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China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress

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Summary

China is building a modern and regionally powerful Navy with a modest but growing capability for conducting operations beyond China's near-seas region. The question of how the United States should respond to China's military modernization effort, including its naval modernization effort, is a key issue in U.S. defense planning. The question is of particular importance to the U.S. Navy, because many U.S. military programs for countering improved Chinese military forces would fall within the Navy's budget.

As a part of the U.S. strategic rebalancing toward the Asia-Pacific region announced in January 2012, Department of Defense (DOD) planning is placing an increased emphasis on the Asia-Pacific region. Administration officials have stated that notwithstanding constraints on U.S. defense spending, DOD will seek to protect initiatives relating to the U.S. military presence in the Asia-Pacific region.

Decisions that Congress and the executive branch make regarding U.S. Navy programs for countering improved Chinese maritime military capabilities could affect the likelihood or possible outcome of a potential U.S.-Chinese military conflict in the Pacific over Taiwan or some other issue. Some observers consider such a conflict to be very unlikely, in part because of significant U.S.-Chinese economic linkages and the tremendous damage that such a conflict could cause on both sides. In the absence of such a conflict, however, the U.S.-Chinese military balance in the Pacific could nevertheless influence day-to-day choices made by other Pacific countries, including choices on whether to align their policies more closely with China or the United States. In this sense, decisions that Congress and the executive branch make regarding U.S. Navy programs for countering improved Chinese maritime military forces could influence the political evolution of the Pacific, which in turn could affect the ability of the United States to pursue goals relating to various policy issues, both in the Pacific and elsewhere.

China's naval modernization effort encompasses a broad array of weapon acquisition programs, including anti-ship ballistic missiles (ASBMs), anti-ship cruise missiles (ASCMs), submarines, surface ships, aircraft, and supporting C4ISR (command and control, communications, computers, intelligence, surveillance, and reconnaissance) systems. China's naval modernization effort also includes reforms and improvements in maintenance and logistics, naval doctrine, personnel quality, education and training, and exercises.

Observers believe China's naval modernization effort is oriented toward developing capabilities for doing the following: addressing the situation with Taiwan militarily, if need be; asserting or defending China's territorial claims in the South China Sea and East China Sea; enforcing China's view that it has the right to regulate foreign military activities in its 200-mile maritime exclusive economic zone (EEZ); displacing U.S. influence in the Western Pacific; and asserting China's status as a leading regional power and major world power. Consistent with these goals, observers believe China wants its military to be capable of acting as an anti-access/area-denial (A2/AD) force—a force that can deter U.S. intervention in a conflict in China's near-seas region over Taiwan or some other issue, or failing that, delay the arrival or reduce the effectiveness of intervening U.S. forces. China may also use its navy for other purposes, such as conducting maritime security (including anti-piracy) operations, evacuating Chinese nationals in foreign countries when necessary, and conducting humanitarian assistance/disaster response (HA/DR) operations.

Potential oversight issues for Congress include the following: whether the U.S. Navy in coming years will be large and capable enough to adequately counter improved Chinese maritime forces while also adequately performing other missions around the world; the Navy's ability to counter Chinese ASBMs and submarines; and whether the Navy, in response to China's maritime A2/AD capabilities, should shift over time to a more distributed fleet architecture.

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Introduction

Issue for Congress

China is building a modern and regionally powerful Navy with a modest but growing capability for conducting operations beyond China's near-seas region. The question of how the United States should respond to China's military modernization effort, including its naval modernization effort, is as a key issue in U.S. defense planning. The question is of particular importance to the U.S. Navy, because many U.S. military programs for countering improved Chinese military forces would fall within the Navy's budget.

Decisions that Congress and the executive branch make regarding U.S. Navy programs for countering improved Chinese maritime military capabilities could affect the likelihood or possible outcome of a potential U.S.-Chinese military conflict in the Pacific over Taiwan or some other issue. Some observers consider such a conflict to be very unlikely, in part because of significant U.S.-Chinese economic linkages and the tremendous damage that such a conflict could cause on both sides. In the absence of such a conflict, however, the U.S.-Chinese military balance in the Pacific could nevertheless influence day-to-day choices made by other Pacific countries, including choices on whether to align their policies more closely with China or the United States. In this sense, decisions that Congress and the executive branch make regarding U.S. Navy programs for countering improved Chinese maritime military forces could influence the political evolution of the Pacific, which in turn could affect the ability of the United States to pursue goals relating to various policy issues, both in the Pacific and elsewhere.

Scope, Sources, and Terminology

This report focuses on the potential implications of China's naval modernization for future required U.S. Navy capabilities. Other CRS reports address separate issues relating to China.

This report is based on unclassified open-source information, such as the annual DOD report to Congress on military and security developments involving China,¹ an August 2009 report on China's navy from the Office of Naval Intelligence (ONI),² published reference sources such as *Jane's Fighting Ships*, and press reports.

For convenience, this report uses the term China's naval modernization to refer to the modernization not only of China's navy, but also of Chinese military forces outside China's navy that can be used to counter U.S. naval forces operating in the Western Pacific, such as land-based anti-ship ballistic missiles (ASBMs), land-based surface-to-air missiles (SAMs), land-based Air Force aircraft armed with anti-ship cruise missiles (ASCMs), and land-based long-range radars for detecting and tracking ships at sea.

¹ Department of Defense, *Annual Report to Congress [on] Military and Security Developments Involving the People's Republic of China 2014*. Washington, June 2014. 87 pp. Hereinafter *2014 DOD CMSD*. The 2010-2013 editions of the report are cited similarly. The 2009 and earlier editions of the report were known as the China military power report; the 2009 edition is cited as *2009 DOD CMP*, and earlier editions are cited similarly.

² Office of Naval Intelligence, *The People's Liberation Army Navy, A Modern Navy with Chinese Characteristics*, Suitland (MD), Office of Naval Intelligence, August 2009. 46 pp. (Hereinafter *2009 ONI Report*.)

China's military is formally called the People's Liberation Army, or PLA. Its navy is called the PLA Navy, or PLAN (also abbreviated as PLA[N]), and its air force is called the PLA Air Force, or PLAAF. The PLA Navy includes an air component that is called the PLA Naval Air Force, or PLANAF. China refers to its ballistic missile force as the Second Artillery Corps (SAC).

This report uses the term *China's near-seas region* to refer to the Yellow Sea, East China Sea, and South China Sea—the waters enclosed by the so-called *first island chain*. The so-called *second island chain* encloses both these waters and the Philippine Sea that is situated between the Philippines and Guam.³

Background

Overview of China's Naval Modernization Effort⁴

Date of Inception

Observers date the beginning of China's naval modernization effort to various points in the 1990s.⁵ Design work on the first of China's newer ship classes appears to have begun in the later 1980s.⁶ Some observers believe that China's military (including naval) modernization effort may have been reinforced or accelerated by China's observation of U.S. military operations against Iraq in Operation Desert Storm in 1991,⁷ and by a 1996 incident in which the United States deployed two aircraft carrier strike groups to waters near Taiwan in response to Chinese missile tests and naval exercises near Taiwan.⁸

A Broad-Based Modernization Effort with Many Elements

Although press reports on China's naval modernization effort sometimes focus on a single element, such as China's aircraft carrier program or its anti-ship ballistic missiles (ASBMs), China's naval modernization effort is a broad-based effort with many elements. China's naval modernization effort includes a wide array of platform and weapon acquisition programs,

³ For a map showing the first and second island chains, see *2013 DOD CMSD*, p. 81.

⁴ Unless otherwise indicated, shipbuilding program information in this section is taken from *Jane's Fighting Ships 2012-2013*, and previous editions. Other sources of information on these shipbuilding programs may disagree regarding projected ship commissioning dates or other details, but sources present similar overall pictures regarding PLA Navy shipbuilding.

⁵ China ordered its first four Russian-made Kilo-class submarines in 1993, and its four Russian-made Sovremenny-class destroyers in 1996. China laid the keel on its first Song (Type 039) class submarine in 1991, its first Luhui (Type 052) class destroyer in 1990, its Luhai (Type 051B) class destroyer in 1996, and its first Jiangwei I (Type 053 H2G) class frigate in 1990.

⁶ First-in-class ships whose keels were laid down in 1990 or 1991 (see previous footnote) likely reflect design work done in the latter 1980s.

⁷ See, for example, Robert Farley, "What Scares China's Military: The 1991 Gulf War," *The National Interest* (<http://nationalinterest.org>), November 24, 2014.

⁸ DOD, for example, stated in 2011 that "The U.S. response in the 1995-96 Taiwan Strait crisis underscored to Beijing the potential challenge of U.S. military intervention and highlighted the importance of developing a modern navy, capable of conducting A2AD [anti-access/area-denial] operations, or 'counter-intervention operations' in the PLA's lexicon." (*2011 DOD CMSD*, p. 57.)

including programs for ASBMs, anti-ship cruise missiles (ASCMs), land-attack cruise missiles (LACMs), surface-to-air missiles, mines, manned aircraft, unmanned aircraft, submarines, aircraft carriers, destroyers, frigates, corvettes, patrol craft, amphibious ships, mine countermeasures (MCM) ships, underway replenishment ships, hospital ships, and supporting C4ISR⁹ systems. Some of these acquisition programs are discussed in further detail below. China's naval modernization effort also includes reforms and improvements in maintenance and logistics, naval doctrine, personnel quality, education and training, and exercises.

