared to U.S., Indian and Russian SSNs. As such it is possible that the PLAN would seek to be able to deploy multiple SSN escorts for its SSBNs, and there may be a considerable difference in consideration between 5 and 6 SSBNs, as it has been suggested that the 6 SSBNs may enable simultaneous patrols by two SSBNs. The latter might serve to justify a new minimum force of 12 SSNs, though carrier battle group escort missions might increase this number from to between 15 and 20.

If the U.S. decides to pursue PLAN SSBNs with missiles targeted against the United States, as the U.S. Navy did versus Soviet SSBNs during the Cold War, then China may react by seeking to increase the capability and number of its SSNs to an even greater level. This would spur a new undersea technology competition, especially if China also responded by starting to pursue U.S. SSBNs.

Aircraft Carriers

In late April 2009 the incomplete former Soviet/Ukrainian aircraft carrier *Varyag* made its first voyage in Chinese waters. From its berth in Dalian harbor, where the PLA has kept it since 2002, the *Varyag* moved about two miles to a drydock in a nearly complete new large ship construction facility that did not exist in 2007. This new shipyard, and the *Varyag's* placement in it, demonstrates that China is now mobilizing resources to fulfill its longstanding ambition to build an aircraft carrier navy.

Long a matter of debate, at times complicated by Chinese disinformation, doubts about China's ambition to build a carrier navy have been laid to rest by series of public and semi-public Chinese disclosures. In mid-November 2008 Major General Qian Lihua, Director of the Foreign Affairs Office of the Chinese Ministry of Defense, told the *Financial Times*, "The navy of any great power...has the dream to have one or more aircraft carriers…" From late December 2008 through January 2009 Chinese military and shipyard sources made a rare series of press leaks to Japan's *Asahi Shimbun* and Hong Kong's *South China Morning Post*, previewing plans to build up to four new aircraft carriers by 2020. The first two would be 50,000 to 65,000 ton conventionally powered carriers similar to the *Varyag*, while the later two would be nuclear powered and similar to the uncompleted Soviet carrier *Ulyanovsk.* Then at the early March 2009 National People's Congress session, PLA Navy (PLAN) East Sea Fleet Commander Admiral Xu Hongmeng stated, "China really needs a carrier. Both technologically and economically, China already has the capacity to build a carrier…China will very soon have its own aircraft carrier." Then in late March 2009 Defense Minister General Liang Guanglie told visiting Japanese Defense Minister Hamada Yasukazu, "We need to develop an aircraft carrier."

Provided requisite funding and political support continue, the PLA will have to simultaneously advance at least four interrelated tasks to realize its carrier ambition. First the PLA will have to assemble the necessary design, construction, logistic support and combat support capabilities to sustain a carrier navy. Second, it will have to refurbish the Varyag to mission capable status and commence construction of indigenously designed carriers. Then it will have to expand the PLA Navy Air Force to include a range of carrier-capable aircraft for training, combat and combat support missions. Fourth, the PLA will have to train requisite personnel for their carriers and air wings.

In his 2004 memoirs Liu Huaqing (now 92) noted that he began investigating the construction of aircraft carriers for China in 1970. But he was not able to place a top priority on carriers, and as noted in his memoirs, instead pursued an intensive intelligence gathering campaign. This included the purchase of retired carriers from Australia, Russia, and a reported attempt to purchase the *Clemenceau* from France, culminating in the 1998 purchase of the Varyag for $20 million. Scores of PLA personnel have visited U.S., Russian, British, French and Brazilian carriers, to even include interrogating docents on the *U.S.S. Midway* carrier museum in San Diego. There has been extensive PLA contact with Russian carrier related companies, who stand to play a significant role in China's carrier development.

Starting in the 10th Five Year Plan of 2001-2005, the PLA started in earnest to build the infrastructure to support a future carrier fleet, as well as start to build the first generation of large warships which could serve as future carrier escorts. In early 2001 an Asian military source told Jane's that the PLA had started building a major new naval base on Hainan Island. Starting in 2002 the PLAN launched two Type 093 second-generation nuclear attack submarines, plus two Type 052B and two Type 052C air defense destroyers, which could serve as initial carrier battle group escorts.