Quality vs. Quantity

Although numbers of some types of Chinese navy ships have increased, China's naval modernization effort appears focused less on increasing total platform numbers than on increasing the modernity and capability of Chinese platforms. Changes in platform capability have been more dramatic than changes in platform numbers. In some cases (such as submarines and coastal patrol craft), total numbers of platforms have actually decreased over the past 20 years or so, but aggregate capability has nevertheless increased because a larger number of older and obsolescent platforms have been replaced by a smaller number of much more modern and capable new platforms. ONI states that

Although [China's] overall [navy] order-of-battle [i.e., numbers of ships] has remained relatively constant in recent years, the PLA(N) is rapidly retiring legacy combatants in favor of larger, multi-mission ships, equipped with advanced anti-ship, anti-air, and anti-submarine weapons and sensors.... Even if order-of-battle numbers remain relatively constant through 2020, the PLA(N) will possess far more combat capability due to the rapid rate of acquisition coupled with improving operational proficiency.¹⁰

Limitations and Weaknesses

Although China's naval modernization effort has substantially improved China's naval capabilities in recent years, observers believe China's navy currently has limitations or weaknesses in several areas, including capabilities for sustained operations by larger formations in distant waters, joint operations with other parts of China's military, antisubmarine warfare (ASW), MCM, a dependence on foreign suppliers for some ship components,¹¹ and a lack of operational experience in combat situations.¹²

⁹ C4ISR stands for command and control, communications, computers, intelligence, surveillance, and reconnaissance.

¹⁰ [Hearing on] Trends in China's Naval Modernization [before] U.S. China Economic and Security Review Commission[.] Testimony [of] Jesse L. Karotkin, [Senior Intelligence Officer for China, Office of Naval Intelligence, January 30, 2014],

¹¹ DOD states that "China continues to invest in foreign suppliers for some propulsion units, but is becoming increasingly self-reliant." (2014 DOD CMSD, p. 46.)

¹² DOD states that

China would face several shortcomings in a near-term conflict.... First, the PLA's deep-water anti-submarine warfare capability seems to lag behind its air and surface warfare capabilities. Second, it is not clear whether China has the capability to collect accurate targeting information and pass it to launch platforms in time for successful strikes against targets at sea beyond the first island chain. Chinese submarines do, however, already possess some capability to hold surface ships at risk, and China is working to overcome shortcomings in other areas.

(2014 DOD CMSD, pp. 31-32.)

(continued...)

The sufficiency of a country's naval capabilities is best assessed against that navy's intended missions. Although China's navy has limitations and weaknesses, it may nevertheless be sufficient for performing missions of interest to Chinese leaders. As China's navy reduces its weaknesses and limitations, it may become sufficient to perform a wider array of potential missions. China reportedly is working to overcome its limitations in ASW in part by deploying arrays of acoustic sensors on the ocean floor.¹³

Goals of Naval Modernization Effort

Observers believe China's naval modernization effort is oriented toward developing capabilities for doing the following:

- addressing the situation with Taiwan militarily, if need be;
- asserting or defending China's territorial claims in the South China Sea (SCS) and East China Sea (ECS);¹⁴
- enforcing China's view—a minority view among world nations—that it has the legal right to regulate foreign military activities in its 200-mile maritime exclusive economic zone (EEZ);¹⁵
- displacing U.S. influence in the Western Pacific; and
- asserting China's status as a leading regional power and major world power.¹⁶

Most observers believe that, consistent with these goals, China wants its military to be capable of acting as an anti-access/area-denial (A2/AD) force—a force that can deter U.S. intervention in a conflict in China's near-seas region over Taiwan or some other issue, or failing that, delay the

(...continued)

See also Dennis J. Blasko, "Ten Reasons Why China Will Have Trouble Fighting A Modern War," *War on the Rocks*, February 18, 2015.

¹³ See Lyle Goldstein and Shannon Knight, "Wired for Sound in the 'Near Seas,'" *U.S. Naval Institute Proceedings*, April 2014: 56-61; Harry Kazianis, "China's Underwater A2/AD Strategy," *The Diplomat* (<http://thediplomat.com>), May 6, 2014; "Experts: U.S. Undersea Surveillance System Poses Threats," *China Military Online English Edition*, February 13, 2015.

¹⁴ For more on China's territorial claims in the SCS and ECS, see CRS Report R42784, *Maritime Territorial and Exclusive Economic Zone (EEZ) Disputes Involving China: Issues for Congress*, by Ronald O'Rourke, and CRS Report R42930, *Maritime Territorial Disputes in East Asia: Issues for Congress*, by Ben Dolven, Mark E. Manyin, and Shirley A. Kan.

¹⁵ For more on China's view regarding its rights within its EEZ, see CRS Report R42784, *Maritime Territorial and Exclusive Economic Zone (EEZ) Disputes Involving China: Issues for Congress*, by Ronald O'Rourke.

¹⁶ DOD states that

Preparing for potential conflict in the Taiwan Strait, which includes deterring or defeating third-party intervention, remains the focus and primary driver of China's military investment. However, the Chinese People's Liberation Army (PLA) also is placing emphasis on preparing for contingencies other than Taiwan, including potential contingencies in the South and East China Seas....

As China's interests, capabilities, and international influence have grown, its military modernization program has also become increasingly focused on military investments for a range of missions beyond China's coast, including sea lane security, counterpiracy, peacekeeping, and humanitarian assistance/disaster relief (HA/DR).

(2014 DOD CMSD, p. i.)

arrival or reduce the effectiveness of intervening U.S. forces. (A2/AD is a term used by U.S. and other Western writers.¹⁷ During the Cold War, U.S. writers used the term sea-denial force to refer to a maritime A2/AD force.) ASBMs, attack submarines, and supporting C4ISR systems are viewed as key elements of China's emerging maritime A2/AD force, though other force elements—such as ASCMs, LACMs (for attacking U.S. air bases and other facilities in the Western Pacific), and mines—are also of significance.

China's maritime A2/AD force can be viewed as broadly analogous to the sea-denial force that the Soviet Union developed during the Cold War to deny U.S. use of the sea or counter U.S. forces participating in a NATO-Warsaw Pact conflict. One potential difference between the Soviet sea-denial force and China's emerging maritime A2/AD force is that China's force includes ASBMs capable of hitting moving ships at sea.

China may also use its navy for other purposes, such as conducting maritime security (including anti-piracy) operations, evacuating Chinese nationals in foreign countries when necessary, and conducting humanitarian assistance/disaster response (HA/DR) operations.

January 2014 ONI Testimony

In his prepared statement for a January 30, 2014, hearing on China's military modernization and its implications for the United States before the U.S.-China Economic and Security Review Commission, Jesse L. Karotkin, ONI's Senior Intelligence Officer for China, summarized China's naval modernization effort. For the text of Karotkin's statement, see **Appendix A**.

Selected Elements of China's Naval Modernization Effort

Anti-Ship Ballistic Missiles (ASBMs)

China for several years has been developing and testing an ASBM, referred to as the DF-21D, that is a theater-range ballistic missile equipped with a maneuverable reentry vehicle (MaRV) designed to hit moving ships at sea. DOD states that

China continues to field an ASBM based on a variant of the CSS-5 (DF-21) MRBM that it began deploying in 2010. This missile provides the PLA the capability to attack large ships, including aircraft carriers, in the western Pacific. The CSS-5 Mod 5 has a range exceeding 1,500 km [810 nautical miles] and is armed with a maneuverable warhead.¹⁸

DOD also states that "China continues to deploy growing numbers of the DF-21D antiship ballistic missile...."¹⁹

¹⁷ There is some debate among observers on this point. See, for example, M. Taylor Fravel and Christopher P. Twomey, "Projecting Strategy: The Myth of Chinese Counter-intervention," *The Washington Quarterly*, January 26, 2015; Franz-Stefan Gady, "The One Article to Read on Chinese Naval Strategy in 2015," *The Diplomat*, February 3, 2015; Michael Carl Haas, "China: Exit Counter-Intervention, Enter Peripheral Defense," *The Diplomat*, March 4, 2015; Franz-Stefan Gady, "This Is Still the One Article To Read on Chinese Naval Strategy in 2015," *The Diplomat*, March 5, 2015.

¹⁸ 2014 DOD CMSD, p. 37. A similar statement appears on page 7. See also 2009 ONI Report, pp. 26-27.

¹⁹ Statement for the Record, Worldwide Threat Assessment, [before the] Armed Services Committee, United States House of Representatives, Vincent R. Stewart, Lieutenant General, U.S. Marine Corps, Director, Defense Intelligence (continued...)

Another observer states that “the DF-21D’s warhead apparently uses a combination of radar and optical sensors to find the target and make final guidance updates.... Finally, it uses a high explosive, or a radio frequency or cluster warhead that at a minimum can achieve a mission kill [against the target ship].”²⁰

Observers have expressed strong concern about the DF-21D, because such missiles, in combination with broad-area maritime surveillance and targeting systems, would permit China to attack aircraft carriers, other U.S. Navy ships, or ships of allied or partner navies operating in the Western Pacific. The U.S. Navy has not previously faced a threat from highly accurate ballistic missiles capable of hitting moving ships at sea. For this reason, some observers have referred to the DF-21 as a “game-changing” weapon. Due to their ability to change course, the MaRVs on an ASBM would be more difficult to intercept than non-maneuvering ballistic missile reentry vehicles.²¹

According to press reports, the DF-21D has been tested over land but has not been tested in an end-to-end flight test against a target at sea. A January 23, 2013, press report about a test of the weapon in the Gobi desert in western China stated:

The People’s Liberation Army has successfully sunk a US aircraft carrier, according to a satellite photo provided by Google Earth, reports our sister paper *Want Daily*—though the strike was a war game, the carrier a mock-up platform and the “sinking” occurred on dry land in a remote part of western China.²²

A January 27, 2014, press report stated:

In the view of the U.S. Navy, the Mach 10 test of a hypersonic glide vehicle that China conducted on Jan. 9 reflects its predictions of future warfare. If and when China can put the technology into service, Beijing will have a weapon that challenges defenses and extends the range of its ballistic missiles against land and sea targets, but its offensive application is still some years away and depends on solving tough challenges in targeting and guidance.

(...continued)

Agency, February 3, 2015, p. 13.

²⁰ Richard Fisher, Jr., “PLA and U.S. Arms Racing in the Western Pacific,” available online at http://www.strategycenter.net/research/pubID.247/pub_detail.asp. A mission kill means that the ship is damaged enough that it cannot perform its intended mission.

²¹ For further discussion of China’s ASBM-development effort and its potential implications for U.S. naval forces, see Craig Hooper and Christopher Albon, “Get Off the Fainting Couch,” *U.S. Naval Institute Proceedings*, April 2010: 42-47; Andrew S. Erickson, “Ballistic Trajectory—China Develops New Anti-Ship Missile,” *Jane’s Intelligence Review*, January 4, 2010; Michael S. Chase, Andrew S. Erickson and Christopher Yeaw, “Chinese Theater and Strategic Missile Force Modernization and its Implications for the United States,” *The Journal of Strategic Studies*, February 2009: 67-114; Andrew S. Erickson and David D. Yang, “On the Verge of a Game-Changer,” *U.S. Naval Institute Proceedings*, May 2009: 26-32; Andrew Erickson, “Facing A New Missile Threat From China, How The U.S. Should Respond To China’s Development Of Anti-Ship Ballistic Missile Systems,” *CBSNews.com*, May 28, 2009; Andrew S. Erickson, “Chinese ASBM Development: Knowns and Unknowns,” *China Brief*, June 24, 2009: 4-8; Andrew S. Erickson and David D. Yang, “Using the Land to Control the Sea? Chinese Analysts Consider the Antiship Ballistic Missile,” *Naval War College Review*, Autumn 2009: 53-86; Eric Hagt and Matthew Durnin, “China’s Antiship Ballistic Missile, Developments and Missing Links,” *Naval War College Review*, Autumn 2009: 87-115; Mark Stokes, “China’s Evolving Conventional Strategic Strike Capability,” *The Anti-ship Ballistic Missile Challenge to U.S. Maritime Operations in the Western Pacific and Beyond*, Project 2049 Institute, September 14, 2009. 123 pp.

²² “PLA ‘Sinks’ US Carrier in DF-21D Missile Test in Gobi,” *Want China Times* (<http://www.wantchinatimes.com>), January 23, 2013, accessed March 21, 2013, at <http://www.wantchinatimes.com/news-subclass-cnt.aspx?id=20130123000112&cid=1101>.

The hypersonic glide vehicle (HGV) test appears to mark a step beyond China's anti-ship ballistic missile (ASBM) program, featuring a slower, shorter-range maneuverable reentry vehicle (RV)—and may point to a second-generation ASBM.

To some analysts, the test underscores the need for the U.S. to field directed-energy weapons, since interceptor missiles may be unable to handle targets that appear with little warning and then maneuver at speeds above Mach 5. The U.S. is developing directed-energy weapons, but it is not clear when they will be needed or available.

China's HGV, called WU-14 by the Pentagon, was launched into space by an intercontinental ballistic missile (ICBM) booster, after which it returned to the atmosphere to glide at up to Mach 10. The test was conducted within China, says the defense ministry in Beijing. On Jan. 19, another object was test-launched from the same space base at Taiyuan, says analyst Richard Fisher of the Washington-based International Assessment and Strategy Center. The Jan. 9 test was first detailed by Bill Gertz of the *Washington Free Beacon*....

A Chinese anti-ship ballistic missile, the DF-21D, is operational, according to the Pentagon, raising the possibility that HGV development will lead to a longer-range, more maneuverable anti-ship weapon.²³

Anti-Ship Cruise Missiles (ASCMs)

Among the most capable of the new ASCMs that have been acquired by China's navy are the Russian-made SS-N-22 Sunburn (carried by China's four Russian-made Sovremenny-class destroyers) and the Russian-made SS-N-27 Sizzler (carried by 8 of China's 12 Russian-made Kilo-class submarines). China's large inventory of ASCMs also includes several indigenous designs. DOD states that

The PLA Navy deploys the domestically produced ship-launched YJ-62 ASCM; the Russian SS-N-22/SUNBURN supersonic ASCM, which is fitted on China's SOVREMENNY-class DDGs acquired from Russia; and the Russian SS-N-27B/SIZZLER supersonic ASCM on China's Russian-built KILO SS. It has, or is acquiring, nearly a dozen ASCM variants, ranging from the 1950s-era CSS-N-2 to the modern Russian-made SS-N-22 and SS-N-27B. The pace of ASCM research, development, and production has accelerated over the past decade. In addition, the PLA Navy Air Force employs the YJ-83K ASCM on its JH-7 and H-6G aircraft. China has also developed the YJ-12 ASCM for the Navy. The new missile provides an increased threat to naval assets, due to its long range and supersonic speeds. It is capable of being launched from H-6 bombers.²⁴

²³ Bradley Perrett, Bill Sweetman, and Michael Fabey, "U.S. Navy Sees Chinese HGV As Part of Wider Threat," *Aviation Week & Space Technology* (www.aviationweek.com), January 27, 2014. See also Staff Reporter, "PLA's Hypersonic Vehicle 'Can Travel 10 Times The Speed Of Sound,'" *WantChinaTimes.com*, March 16, 2014.

²⁴ 2014 DOD CMSD, p. 40. See also Dennis M. Gormley, Andrew S. Erickson, and Jingdong Yuan, *A Low-Visibility Force Multiplier, Assessing China's Cruise Missile Ambitions*, Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, Washington, 2014, 165 pp.; Dennis Gormley, Andrew S. Erickson, and Jingdong Yuan, "China's Cruise Missiles: Flying Fast Under the Public's Radar," *The National Interest* (<http://nationalinterest.org>), May 12, 2014; Dennis M. Gormley, Andrew S. Erickson, and Jingdong Yuan, "A Potent Vector, Assessing Chinese Cruise Missile Developments," *Joint Force Quarterly*, 4th Quarter 2014: 98-105; "Bradley Perrett, "China Strongly Pushing Cruise Missile Capability," *Aerospace Daily & Defense Report*, May 22, 2014: 4; Wendell Minnick, "Report: Chinese Cruise Missiles Could Pose Biggest Threat to US Carriers," *DefenseNews.com*, June 2, 2014; Richard D. Fisher Jr., "China Unveils Third 'Russian' Supersonic Anti-Ship Cruise Missile," *Aerospace Daily & Defense Report*, November 10, 2014: 4; "China's Anti-Ship Missiles YJ-12 and YJ-100 Revealed," *China Military Online English Edition*, February 4, 2014.

Submarines

China's submarine modernization effort has attracted substantial attention and concern. DOD states, "The PLA Navy places a high priority on the modernization of its submarine force."²⁵ ONI states that

China has long regarded its submarine force as a critical element of regional deterrence, particularly when conducting "counter-intervention" against modern adversary. The large, but poorly equipped [submarine] force of the 1980s has given way to a more modern submarine force, optimized primarily for regional anti-surface warfare missions near major sea lines of communication.²⁶

Types Acquired in Recent Years

China since the mid-1990s has acquired 12 Russian-made Kilo-class non-nuclear-powered attack submarines (SSs) and put into service at least four new classes of indigenously built submarines, including the following:

- a new nuclear-powered ballistic missile submarine (SSBN) design called the Jin class or Type 094 (**Figure 1**);
- a new nuclear-powered attack submarine (SSN) design called the Shang class or Type 093;²⁷
- a new SS design called the Yuan class or Type 039A (**Figure 2**);²⁸ and
- another (and also fairly new) SS design called the Song class or Type 039/039G.

Figure 1. Jin (Type 094) Class Ballistic Missile Submarine



Source: Photograph provided to CRS by Navy Office of Legislative Affairs, December 2010.

²⁵ 2014 DOD CMSD, p. 7.

²⁶ [Hearing on] Trends in China's Naval Modernization [before] U.S. China Economic and Security Review Commission[,] Testimony [of] Jesse L. Karotkin, [Senior Intelligence Officer for China, Office of Naval Intelligence, January 30, 2014], accessed February 12, 2014, p. 7.

²⁷ Some sources state that a successor to the Shang class SSN design, called the Type 095 SSN design, is in development.

²⁸ Some sources refer to the Yuan class as the Type 041.

The Kilos and the four new classes of indigenously built submarines are regarded as much more modern and capable than China's aging older-generation submarines. At least some of the new indigenously built designs are believed to have benefitted from Russian submarine technology and design know-how.²⁹

DOD and other observers believe the Type 093 SSN design will be succeeded by a newer SSN design called the Type 095. The August 2009 ONI report includes a graph (see **Figure 3**) that shows the Type 095 SSN, along with the date 2015, suggesting that ONI projected in 2009 that the first Type 095 would enter service that year. DOD states that

China seeks some high-tech components and certain major end items, particularly from Russia, that it has difficulty producing domestically. China is pursuing... a new joint-design and production program for diesel-electric submarines based on the Russian PETERSBURG/LADA-class.³⁰

Figure 2. Yuan (Type 039A) Class Attack Submarine



Source: Photograph provided to CRS by Navy Office of Legislative Affairs, December 2010.