China's carriers: Soon after the Varyag arrived at its new location it is increasingly apparent that this ship has entered a new more active phase in its eventual refurbishment as China's first aircraft carrier. DigitalGlobe images obtained by *Jane's* show the *Varyag* is now surrounded by four large construction cranes and Internet-source imagery shows that three new material and personnel elevators have been built around the carrier. The normally 58,500 ton (full load) *Varyag* was reported to be about 70 percent complete when it arrived in Dalian, and much speculation has centered on the condition of its steam-turbine engines. A possible end-goal for the *Varyag* or perhaps a PLA version of this design was potentially revealed by the Harbin Institute of Technology, a major PLA research subcontractor, when students and faculty built a large scale model of this ship for the university's 50th anniversary in 2003. This model showed a near copy of the *Varyag* equipped with at least 48 HQ-9 SAM launchers, 24 YJ-62 size cruise missiles, two Type 730 CIWS systems, all mounted the ship's periphery, and a phased array radar system—the same weapons and systems that equip the new Type 052C *Luyang II* destroyer. The possible lack of deck-hull mounted vertical launch anti-ship cruise missiles on a PLAN version of the *Varyag* may mean it can carry more than the usual 18 Sukhoi Su-33 size fighters.

Less is known about the PLA's nuclear-powered aircraft carrier plans, save that reports in January noted it would be larger, displacing as much as 65,000 tons. China has no previous experience with nuclear powered surface ships. However, inasmuch as Russia has announced the intention to build three to four new nuclear powered 50,000 to 60,000 ton aircraft carriers, it is possible that Russia stands to make a substantial contribution to China's nuclear carrier plans. Reports that China has acquired plans for the 80,000 ton Project 1143.7 (Ulyanovsk) class nuclear powered carrier are another indicator that China may seek Russian assistance.

Carrier Air Wing: Since 2005 Russian industry sources have told the author of China's interest in acquiring an initial group of Sukhoi Su-33 jet fighters for carrier operations. Since then negotiations between the PLA and Russia have waxed and waned, with reports ranging from China insisting on acquiring a small number that would not justify reviving production, to China's interest in purchasing up to 100 new Su-33s upgraded with more powerful radar, engines and weapons. Russian reluctance to sell the Su-33 is prompted by its concerns over China's Shenyang Aircraft Corporation having copied previously co-produced models of the Su-27SK/J-11, to include the new J-11B with Chinese radar and avionics, and soon engines, and the twin-seat J-11BS. In the late 1990s China also acquired an early T-10K/Su-33 prototype from the Ukraine, fueling speculation that China is developing its own carrier capable J-11, despite doubts that it can master the complex modifications necessary for carrier operations. More recently Chinese sources indicate that Shenyang may be developing a separate twin-engine 4th generation combat aircraft called the J-13 or J-15, which may be closer in size to the Boeing F/A-18C and slated for early development into a carrier capable version.

Should the PLA opt for upgraded Su-33s, they would quickly obtain a carrier combat aircraft that would have greater unrefueled range, greater maneuverability and options for longer range weapons than possessed by the current U.S. Navy Boeing F/A-18E/F fighter. During the recent April 2009 60th Anniversary celebration of the PLA Navy, Commander Wu Shengli publically called for the development of a "supersonic cruise" capable fighter for the PLAN, an indication of interest in 5th generation fighters that could eventually equip Chinese aircraft carriers. Both the Shenyang and Chengdu Aircraft Corporations are known to be developing 5th generation fighters. They may also be developing lightweight 5th generation fighters, inasmuch as a Chinese source disclosed to the author in 2005 that Chengdu was considering the development of a Lockheed-Martin F-35 class 5th generation fighter. The PLA has had a longstanding interest in acquiring vertical take-off fighters, having considered the British *Harrier* and the Russian Yakovlev Yak-141 at different times.