DOD also states that:

China continues the production of JIN-class nuclear-powered ballistic missile submarines (SSBNs). Three JIN-class SSBNs (Type 094) are currently operational, and up to five may enter service before China proceeds to its next generation SSBN (Type 096) over the next decade....

²⁹ The August 2009 ONI report states that the Yuan class may incorporate quieting technology from the Kilo class. (2009 ONI Report, p. 23.)

³⁰ 2014 DOD CMSSD, p. 47.

China also has expanded its force of nuclear-powered attack submarines (SSNs). Two SHANG-class SSNs (Type 093) are already in service, and China is building four improved variants of the SHANG-class SSN, which will replace the aging HAN-class SSNs (Type 091). In the next decade, China likely will construct the Type 095 guided-missile attack submarine (SSGN), which may enable a submarine-based land-attack capability. In addition to likely incorporating better quieting technologies, the Type 095 will fulfill traditional anti-ship roles with the incorporation of torpedoes and anti-ship cruise missiles (ASCMs).

The mainstay of the Chinese submarine force remains the diesel-powered attack submarine (SS). In addition to twelve KILO-class submarines acquired from Russia in the 1990s and 2000s, eight of which are equipped with the SS-N-27 ASCM, the PLA Navy possesses 13 SONG-class SS (Type 039) and 12 YUAN-class SSP (Type 039A). The YUAN-class SSP is armed similarly to the SONG-class SS, but also includes a possible air-independent power system. China may plan to construct up to 20 YUAN-class SSPs.³¹

China in 2011 commissioned into a service a new type of non-nuclear-powered submarine, called the Type 032 or Qing class according to *Jane's Fighting Ships 2014-2015*, that is about one-third larger than the Yuan-class design. Observers believe the boat may be a one-of-kind test platform; *Jane's Fighting Ships 2014-2015* refers to it as an auxiliary submarine (SSA).³²

A March 25, 2014, press report states:

Instead of providing the older Lada-class submarines to the People's Liberation Army Navy as requested by Beijing, Russia's president, Vladimir Putin, will likely authorize China to receive the more advanced Kalina-class submarine, reports the *Voice of Russia*, citing Vassily Kashin, a senior research fellow from the Moscow-based Center for Analysis of Strategies and Technologies.

Viktor Chirkov, the commander-in-chief of the Russian Navy, officially announced that the Kalina-class conventional submarine equipped with an advanced air-independent propulsion system will be developed and produced in the future on Mar. 20. "Russia is currently designing a fifth-generation conventional submarine, dubbed Project Kalina, which will be fitted with an air-independent propulsion (AIP) system," said Chirkov.

Authorities also declared that the construction of the older Lada-class submarine will be cancelled. The Lada-class, or Project 677, is a fourth-generation diesel-electric submarine based on the older Kilo-class submarine.

China was negotiating with Russia to purchase four Lada-class submarines from the Rubin Design Bureau based in St Petersburg. China hoped those submarines could be refitted with Chinese engines and an electronic fire-control system, according to the Canada-based *Kanwa Defense Review*.

As Russia remains isolated over its intervention in the Ukraine crisis, Moscow values China's position as one of its strategic partners, Kashin said. He added that the PLA Navy will benefit from the cancellation of the Lada-class as it will open a new door for China to gain more advanced technology from Russia to build its own submarine in the future.

³¹ 2014 DOD CMSD, pp. 7-8.

³² *Jane's Fighting Ships 2014-2015*, p. 134.

Meanwhile, China may be able to design its own fifth-generation conventional submarine with the help of Russia under this new concept, Kashin said.³³

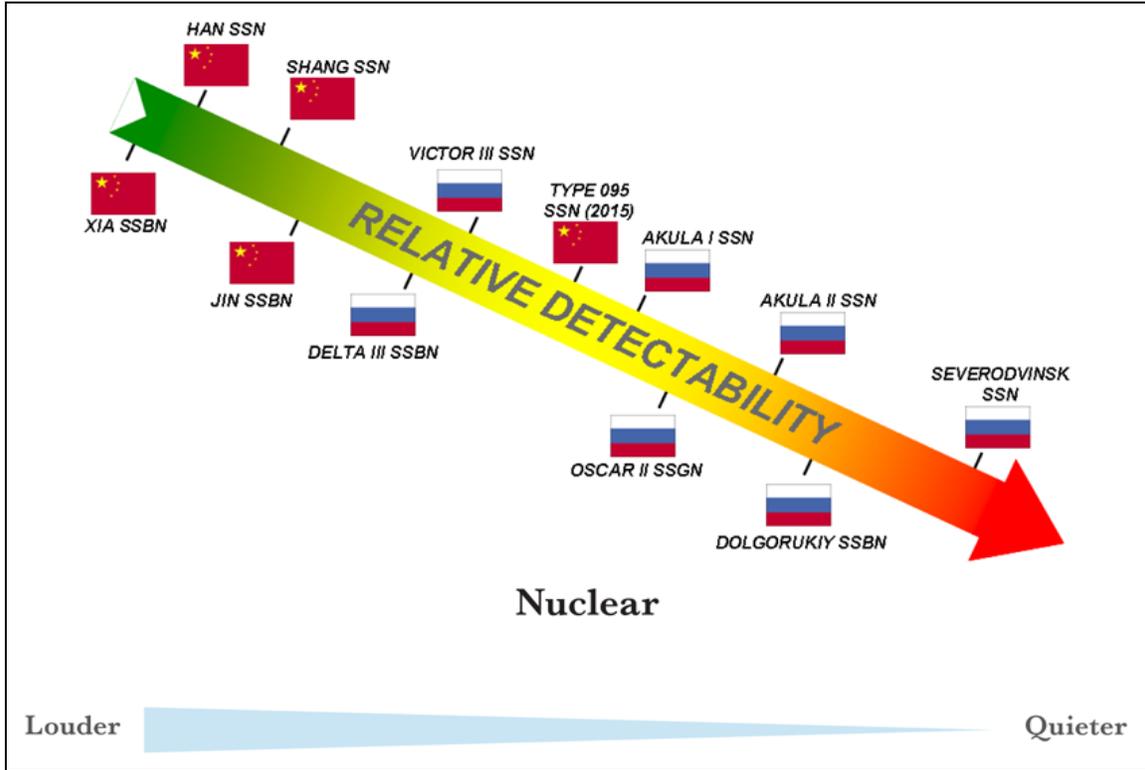
In August 2014, it was reported that researchers at the Harbin Institute of Technology in China are developing technology for a high-speed submarine that would take advantage of supercavitation (which essentially involves maintaining an air bubble around the submarine) to achieve speeds that are much higher than those of other submarines.³⁴

Figure 3 and **Figure 4**, which are taken from the August 2009 ONI report, show the acoustic quietness of Chinese nuclear- and non-nuclear-powered submarines, respectively, relative to that of Russian nuclear- and non-nuclear-powered submarines. The downward slope of the arrow in each figure indicates the increasingly lower noise levels (i.e., increasing acoustic quietness) of the submarine designs shown. In general, quieter submarines are more difficult for opposing forces to detect and counter. The green-yellow-red color spectrum on the arrow in each figure might be interpreted as a rough indication of the relative difficulty that a navy with capable antisubmarine warfare forces (such as the U.S. Navy) might have in detecting and countering these submarines: Green might indicate submarines that would be relatively easy for such a navy to detect and counter, yellow might indicate submarines that would be less easy for such a navy to detect and counter, and red might indicate submarines that would be more difficult for such a navy to detect and counter.

³³ Staff Reporter, "Russia To Give China More Advanced Submarine Technology," *WantChinaTimes.com*, March 25, 2014.

³⁴ See, for example, Terrence McCoy, "Chinese Reportedly Working on Submarine That Would 'Fly' in An 'Air Bubble,'" *Washington Post* (www.washingtonpost.com), August 26, 2014.

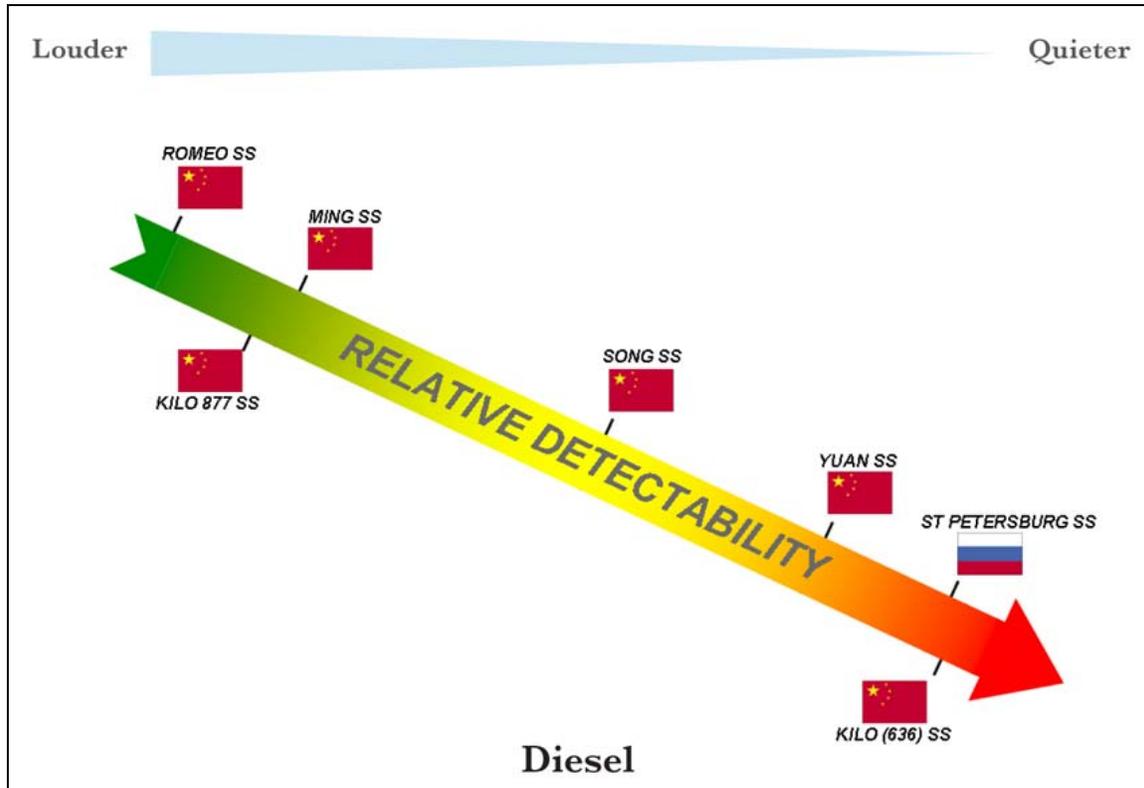
Figure 3. Acoustic Quietness of Chinese and Russian Nuclear-Powered Submarines