The PLA is also known to be developing carrier combat support aircraft, that initially could focus on airborne early warning (AEW) and anti-submarine versions of the Changhe Z-8 helicopter. A 2005 Chinese magazine photo of politician visiting an unknown design bureau revealed a possible model of an AWACs aircraft similar in size to the U.S. Navy E-1 Tracer. More recently China's Northwestern University, another major center for PLA-funded aerospace research, conducted wind tunnel analysis of the the twin-engine Sukhoi Su-80 cargo/passenger aircraft with saucer-shaped and "rail" shaped radar arrays. All of these designs could be configured for anti-submarine or cargo missions. In addition, the PLA can be expected to modify future unmanned combat and support aircraft for carrier operation. Shenyang's *Warrior*

Eagle UCAV concept revealed at the 2008 Zhuhai Airshow could form the basis for a future carrier-based UCAV similar in size to the Northrop-Grumman X-47B.

Less is known about the PLA's personnel and training programs to sustain its carrier fleet. The *Varyag*, once it enters service, possibly between 2012 and 2015, will serve initially as a platform for training and doctrine development. The PLANAF's existing regiment of Su-30MK2 fighters could also provide experienced pilots carrier training. Recent reports indicate that the PLAN may have access to the Saki carrier training facility at Saki in the Ukraine, and may pursue a training relationship with Brazil, who's *Sao Paulo* is the former French carrier *Foch*.

Future issues: If early 2009 reports from Chinese sources prove correct the PLAN would have a four-carrier force by the 2020s. Two smaller "Varyag" size carriers might prove best suited for regional and pro-SSBN missions, while the two larger nuclear powered carriers would be available for global political image projection or military projection missions. Again, provided the PLA retains its political power into the coming decades, a number of variables, ranging from a precipitous decline of U.S. global leadership to the emergence of hostile relationships with Russia, India, Japan or other powerful neighbors, could lead the PLA to build a larger number of carriers. It is likely that China's future 5th generation combat aircraft will have carrier capable variants. The potential emergence of a 5th generation short take-off and vertical landing (STOVL) 5th generation fighter could also lead the PLA to consider smaller pro-SSBN carriers or enable larger landing helicopter dock (LHD) amphibious assault ships that could fulfill secondary SSBN support missions.

Growing Amphibious Capabilities

The PLA has long maintained a capability for short-range amphibious projection, with the PLA Army providing the majority of amphibious equipped and trained divisions, and the nominally PLAN-controlled PLA Marines fielding two brigades. Having long used former U.S. World War 2 landing ship tanks (LSTs), the PLA began designing its own LSTs in the 1970s, maintaining a small force of 17-20 until earlier this decade, when these were effectively doubled by the construction of 10 *Yuting-II* and *10 Yubei* class LSTs between 2003 and 2005. PLAN LSTs are credited with a capacity of either 10 tanks or about 250 troops. In addition the PLAN maintains a much larger number of smaller LSM and LCU size amphibious transports. Recent reports indicating PLA interest in the large Russian *Zubr* assault hovercraft have yet to lead to a sale.

In 2006 the Taiwan Ministry of Defense estimated that the PLA could also mobilize 800 "civilian" ships to assist an invasion. China has about 150 or so fast ferries that could carry 100-500 troops each. The PLA could also mobilize fishing ships, regular ferries and Roll-on/Roll-off (Ro-Ro) cargo ships to pour troops, armor and material into captured ports. However, the use of such a "Dunkirk" collection of an invasion force would require substantial surprise plus flawless planning and weather, difficult variables on the Taiwan Strait.

Starting in the 10th Five Year Plan it is apparent that the PLA commenced the building of larger amphibious assault ships capable of distant projection missions. This represents a stark change from previous PLAN practice and even exceeds the Soviet experience, whose largest *Rogov* class

amphibious assault ship was intended for tactical operations, not strategic. During the later six months of 2006 the PLA built and launched its first 20,000ton Type 071 landing platform dock (LPD). With an estimated capacity for about 800 troops the Type 071 has a helicopter landing deck that can accommodate two Z-8 size assault helicopters. In 2005 there were reports that the PLAN was interested in purchasing Russian Kamov Ka-29 specialized naval assault helicopters, but such has not happened. The PLAN can be expected to eventually place versions of the Z-10 or lighter Z-11 attack helicopters on its larger amphibious assault ships. The Type 071 also has a well deck designed to carry the new *Yuyi* class hovercraft, similar to but smaller than the U.S. Landing Craft-Air Cushion (LCAC). This will allow the deployment of heavy armor and equipment from beyond the horizon.