Source: 2009 ONI Report, p. 22.

Figure 4. Acoustic Quietness of Chinese and Russian Non-Nuclear-Powered Submarines

(Non-nuclear-powered submarines are commonly referred to as diesel or diesel-electric submarines)



Source: 2009 ONI Report, p. 22.

China's submarines are armed with one or more of the following: ASCMs, wire-guided and wake-homing torpedoes, and mines. Eight of the 12 Kilos purchased from Russia (presumably the ones purchased more recently) are armed with the highly capable Russian-made SS-N-27 Sizzler ASCM. In addition to other weapons, Shang-class SSNs may carry LACMs. Although ASCMs are often highlighted as sources of concern, wake-homing torpedoes are also a concern because they can be very difficult for surface ships to counter.

Although China's aging Ming-class (Type 035) submarines are based on old technology and are much less capable than China's newer-design submarines, China may decide that these older boats have continued value as minelayers or as bait or decoy submarines that can be used to draw out enemy submarines (such as U.S. SSNs) that can then be attacked by other Chinese naval forces.

In related areas of activity, China reportedly is developing new unmanned underwater vehicles,³⁵ and has modernized its substantial inventory of mines.³⁶ DOD stated in 2012 that "China has

³⁵ Lyle Goldstein and Shannon Knight, "Coming Without Shadows, Leaving Without Footprints," *U.S. Naval Institute Proceedings*, April 2010: 30-35.

³⁶ See, for example, Scott C. Truver, "Taking Mines Seriously, Mine Warfare in China's Near Seas," *Naval War College Review*, Spring 2012: 30-66.

developed torpedo and mine systems capable of area denial in a Taiwan scenario. Estimates of China's naval mine inventory exceed 50,000 mines, with many more capable systems developed in the past 10 years.³⁷

Submarine Acquisition Rate and Potential Submarine Force Size

Table 1 shows actual and projected commissionings of Chinese submarines by class since 1995, when China took delivery of its first two Kilo-class boats. The table includes the final nine boats in the Ming class, which is an older and less capable submarine design. As shown in **Table 1**, China by the end of 2012 was expected to have a total of 40 relatively modern attack submarines—meaning Shang, Kilo, Yuan, Song, and Qing class boats—in commission. As shown in the table, much of the growth in this figure occurred in 2004-2006, when 18 attack submarines (including 8 Kilo-class boats) were added, and in 2011-2012, when 9 attack submarines were added.

The figures in **Table 1** show that between 1995 and 2012, China placed or was expected to place into service a total of 52 submarines of all kinds, or an average of about 2.9 submarines per year. This average commissioning rate, if sustained indefinitely, would eventually result in a steady-state submarine force of about 58 to 87 boats of all kinds, assuming an average submarine life of 20 to 30 years.

Excluding the 12 Kilos purchased from Russia, the total number of domestically produced submarines placed into service between 1995 and 2012 is 40, or an average of about 2.2 per year. This average rate of domestic production, if sustained indefinitely, would eventually result in a steady-state force of domestically produced submarines of about 44 to 67 boats of all kinds, again assuming an average submarine life of 20 to 30 years.

The August 2009 ONI report states that “Chinese submarine procurement has focused on smaller numbers of modern, high-capability boats,” and that “over the next 10 to 15 years, primarily due to the introduction of new diesel-electric and [non-nuclear-powered] air independent power (AIP) submarines, the force is expected to increase incrementally in size to approximately 75 submarines.”³⁸

A May 16, 2013, press report quotes Admiral Samuel Locklear, the Commander of U.S. Pacific Command, as stating that China plans to acquire a total of 80 submarines.³⁹

³⁷ 2012 DOD CMSD, p. 23.

³⁸ 2009 ONI Report, p. 21. The report states on page 46 that “Because approximately three-quarters of the current submarine force will still be operational in 10-15 years, new submarine construction is expected to add approximately 10 platforms to the force.” See also the graph on page 45, which shows the submarine force leveling off in size around 2015.

³⁹ Richard Halloran, “China, US Engaging in Underwater Arms Race,” *Taipei Times*, May 16, 2013: 8, accessed May 17, 2013, at <http://www.taipeitimes.com/News/editorials/archives/2013/05/16/2003562368>.

Table I. PLA Navy Submarine Commissionings

Actual (1995-2013) and Projected (2014-2016)

	Jin (Type 094) SSBN	Shang (Type 093) SSN	Kilo SS (Russian- made)	Ming (Type 035) SS ^a	Song (Type 039) SS	Yuan (Type 039A) SS ^b	Qing (Type 032) SS	Annual total for all types shown	Cumulative total for all types shown	Cumulative total for modern attack boats ^c
1995			2 ^d	1				3	3	2
1996				1				1	4	2
1997				2				2	6	2
1998			1 ^d	2				3	9	3
1999			1 ^d		1			2	11	5
2000				1				1	12	5
2001				1	2			3	15	7
2002				1				1	16	7
2003					2			2	18	9
2004			1		3			4	22	13
2005			4		3			7	29	20
2006		1	3		2	1		7	36	27
2007	1	1						2	38	28
2008								0	38	28
2009						2		2	40	30
2010	1					1		2	42	31
2011						3	1 ^e	4	46	35
2012	1					5 ^f		6	52	40
2013	1					n/a		n/a	n/a	n/a
2014	n/a ^g	1 ^h				n/a		n/a	n/a	n/a
2015	n/a	n/a				n/a		n/a	n/a	n/a
2016	n/a	n/a				n/a		n/a	n/a	n/a

Source: *Jane's Fighting Ships 2014-2015*, and previous editions.

Note: n/a = data not available.

- Figures for Ming-class boats are when the boats were launched (i.e., put into the water for final construction). Actual commissioning dates for these boats may have been later.
- Some observers believe the Yuan class to be a variant of the Song class and refer to the Yuan class as the Type 039A.
- This total excludes the Jin-class SSBNs and the Ming-class SSs.
- Jane's Fighting Ships 2014-2015* lists the commissioning date of one of the two Kilos as December 15, 1994.
- Observers believe this boat may be a one-of-kind test platform; *Jane's Fighting Ships 2014-2015* refers to it as an auxiliary submarine (SSA).
- Jane's Fighting Ships 2014-2015* states that a class of up to 20 boats is expected (page 133).
- Jane's Fighting Ships 2014-2015* states that the fourth boat in the class began sea trials in 2014 (page 128).
- Jane's Fighting Ships 2014-2015* states that, following the first two ships in the class, "up to four further boats (Type 093A), the first of which was launched in 2012, are under construction. These are reported to be a modified design (commercial imagery suggests that Type 093A may be slightly longer than Type 093)." (Page 129.)

JL-2 SLBM on Jin-Class SSBN

Each Jin-class SSBN is expected to be armed with 12 JL-2 nuclear-armed submarine-launched ballistic missiles (SLBMs). DOD states that

The JIN-class SSBN will carry the new JL-2 submarine-launched ballistic missile (SLBM) with an estimated range of 7,400 km [3,996 nautical miles]. The JIN-class and the JL-2 will give the PLA Navy its first credible sea-based nuclear deterrent. China is likely to conduct its first nuclear deterrence patrols with the JIN-class SSBN in 2014.⁴⁰

A range of 7,400 km could permit Jin-class SSBNs to attack

- targets in Alaska (except the Alaskan panhandle) from protected bastions close to China;
- targets in Hawaii (as well as targets in Alaska, except the Alaskan panhandle) from locations south of Japan;
- targets in the western half of the 48 contiguous states (as well as Hawaii and Alaska) from mid-ocean locations west of Hawaii; and
- targets in all 50 states from mid-ocean locations east of Hawaii.

Aircraft Carriers and Carrier-Based Aircraft⁴¹

China has begun operating its first aircraft carrier—the *Liaoning*, a refurbished ex-Ukrainian aircraft carrier—and reportedly has begun construction of its first indigenously built aircraft carrier. Observers expect that it will be some time before China achieves proficiency in the operation of an embarked air wing on the *Liaoning*.