In 2007 a Chinese source at the Singapore IMDEX naval show confirmed to the author that China was developing the Type 081 landing helicopter dock (LHD). Subsequent Chinese-source concept illustrations indicate this 20,000 ton ship differs from the Type 071 by having a full length aircraft deck and provision for SAMs and a phased-array radar. Some sources report that the PLA intends eventually to build a force of 6 Type 081s and 3 Type 071s. If realized, this would enable the PLA to mount an amphibious projection force of several thousand troops plus their associated armor and equipment, as far as logistic support ships or port access would allow.

In addition the PLA has invested considerable effort to develop new and more effective amphibious assault equipment and armor. The PLA has developed its version of the "Funnies," specialized beach assault equipment which the Allies perfected during World War 2, to include mine-clearing rockets and trucks that lay aprons to assist trucks getting over beaches. In the late 1990s the PLA revealed that it had developed the Type-63C amphibious tank, equipped with a Russian-designed 105mm gun-launched anti-tank missile that out-ranges Taiwan's 105mm tank guns. These are now being supplemented by a new family of amphibious assault vehicles that began appearing in 2005. The ZBD2000 utilizes a powerful pumpjet and a planning hull to achieve high speeds over water, and has a version armed with a 105mm gun, an infantry fighter vehicle version with a 30mm cannon, plus command and logistic support variants. This new assault vehicle family is now entering PLA Army and Marine units. It has succeeded in part due to its smaller size, compared to the the similar but larger and troubled/over budget U.S. Marines Expeditionary Fighting Vehicle (EFV), which has recently had its planned procurement halved and is in danger of cancellation altogether.

Future issues: The Type 071 and 081 represent the PLA's first generation of large amphibious projection ships. It is reasonable to expect that the PLA may develop larger successors to both classes nearer to the 2020s. The PLA would have more cause to develop larger LHDs if the Chengdu Co. were to develop a short take-off vertical landing (STOVL) capable 5th generation fighter. The PLA's apparent success in developing a family of fast planning amphibious assault vehicles serves to enable PLAN amphibious ships to strike from beyond the horizon, the long objective of the U.S. Marines. It is just as possible that in the future U.S. Marines will be cooperating with their PLA counterparts in distant humanitarian or other missions, as it is also possible that the U.S. Navy and the PLAN could race to dominate a distant critical beachhead. In the near future, if a U.S. Navy and PLAN LPD arrived simultaneously at the same assault

point, it is possible that the PLAN would succeed first in placing dominant armored forces ashore.

Destroyers and Frigates

Modern PLAN surface warships are quickly emerging to fulfill air defense, escort, and perhaps in the future, anti-missile and anti-submarine missions. The PLAN is slowly retiring its long-serving *Luda* class destroyers, of which 17 built during the 1970s and 1980s. About 14 remain in service, equipped mainly with anti-ship missile and gun armament, intended mainly to extend further out to sea previous PLAN doctrines of sea denial. As it acquired four Russian-built 1980s technology *Sovremenniy* class destroyers, from 2000 to 2006, the PLAN was developing three new classes of air defense destroyers that used purchased and co-developed sensor and weapon systems. Starting in 2003 the PLAN launched its new stealthy Type 054 *Jiankai* frigate, and a second class of stealthy frigate is expected before the end of the decade.

It appears that in building two ships each of three classes of air defense destroyers, filling a long-standing gap in capability, among the PLAN's possible goals were to build different capability levels and to test different technologies and weapon-sensor combinations. The Type 051C, based on the transitional Type 051 *Luhai* class hull, features the high performance Russian *Fort* vertical-launched SAM system, which could deal with some tactical ballistic missile threats and high-speed cruise missiles. Then the Type 052B *Luyang I* featured the medium range Russian Shtil rail-launched SAM, and medium-range ASMs, perhaps also offering a more cost effective design. The Type 052C *Luyang II* was more ambitious, featuring an Aegis-like phased array radar and the HHQ-9 vertical-launched SAM co-developed with Russia's Almaz-Antey SAM company. This SAM may have some ATBM capability, a feature that the PLAN will likely further develop for future destroyers.