Liaoning (Ex-Ukrainian Aircraft Carrier Varyag)

On September 25, 2012, China commissioned into service its first aircraft carrier—the *Liaoning* (**Figure 5**), a refurbished ex-Ukrainian aircraft carrier, previously named *Varyag*, that China purchased from Ukraine as an unfinished ship in 1998.⁴² The *Liaoning* is named for the province containing Dalian, the port city where the ship was refurbished. DOD states that in 2013, the

⁴⁰ 2014 DOD CMSD, pp. 7-8. A similar statement appears on page 30.

⁴¹ China, according to one set of observers, initiated studies on possible aircraft carrier options in the 1990s, and approved a formal aircraft carrier program in 2004. (Andrew S. Erickson and Gabriel B. Collins, “The Calm Before the Storm,” *FP [Foreign Policy] National Security* (www.foreignpolicy.com), September 26, 2012.) Another observer dates Chinese activities in support of an eventual aircraft carrier program back to the 1980s. (Torbjorg Hemmingsen, “PLAN For Action: New Dawn for Chinese Naval Aviation,” *Jane’s Navy International*, June 2012: 12-17.) Chinese officials have been talking openly since 2006 about eventually operating aircraft carriers. A 2009 report from the Office of Naval Intelligence states that “Beginning in early 2006, PRC-owned media has reported statements from high-level officials on China’s intent to build aircraft carriers.” (Office of Naval Intelligence, *The People’s Liberation Army Navy, A Modern Navy with Chinese Characteristics*, Suitland (MD), August 2009, p. 19.

⁴² The Soviet Union began work on the *Varyag* in a shipyard in Ukraine, which at the time was part of the Soviet Union. Following the dissolution of the Soviet Union, construction work on the ship stopped and the unfinished ship became the property of Ukraine. For a discussion, see James Holmes, “The Long Strange Trip of China’s First Aircraft Carrier,” *Foreign Policy*, February 3, 2015; Chen Chu-chun and Staff Reporter, “Man Who Bought Varyag From Ukraine Plied Officials With Liquor,” *Want China Times*, January 22, 2015.

ship's home port was shifted from Dalian to the PLA Navy's Yuchi naval base, located in the North Sea Fleet.⁴³

Figure 5. Aircraft Carrier Liaoning (ex-Varyag)



Source: "Highlights of Liaoning Carrier's One-Year Service," *China Daily*, September 26, 2013, accessed September 30, 2013, at http://www.china.org.cn/china/2013-09/26/content_30142217.htm. This picture shows the ship during a sea trial in October 2012.

The *Liaoning* is conventionally powered, has an estimated full load displacement of almost 60,000 tons,⁴⁴ and might accommodate an eventual air wing of 30 or more aircraft, including fixed-wing airplanes and helicopters. A September 7, 2014, press report, citing an August 28, 2014, edition of the Chinese-language *Shanghai Morning Post*, stated that the *Liaoning*'s air wing may consist of 24 J-15 fighters, 6 anti-submarine warfare helicopters, 4 airborne early warning helicopters, and 2 rescue helicopters, for a total of 36 aircraft.⁴⁵ The *Liaoning* lacks aircraft catapults and instead launches fixed-wing airplanes off the ship's bow using an inclined "ski ramp."

By comparison, a U.S. Navy aircraft carrier is nuclear powered (giving it greater cruising endurance than a conventionally powered ship), has a full load displacement of about 100,000 tons, can accommodate an air wing of 60 or more aircraft, including fixed-wing aircraft and some helicopters, and launches its fixed-wing aircraft over both the ship's bow and its angled deck

⁴³ 2014 DOD CMSD, p. 7.

⁴⁴ *Jane's Fighting Ships 2012-2013* lists a full load displacement of 59,439 tons for the ship.

⁴⁵ Wendell Minnick, "Chinese Carrier's Purported Air Wing Deemed Plausible But Limited," *Defense News* (www.defensenews.com), September 7, 2014.

using catapults, which can give those aircraft a range/payload capability greater than that of aircraft launched with a ski ramp. The *Liaoning*, like a U.S. Navy aircraft carrier, lands fixed-wing aircraft using arresting wires on its angled deck.

Some observers have referred to the *Liaoning* as China's "starter" carrier.⁴⁶ The PLA Navy is currently learning to operate aircraft from the ship. DOD states, "The most significant development in the PLA Navy over the past year has been the first long-range deployment and continued flight operations of China's first aircraft carrier, CV-16, the LIAONING,"⁴⁷ and that the ship "continued flight integration training throughout 2013, but it is not expected to embark an operational air wing until 2015 or later."⁴⁸

A May 16, 2013, U.S. press report stated:

It will take less time for China to learn how to effectively operate aircraft carriers than it took the U.S., the commander of the U.S. Navy's Atlantic air arm, Rear Adm. Ted Branch said Wednesday.

"They will learn faster than we did and they will leverage our lessons," Branch said during a panel at the at the [sic] EAST: Joint Warfighting 2013 symposium in Virginia Beach, Va....

But the PLAN [PLA Navy] will unlikely be proficient in carrier operations for several more years.

"They have the advantage of starting with more modern technology but it's still a tough nut to crack to learn how to do this business," Branch said.

"They still have a lot of learning to do before they have a viable capability."⁴⁹

A September 12, 2013, press report stated:

The Chinese navy is using its first aircraft carrier, the *Liaoning*, for training and testing and will decide on an operational carrier for the fleet after a few years of evaluation, Admiral Wu Shengli said on Thursday [September 12].

The navy chief of the People's Liberation Army, on a military-to-military visit with his U.S. counterpart, told reporters at the Washington Navy Yard that Chinese sailors would carry out "very heavy" training over the next two or three years as they assess the carrier.

⁴⁶ See, for example, "China Plans New Generation of Carriers as Sea Disputes Grow," *Bloomberg News*, April 24, 2013.

⁴⁷ 2014 DOD CMSD, p. 68.

⁴⁸ 2014 DOD CMSD, p. 7. On page 36, DOD states that "During 2013, China focused on integrating the LIAONING with its J-15 aircraft as well as working out other carrier operations." On page 68, DOD states that

The J-15, a carrier-based fighter modeled after the Russian Su-33, conducted its first takeoffs and landings from the LIAONING on November 26, 2012. By September 2013, J-15s were conducting full-stops and takeoffs with weapon loads at full maximum gross weights. Additional full-stop landings, ramp takeoffs, and storage of aircraft in the hangar bay below the flight deck continued in October. Although the J-15 has a land-based combat radius of 1,200 km [about 650 nautical miles], the aircraft will be limited in range and armament when operating from the carrier, because the ski-jump design does not provide as much airspeed and, therefore, lift at takeoff as a catapult design.

⁴⁹ "Admiral: China Will Likely Learn Carrier Ropes Faster than U.S.," *USNI News* (<http://news.usni.org>), May 16, 2013. See also "China's First Aircraft Carrier Advances With jet Take-Off Drills," *Bloomberg.com*, July 4, 2013.

“After the training and experimentation we will have a final evaluation on the development of the aircraft carrier for the PLA navy,” said Shengli, whose delegation included the commander of the Liaoning and the first pilot to land on its flight deck....

“We have around 36 airplanes operating on board our ship,” [Senior Captain Zhang Zheng, the commander of the Liaoning] told reporters. “And we are still practicing and doing tests and experiments for the equipment and systems.”

Wu, Zhang and Captain Dai Ming Meng, the pilot who first landed on the carrier, visited several American ships in California earlier this week, including the carrier USS Carl Vinson, where they met with their counterparts.⁵⁰

Indigenous Aircraft Carriers

DOD states that “China also continues to pursue an indigenous aircraft carrier program... and likely will build multiple aircraft carriers over the next decade. The first Chinese-built carrier will likely be operational sometime at the beginning of the next decade.”⁵¹ On July 25, 2014, Admiral Jonathan Greenert, the U.S. Navy’s Chief of Naval Operations (CNO), stated that China “will build another carrier [in addition to the *Liaoning*], probably relatively soon,” that Chinese officials said it will “look just like” the *Liaoning*, with a ski ramp, that it will be similar in size to the Liaoning, with a displacement of 65,000 tons or 70,000 tons, and that China is “moving on a pace that is extraordinary.”⁵²

A March 9, 2015, press report states:

Several senior Chinese officials have confirmed that China is building its second aircraft carrier and will likely adopt an improved launch system for aircraft on the ship, a Chinese-language daily in Hong Kong reported Monday.

The Hong Kong Commercial Daily... cited Liu Xiaojiang..., a former political commissar of the People’s Liberation Army (PLA) Navy, as saying that the government’s industrial and manufacturing agencies are now in charge of the ship’s construction.

Liu said that compared with the first carrier, the Liaoning..., which was commissioned in September 2012, several improvements are being made to the second ship but concrete details are only known within those agencies responsible for the project....

The reports also cited Ma Weiming..., an expert in electrical and electronics engineering, as saying that the new carrier’s system to launch aircraft was proceeding smoothly.

⁵⁰ David Alexander, “China Navy Chief Says Operational Aircraft Carrier A Few Years Away,” *Reuters.com*, September 12, 2013.

⁵¹ 2014 DOD CMSD, p. 7. On page 38, DOD states that “China will probably build multiple aircraft carriers over the next 15 years.” On page 68, DOD states that “China acknowledged publicly for the first time in 2013 its desire to build indigenous aircraft carriers. The first Chinese-built carrier will likely be operational sometime at the beginning of the next decade.”

⁵² Claudette Roulo, “Greenert: China Moving Quickly to Modernize Navy,” DoD News, *Defense Media Activity/American Forces Press Service* (www.defense.gov/news), July 26, 2014; Bill Gertz, “Chinese Missile Forces Pose Threat to U.S. in Future Conflict,” *Washington Free Beacon* (<http://freebeacon.com>), July 28, 2014.

He stressed that the system was no longer inferior to and might even be more advanced than that used by the United States, whose catapult takeoff service technology is currently the best in the world.

China's CCTV reported last week that the catapult being tested in China to help planes take off quickly is more efficient than the "ski-jump" ramp used to launch aircraft on China's first carrier.⁵³

An October 22, 2014, press report states:

China will soon start building its second locally designed aircraft carrier in Shanghai, according to a Canadian report.

Kanwa Asian Defence, an English-language monthly defence review produced in Toronto, said Shanghai's Jiangnan Shipyard was preparing to start work on the carrier.

When completed, the carrier and another under construction in Dalian will give the PLA Navy two fully functioning, battle-ready aircraft carriers.

The recently completed *Liaoning*, the refitted former Soviet carrier Varyag, is classed as a training platform, not a full combat vessel, by the navy, since it went into service in September 2012.

Counter to many expectations, the new carrier about to be built at the Jiangnan Shipyard will use conventional, not nuclear power....

Military experts said China would not attempt a nuclear-powered carrier until a range of issues were resolved, such as the reliability of nuclear-powered engines, crew training and establishing a reliable home port for carrier maintenance.⁵⁴

A June 20, 2014, blog post states:

According to a June 5 report in the Strait Times.... China is "preparing to deploy three new carrier battle groups (CBG) in the world's oceans, with the first expected just three years from now."

The Singapore-based newspaper seems to have sourced the information from the latest GI Zhou newsletter. The newsletter is published in Australia and "specializes in forensic analysis of China's defense-related publications and news sources."...

The report lays out some very ambitious plans for China's supposed new carriers.

⁵³ "China Reportedly Building 2nd Aircraft Carrier," *Focus Taiwan News Channel*, March 9, 2015. See also "PLA Official Confirms 2nd Aircraft Carrier Under Construction," *Want China Times*, March 9, 2013; Zachary Keck, "Confirmed: China Is Building 2nd Aircraft Carrier," *The National Interest*, March 9, 2015; Charles Clover, "China Media Confirm Second Aircraft Carrier," *Financial Times*, March 10, 2015; Shannon Tiezzi, "Chinese Admirals Spill the Beans on New Aircraft Carrier," *The Diplomat*, March 12, 2015; "Corporate Meeting Reveals New PLA navy Aircraft Carrier in the Works," *Focus Taiwan News Channel*, February 1, 2015; Simon Denyer, "Fresh Reports Circulate on China's Second Aircraft Carrier," *Reuters*, February 2, 2015; "China Builds Second Aircraft Carrier, But Deletes News Reports Announcing It," *Washington Post*, February 2, 2015.

⁵⁴ Minnie Chan, "Shanghai Shipyard 'To Build Second Chinese Designed Aircraft Carrier,'" *South China Morning Post* (www.scmp.com), October 22, 2014.

In what one would have to assume would be a new class of ships for the PLAN, the new vessels “will have an overall length of 320m and a planned displacement of 85,000 tons. The Liaoning has an overall length of 300m and a displacement of 67,000 tons.”...

The challenge with such reports is that they are tough to verify and even harder to make accurate predictions against. When you consider how difficult it was for China to fully develop and put to sea one carrier that was partially completed (yes, it was completely refurbished from top to bottom) it seems quite the challenge to develop a whole new class of carriers so quickly.

Could the report be more a wish list than a stated fact? Thinking through the logic it would seem so....

My own take: China will have four carriers and accompanying CBG’s at some point, just don’t look for Beijing’s latest flat top on the high seas in three years’ time.⁵⁵

A May 28, 2014, press report states:

The People’s Liberation Army Navy will commission between three and four carrier battle groups over the next 15 years, reports the latest issue of Kanwa Defense Review, a military magazine run by Andrei Chang also known as Pinkov, a defense expert from Canada....

China is also quicker at constructing large surface combat vessels than the United States, according to the magazine, which stated that China already has plans to build two domestic aircraft carriers after the Liaoning. Over the next 15 years, the PLA Navy may be able to maintain four carrier battle groups.⁵⁶

A March 2, 2014, press report states:

The Moscow-based *Military Parade* has revealed more details on China’s secretive construction of indigenous aircraft carriers in Dalian and Shanghai.

In an [sic] report on Feb. 28, the Russian website said that the first vessel—known as 001A and designed by the China Shipbuilding Industry Corporation—is being built in Dalian in northeast China’s Liaoning province and will be equipped with a steam catapult. The new carrier is expected to have a greater tonnage than China’s first aircraft carrier, the Liaoning, which was originally a Soviet-era Admiral Kuznetsov-class carrier purchased from Ukraine in 1998.

The second vessel—known as 002—under construction at Jiangnan shipyard on Shanghai’s Changxing island, will be China’s first nuclear-powered aircraft carrier, the report said. The size of the 002 will be similar to the USS Kitty Hawk with a tonnage of 61,351, and will be 5% larger than the 001A.

Both vessels have been designed based on blueprints of the unfinished Soviet Ulyanovsk-class aircraft carrier, according to *Military Parade*. The 002 will be fitted with four steam catapults, while the 001A will only have two. The 001A is likely to be named after the

⁵⁵ Harry Kazianis, “China’s Oversized Carrier Ambitions,” *The Diplomat* (<http://thediplomat.com>), June 20, 2014. See also Sean O’Connor, “PLAN To Get First Homegrown Carrier by 2017, Claims Local Media,” *Jane’s Defence Weekly*, June 11, 2017.

⁵⁶ Staff Reporter, “PLA Could Commission Four Carrier Battle Groups: Kanwa,” *Want China Times* (www.wantchinatimes.com), May 28, 2014.

northeastern province of Shandong, similar to the Liaoning, which was also named after a Chinese province.

The Shandong aircraft carrier may enter service with the PLA Navy as soon as 2018, the report said, adding that China plans to build a total four aircraft carriers. Once completed, the PLA Navy would be able to establish four carrier battle groups to expand its maritime influence in the South China Sea and Western Pacific.⁵⁷

A January 20, 2014, press report stated:

A senior Communist Party official in northeastern China said that China was at work on a home-built aircraft carrier and had plans to operate a fleet of at least four of the vessels, a Hong Kong newspaper reported.

The comments by Wang Min, the party secretary of Liaoning Province, are an official indication of what outside observers have long predicted: that China's commissioning of a refurbished aircraft carrier in 2012 was only a first step in its effort to develop its capacity to build and sail its own aircraft carriers.

According to the Hong Kong-based Ta Kung Pao, Mr. Wang said on Saturday that China's second aircraft carrier was being built at a shipyard in the coastal city of Dalian and should be completed in six years.⁵⁸

Carrier-Based Aircraft

China has developed a carrier-capable fighter, called the J-15 or Flying Shark, that can operate from the *Liaoning* (**Figure 6**). DOD states that

The J-15 aircraft conducted its first takeoffs and landings from the Liaoning on November 26, 2012. Subsequently, at least two aircraft conducted multiple landings and takeoffs from the ship. The J-15 carrier-based fighter is the Chinese version of the Russian Su-33. The J-15 is designed for ski-jump takeoffs and arrested landings, as required by the configuration of the Liaoning. Although the J-15 has a land-based combat radius of 1200 km, the aircraft will be limited in range and armament when operating from the carrier, due to limits imposed by the ski-jump takeoff and arrested carrier landings.⁵⁹

A November 10, 2014, trade press report states that "China has put the Shenyang J-15 Flying Shark carrier-borne multirole fighter into serial production, with at least eight production examples known to be flying already. This is in addition to the six J-15 prototypes, some of which conducted carrier trials on board China's refurbished former Soviet Kuznetsov-class carrier, *Liaoning*."⁶⁰

⁵⁷ Staff Reporter, "Work Well Underway on China's Two New Aircraft Carriers: Military Parade," *WantChinaTimes.com*, March 2, 2014.

⁵⁸ "Work on New Chinese Aircraft Carrier Reportedly Underway," *New York Times* (<http://sinosphere.blogs.nytimes.com>), January 20, 2014. See also "China Building Second Aircraft Carrier: Reports," Reuters.com, January 18, 2014; and Li Yan, "New Aircraft Carrier 'Under Construction,'" *Global Times* (via <http://www.ecns.cn>), January 20, 2014.

⁵⁹ 2013 DOD CMSD, pp. 65-66.

⁶⁰ Mike Yeo, "Chinese Carrier Fighter Now In Serial Production," *USNI News* (<http://news.usni.org>), November 10, 2014. See also "J-15 Carrier-Based Fighter Modified for Catapult Launch," *Want China Times* (www.wantchinatimes.com), November 3, 2014. See also David Axe, "Is China Sending a Stealth Fighter to Sea? J-31 (continued...)"

Figure 6. J-15 Carrier-Capable Fighter



Source: Zachary Keck, “China’s Carrier-Based J-15 Likely Enters Mass Production,” *The Diplomat* (<http://thediplomat.com>), September 14, 2013.

In a September 14, 2013, blog post, one U.S. observer, noting recent press reports from China, stated that

A number of recent reports in Chinese state-run media indicate that the country’s carrier-based J-15 multirole fighter jets have entered mass production.

The Shenyang J-15 (also called Flying Shark) is China’s carrier-based fighter aircraft. It was reverse[-] engineered from a Russian Sukhoi Su-33 that China acquired from Ukraine, although it reportedly is equipped with some indigenous weapons, avionics and other features that Beijing claims greatly enhances its capabilities....