The next class of PLAN destroyer is the subject of constant speculation by Chinese military magazines and websites, but there is little indication from open sources what capabilities it will stress. A recent issue of *Shipborne Weapons*, which seems to specialize in such speculation, posited a future PLAN destroyer class that apparently utilizes a smaller more capable version of the phased array radar of the Type 052C, and the new vertical launched SAM that equips the new Type 054A *Jiankai II* frigate. It would appear to be quite similar to the later versions of the U.S. *Burke* class air defense destroyer. It also features a larger bow sonar dome, indicating it may have a much improved anti-submarine capability. Such a ship would appear to be designed for carrier escort missions among others, but again, this is just speculation from one popular Chinese military magazine.

The PLAN frigate force now includes over 25 1970s vintage Jianghu class ships and 14 Jiangwei I and Jiangwei 2 ships, built from the late 1980s up until 2004. Both classes are ill equipped for modern naval warfare but could help enforce blockades if covered by land-based airpower. Some Jiangweis have been seen undergoing refurbishment while some Jianghu's have been converted to carry 122mm multiple artillery rocket systems to perform amphibious fire support missions. The 2003 arrival of the Type 054 signaled the PLAN's intention not to ignore this warship class. Having a similar stealthy shape to Taiwan/French *LaFayette* class frigate, the

Type 054 and especially the later Type 054A with a new vertical launched SAM, they are a more capable though less expensive compliment to the PLAN's new destroyers. The PLAN is expected to build up to 12 Type 054A frigates. In 2007 a European source told the author that Germany's MTU maritime engine concern had won the competition to provide co-produced diesel engines for the next class of PLAN frigate, also expected to number 12 when completed.

Future issues: The PLAN follows closely global naval development trends and Chinese academic and popular military literature reflects an interest in how foreign navies are applying new technologies to produce more combat and cost effective solutions to naval challenges. It should be expected that future PLAN warships will make greater use of stealth, advanced electronics, automation to reduce crew size and Chinese-developed gas turbine engines. Future PLAN warships could also feature much longer range SAMs, new supersonic anti-ship and land-attack missiles, new laser or railgun weapons, and make greater use of UAVs and UUVs.

Small Combatants

In the 1960s and 1970s the PLAN build hundreds of fast attack craft (FAC) based on Soviet Komar and Osa class FACs armed with HY-1 copies of the Soviet Styx early anti-ship missile. Tied to coastal defense "People's War" doctrines these FACs were intended to operate in large numbers in conjunction with mines, submarines and air forces to thwart invasion from the sea. The decline of this threat from the 1980s onward also saw a decline in PLAN FAC numbers.

However, the PLAN has revived interest in this class of warship during the 10^{th} and 11^{th} five year plan. In 2004 the PLAN launched its first Type 022 stealthy wave-piercing catamaran FAC and in early 2009 *Jane's Fighting Ships* estimated that about 60 had been built, out of a potential requirement for 100. Based on a fast-ferry design developed by the Australian AMD Corporation, the 220 ton Type 022's wave-piecing catamaran configuration gives it a high 36 kt speed and offers such smaller ships better sea keeping ability in higher sea states. The Type 022 also uses stealth shaping, stealth coatings and disruptive camouflage to reduce its radar and optical signature. It is armed with up to eight YJ-82 anti-ship cruise missiles though it only has very light defensive armament consisting of one 25mm gun turret and MANPADS. This means that Type 022s can be used to add scores of ASMs to surface action groups for operations within the First Island Chain. In November 2007 Type 022s did join a surface action group consisting of larger destroyers and frigates for naval exercises in the South China Sea. However, the large missile bays could be configured for other types of missile ordinance, such as 300mm artillery rockets to assist amphibious operations. With adequate external cuing the Type 022 could also carry longer range land attack cruise missiles.

Future issues: Of some importance the Type 022 points the possibility of the PLAN building larger wave- piercing catamaran ships for more diverse missions. Starting in 2005 China has built a rescue ship and a fast ferry using a wave piercing catamaran hull, both roughly in the 300-400 ton range. The first fast ferry may have been launched on June 2, 2009. It appears to be able to carry 200-300 passengers. This is not as large as the 950 ton Joint High Speed Surface Vessel (JHSV) wave-piercing catamaran to be built for the U.S. Navy, but it does indicate the PLA could opt to build larger similar warships to enable high speed troop and material

movement for amphibious operations. In early 2008 the popular Chinese military magazine *Shipborne Weapons* printed a speculative article exploring future versions of the Type 022, to include a larger "corvette" version which could carry unmanned helicopters or small manned helicopters, to perhaps serve as a command ship.

Auxiliaries

A rapid buildup of logistic supply and other auxillary support ships would be a key indicator of the PLA's intension to assemble a navy increasingly capable of regional and extra-regional power projection. But so far into this decade, it would appear that the PLAN is not yet ready for a significant expansion of its logistic support fleet, though it has demonstrated a clear capability to do so should it make that decision. From 2002 to 2003 the PLAN built two 23,000 ton *Fuchi* class modern underway replenishment ships (AORs). Based on an earlier design produced for Thailand, the *Fuchi* is a modern AOR capable of underway transfer of fuel and solid stores. These ships have supported PLAN naval diplomatic deployments to Europe and Asia, and also supported the first anti-piracy deployment in December 2008. Prior to this the PLAN built two 21,000 ton *Fuqing* class underway replenishment ships in the 1970s, and acquired the Ukraine-built 37,000 ton *Nanyun* underway refueling tanker in 1993.

Smaller versions of the *Fuchi* hull appear to forms the basis of two other new auxiliaries. In 2006 the 14,000+ ton *Danyao* class was launched. While its primary mission was not readily apparent, Chinese sources have pointed to its being designed to replenish Paracel and Spratly Island outposts. It can lower smaller cargo landing craft into the water to move supplies to the shallow water islets in the Spratly group, or use a helicopter. This ship would also seem suited to for potential future missions to deploy or tend underwater sensors in the South China Sea. Then in 2007 the PLAN launched its first purpose-built 14,000+ ton Type 920 *Anwei* class hospital ship. While its medical support capabilities have not been reported, this ships gives the PLAN a hefty tool play a major role in future humanitarian relief operations. It can also serve to raise combat morale by offering a greater assurance of medical support for military personnel deployed for Taiwan, regional or extra-regional military operations.

Land Based Naval Air Forces

The People's Liberation Army Navy Air Force (PLANAF) consists mainly of land-based fighters, attack fighters, bombers, refueling tankers, plus land and sea-based helicopters. These units are assigned to the three PLAN fleets and the PLANAF conducts most of its own training. As the PLA becomes more comfortable with joint operations, and to realize command and personnel efficiencies, it is possible to consider the PLAN narrowing its types of land-based air assets and devoting most of its resources to new carrier based air wings. While the PLAN would be loath to reduce its combat capabilities, it is possible to consider the PLA Air Force lobbying to have the Navy give up most of its land-based fighters and bombers should it start building politically attractive aircraft carriers. The PLAAF's 3+ and 4th generation fighters and attackers, approaching 500 in number, are capable of mounting effective naval strikes. The PLAAF also has increasing numbers of AWACS and other support aircraft to better control naval air operations. The PLA Air Force may also be doubly sore, as its apparent attempt to control a

possible future "Space Force" may not be meeting with success. It is also possible to consider the PLAN's coastal defense cruise missile forces being transferred to the Second Artillery.

For the current period however, it appears that the PLAN is intent on improving both its air forces and coastal defense missile forces. In the last decade the PLANAF has acquired one regiment of Su-30MKK2 fighter bombers, and may have three to four regiments of the Xian JH-7 and JH-7A fighter bomber. The Sukhoi is the more capable of the two and the PLAN may want to retain these, especially if the PLA opts to purchase Su-33s for its early aircraft carriers. The JH-7 approaches the performance of the British version of the McDonnell-Douglas F-4K *Phantom*, and uses the same Rolls Royce Spey 202 engines. In fact, a 1998 agreement between Rolls Royce and the PLA to revive a failed attempt of the 1970s to buy this engine led to a successful co-production agreement, which made the newer JH-7A possible. The PLA has recently revealed that it has equipped the JH-7 with new electronic warfare pods, in a manner similar to the U.S. E/A-6 electronic warfare aircraft. Chinese sources have recently revealed a possible 1990s design effort to develop a more advanced stealthy version, called the JH-7B. This could also be Xian's attempt to compete with Shenyang's new J-11BS or another unknown stealthy attacker program.

Earlier this decade the PLANAF introduced a new version of the long-serving Xian H-6 bomber, this time armed with four wing-mounted 200+km range YJ-83 anti-ship cruise missiles. In small numbers, this bomber would not survive long in a modern combat environment, but it may meet with success as part of a larger coordinated massed launching of anti-ship cruise missiles from air and sea platforms. The PLANAF also uses small numbers of HU-6 aerial refueling tankers which serve a small number of Shenyang J-8 fighters equipped with refueling probes.
One area of deficiency for the PLANAF is in maritime patrol and anti submarine warfare aircraft. It does have a small number of Shaanxi Y-8 four-turboprop transports outfitted for maritime surveillance missions, and a small number of Y-8s also carry British *Searchwater* AEW radar. More recently the PLANAF has acquired new special mission Y-8s equipped for electronic warfare missions. Earlier interest in buying or co-producing the Russian Beriev Be-200 turbofan powered patrol seaplane has not materialized, and the PLA may instead be designing a new turboprop powered seaplane. The PLANAF does not have a dedicated ASW aircraft like the Lockheed Martin P-3 or the Russian Ilyushin Il-38.

The PLAN has also maintained a small but widely based number of coastal defense units armed with anti-ship missiles. Asian military sources have told the author in 2008 that the PLAN had upgraded its coastal artillery units near Taiwan with a new version of the YJ-62 long-range anti-ship cruise missile. The transporter-erector-launcher (TEL) for this cruise missile has since been revealed by Chinese sources, showing it is now a mobile missile, compared to previously fixed PLAN coastal missile emplacements. The long range of the YJ-62 raises interesting questions. Will the Second Artillery press to control these assets, inasmuch as the SA is also building its force new strategic land attack cruise missiles? Or instead, could the PLAN coastal defense force justify its acquiring new ASBMs, which are thought to currently be controlled by the Second Artillery? The latter possibility would increase should the PLAN successfully press for a submarine or ship launch capable ASBM.

Future issues: So far the PLANAF has not purchased the newer Shenyang J-11B or the Chengdu J-10 fighters. However, it may be attracted to the new twin-seat J-11BS, which would offer a better attack and training platform for carrier based pilots. In addition the PLANAF can be expected to take a strong interest in emerging UAV and UCAV programs of the PLA. Chengdu's large surveillance UAV would be ideally suit PLANAF desires to more closely monitor disputed territories in the East and South China Seas, down to the Malacca Straits. Inasmuch as China may now be developing a new four-turbofan engine transport aircraft similar in size to the Boeing 767, it is likely that the PLANAF will be an early customer for aerial refueling version of this airliner. In addition, China's intention to build a new competitive 150+ passenger airliner by 2014 or 2015, similar in size to the Boeing 737 or Airbus 320, could provide a useful long-range platform for a dedicated ASW, patrol or electronic support aircraft.

Meeting the Challenge

China's potential to build a large power-projection navy by the 2020s will significantly alter the balance of power in Asia and globally. Should this new power be controlled by the same Chinese Communist Party that tolerates no legitimate opposition forces in China, is profoundly hostile to democracy, remains ready to militarily end democracy on Taiwan, and seeks to displace American power in Asia, there are bound to be opportunities for future conflict between China and the democratic states. However, in 2009 China has not yet assembled the myriad elements to build and sustain a global power projection navy. The U.S. Pacific Command controls the most powerful and deployable naval and air combine in Asia, which gives the leadership of the United States great flexibility to address challenges to its security and to exercise regional leadership.

Though the U.S. now faces a period of significant economic turmoil, which is in no small part responsible for recent decisions to curtail several expensive U.S. weapons programs, it is also short sighted in the extreme to dismiss the requirements for many of these systems as "next war-itis." China, North Korea, Iran and others are not giving the U.S. the luxury to ignore their increasing high-technology threats so the U.S. can better prosecute the low-tech wars of counter-insurgency. Sustaining the ability to deter China and others will only be increasingly difficult and expensive. The following are some key concerns and suggested responses:

--As it has been the U.S. experience, the PLA apparently has come to realize that a globally capable military requires access to space and perhaps control of space. The range of PLA military space programs designed to attack U.S. space assets means that an adequate U.S. defense and deterrent offensive military space capability is a requirement to sustain the U.S. ability to conduct global military operations.

--China's potential to develop a defended "Bastion" for future SSBN operations in the South China Sea raises the possibility of China's seeking to impose unacceptable controls over the commercially vital sea lanes of this region. This requires both a diplomatic and a military response if the U.S. truly values its traditional defense of "freedom of the seas." It would be ideal if China were to accept Western concepts of transparency and verifiable nuclear weapons controls but that is not likely. Absent this, it is necessary for the U.S. to change its longstanding

neutrality regarding the South China Sea disputes and to work with regional allies to ensure that China is deterred from imposing control over this region.

--As the PLA builds an increasingly capable phalanx of anti-access forces, to include unique weapons like the ASBM, it also apparent that the PLAN hopes to have carriers that can dominate regions in which the U.S. Navy has been deterred from or made ineffective. The ASBM threat makes more necessary the planned railgun and other energy weapons that would have best been enabled by the now curtailed DDG-1000 class destroyer. The advent of a Chinese carrier navy raises the issue of whether the U.S. Navy should develop its own long-range anti-ship ballistic missile for ship or submarine use, and sale to allies.

--At the same time, the advent of China's carrier navy raises the need to both consider the expansion of the U.S. carrier fleet in terms of numbers and capability, or the development of new sea-based platforms that are both more survivable and able to deliver effective air power. Though the U.S. Navy may be quite comfortable with its affordable fleet of F/A-18E/F combat aircraft, these may prove increasingly inadequate in the face of new Chinese Su-33, and future Chinese and/or Russian 5th generation carrier fighters. It not the time to limit the number of U.S. Air Force F-22 5th generation fighters or limit their sale to allies. The U.S. should also begin investing in a 5+ or 6th generation combat aircraft. It is also necessary for the U.S. to develop new compact but highly capable UAVs and UCAVs which can be deployed from a wider range of smaller ships and submarines, to supplement the increasingly vulnerable aircraft carrier.

--China's buildup of increasingly capable non-nuclear submarines challenges regional navies as it does U.S. naval forces deployed to the Western Pacific. Part of the U.S. response is the commit greater resources to restore anti-submarine capabilities to the fleet. There is a growing need for a carrier-based long range anti-submarine aircraft, either manned or unmanned, which has been lost by the retirement of the Lockheed-Martin S-3 *Viking.* There is also a growing need for the U.S. explore options to more economically compliment its expensive SSN fleet. This could include forward deployment of high-tech non-nuclear submarines, large UUVs and rapidly deployable seabed sensors. Washington should also follow through on its 2001 commitment to sell new submarines to Taiwan, and improve ASW cooperation with its allies.

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[1] This testimony benefits from the author's review of these open sources on China's naval modernization trends as presented in his recent book, *China's Military Modernization, Building for Regiona888l and Global Reach,* Westport: Preager Security International, 2008, Chapters Five, Six and Seven. The section on aircraft carrier developments draws from the author's "China's Carrier Progress," *Jane's Intelligence Review,* (forthcoming).
[2] See "China forges ahead with new carrier," *Jane's Intelligence Weekly,* June 3, 2009, p. 10
[3] See author, "Secret Sanya—China's new nuclear naval base revealed," *Jane's Intelligence Review,* May 2008.
[4] National Air and Space Intelligence Center, *Ballistic and Cruise Missile Threat,* NASIC-1031-0985-09, p. 17.

[5] For a recent review of China's microsatellite efforts see the author's "China's Growing Microsatellite Prowess," for the Institute of Defense Studies and Analysis in New Delhi (forthcoming).
[6] For a review of the PLA's UAV sector and recent UAV developments see the author's "Maritime Employment of PLA Unmanned Aerial Vehicles," for the U.S. Naval War College (forthcoming).

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