Although hardly conclusive, the reports strongly suggest that mass production of the J-15 has begun, or at least that the Communist Party wants to create that impression....

Meanwhile, one of the other J-15 articles that appeared on the People’s Daily website compared it favorably relative to other countries’ carrier-based aircraft. Indeed, Admiral Yin, who was also quoted in that article, is paraphrased as saying that the J-15 “reaches a similar level to the U.S. F/A-18C/D Super Hornet” and is superior in terms of its air combat capability.

However, *Wan* China Times flags a Xinhua report that quotes Sun Cong, the J-15s designer, noting that currently the aircraft cannot launch attacks against ships and ground targets when taking off from the Liaoning. That is because the aircraft carrier utilizes a ski-jump ramp and the J-15 would be too heavy to take off if it was carrying air-to-surface missiles and bombs. Thus, until the Navy acquires a Catapult-Assisted Take-Off But Arrested-Recovery (CATOBAR) carrier, the J-15, which is a multirole fighter, will be limited primarily to air superiority operations (and ship defense).

(...continued)

Mock-Up Appears on Carrier Deck,” *Real Clear Defense* (www.realcleardefense.com), October 1, 2014.

Notably, one of the People's Daily reports observed that the J-15's "front wheel is suitable for catapult launch similar to the carrier-based fighter of the U.S. Navy. The catapult launch was taken into consideration at the beginning of its design."⁶¹

A September 28, 2013, press report stated:

In an unusual departure for mainland Chinese-language media, the Beijing-based Sina Military Network (SMN) criticized the capabilities of the carrier-borne J-15 Flying Shark as nothing more than a "flopping fish."...

What sounded more like a rant than analysis, SMN, on Sept. 23, reported the new J-15 was incapable of flying from the Liaoning with heavy weapons, "effectively crippling its attack range and firepower."

The fighter can take off and land on the carrier with two YJ-83K anti-ship missiles, two PL-8 air-to-air missiles, and four 500-kilogram bombs. But a weapons "load exceeding 12 tons will not get it off the carrier's ski jump ramp." This might prohibit it from carrying heavier munitions such as PL-12 medium-range air-to-air missiles.

To further complicate things, the J-15 can carry only two tons of weapons while fully fueled. "This would equip it with no more than two YJ-83K and two PL-8 missiles," thus the "range of the YJ-83K prepared for the fighter will be shorter than comparable YJ-83K missiles launched from larger PLAN [People's Liberation Army Navy] vessels. The J-15 will be boxed into less than 120 [kilometers] of attack range."...

Built by the Shenyang Aircraft Corporation, the J-15 is a copy of the Russian-made Su-33. China acquired an Su-33 prototype from the Ukraine in 2001. Avionics are most likely the same as the J-11B (Su-27). In 2006, Russia accused China of reverse engineering the Su-27 and canceled a production license to build 200 Su-27s after only 95 aircraft had been built.

Vasily Kashin, a China military specialist at the Moscow-based Centre for Analysis of Strategies and Technologies, suggests the J-15 might be a better aircraft than the Su-33. "I think that there might be some improvements because electronic equipment now weighs less than in the 1990s," he said. It could also be lighter due to new composites that China is using on the J-11B that were not available on the original Su-33.

Despite improvements, Kashin wonders why the Chinese bothered with the Su-33 given the fact that Russia gave up on it. Weight problems and other issues forced the Russians to develop the MiG-29K, which has better power-to-weight ratio and can carry more weapons. "Of course, when the Chinese get their future carriers equipped with catapults, that limitation will not apply and they will be able to fully realize Su-33/J-15 potential—huge range and good payload," Kashin said.

The Liaoning is the problem. The carrier is small—53,000 tons—and uses a ski jump. From Russia's experience, "taking off from the carrier with takeoff weight exceeding some 26 tons is very difficult," Kashin said.

⁶¹ Zachary Keck, "China's Carrier-Based J-15 Likely Enters Mass Production," *The Diplomat* (<http://thediplomat.com>), September 14, 2013. Press reports cited in this blog post (via live links) include "With A Service Lifespan of About 30 Years, J-15 To Have Stable Performance Once in mass Production," *People's Daily Online*, September 10, 2013; "J-15 Better Than U.S. F/A-18 In Terms Of Air Action, Slightly Inferior In Terms Of Attack Against Sea Targets," *People's Daily Online*, September 10, 2013; "J-15 A Major Threat to US (But Can't Take Off With Payload)," *WantChinaTimes.com*, September 13, 2013.

Roger Cliff, a China defense specialist for the Center for Strategic and Budgetary Assessments in Washington, said this is “one of the reasons why sky-jump carriers can’t be considered to be equivalent to full-size carriers with catapults.”

A number of unanswered questions are raised by the SMN report, Kashin said, including the amount of fuel on board, carrier speed, wind speed and direction.

Cliff also raises issues with SMN’s conclusions. “It doesn’t make sense to me that the J-15 can take off with YJ-83s but not PL-12s, since the YJ-83 weighs about 1,800 pounds and the PL-12 weighs about 400 pounds.”

A possible answer is that it was unable to take off with both. “The article says that it can only carry ‘two tons’ of missiles and munitions when fully fueled, which is 4,400 pounds, and two YJ-83s plus two PL-8s would weigh over 4,000 pounds, leaving no margin for any PL-12s. But I don’t see why it couldn’t take off with PL-12s if it wasn’t carrying YJ-83s.” Cliff concludes that the J-15 should be capable of carrying PL-12s when it is flying purely air-to-air missions and that “it probably just can’t carry PL-12s when it is flying a strike mission.”⁶²

Potential Roles, Missions, and Strategic Significance

Although aircraft carriers might have some value for China in Taiwan-related conflict scenarios, they are not considered critical for Chinese operations in such scenarios, because Taiwan is within range of land-based Chinese aircraft. Consequently, most observers believe that China is acquiring carriers primarily for their value in other kinds of operations, and to symbolize China’s status as a leading regional power and major world power.

Chinese aircraft carriers could be used to impress or intimidate foreign observers, and for power-projection operations, particularly in scenarios that do not involve opposing U.S. forces.⁶³ Chinese aircraft carriers could also be used for humanitarian assistance and disaster relief (HA/DR) operations, maritime security operations (such as anti-piracy operations), and non-combatant evacuation operations (NEOs). Politically, aircraft carriers could be particularly valuable to China for projecting an image of China as a major world power, because aircraft carriers are viewed by many as symbols of major world power status. In a combat situation involving opposing U.S. naval and air forces, Chinese aircraft carriers would be highly vulnerable to attack by U.S. ships and aircraft, but conducting such attacks could divert U.S. ships and aircraft from performing other missions in a conflict situation with China.⁶⁴

⁶² Wendell Minnick, “Chinese Media Takes Aim at J-15 Fighter,” *DefenseNews.com*, September 28, 2013. See also “China’s Got an Aircraft Carrier—What About the Air Wing?” *War is Boring* (<https://medium.com/war-is-boring>), undated but apparently posted in early March 2014; and “J-31 Could Replace J-15 as China’s New Carrier-Based Fighter,” *Want China Times* (www.wantchinatimes.com), June 10, 2014.

⁶³ For a discussion, see, for example, Bryan McGrath and Seth Cropsey, “The Real Reason China Wants Aircraft Carriers, China’s Carrier Plans Target U.S. Alliances, Not Its Navy,” *Real Clear Defense* (www.realcleardefense.com), April 10, 2014.

⁶⁴ For further discussion, see Andrew Erickson and Gabe Collins, “The ‘Flying Shark’ Prepares to Roam the Seas: pros and cons [for China] of China’s aircraft carrier program,” *China SignPost*, May 18, 2011, 5 pp.; Aaron Shraberg, “Near-Term Missions for China’s Maiden Aircraft Carrier,” *China Brief*, June 17, 2011: 4-6; and Andrew S. Erickson, Abraham M. Denmark, and Gabriel Collins, “Beijing’s ‘Starter Carrier’ and Future Steps,” *Naval War College Review*, Winter 2012: 15-55.

DOD states that the Liaoning “most likely will conduct extensive local operations focusing on shipboard training, carrier aircraft integration, and carrier formation training for the next three to four years. The carrier conducted operations in the East China Sea and South China Sea in November may be used for other missions as needed.”⁶⁵ DOD also states that

Although the LIAONING is serving in what officials describe as an “experimental” capacity, they also indicate that China will build additional carriers possessing more capability than the ski-jump-configured LIAONING. Such a carrier force would be capable of improved endurance and of carrying and launching more varied types of aircraft, including electronic warfare, early warning, and anti-submarine, to increase the potential striking power of a Chinese “battle group” in safeguarding China’s interests in areas outside China’s immediate periphery. The carriers would most likely perform such missions as patrolling economically important sea lanes and conducting naval diplomacy, regional deterrence, and humanitarian assistance/disaster relief.⁶⁶

Surface Combatants

China since the early 1990s has purchased four Sovremenny-class destroyers from Russia and put into service 10 new classes of indigenously built destroyers and frigates (some of which are variations of one another) that demonstrate a significant modernization of PLA Navy surface combatant technology. DOD states that China’s new destroyers and frigates “provide a significant upgrade to the PLA Navy’s area air defense capability, which will be critical as it expands operations into ‘distant seas’ beyond the range of shore-based air defense.”⁶⁷ China reportedly is also building a new class of corvettes (i.e., light frigates) and has put into service a new kind of missile-armed fast attack craft that uses a stealthy catamaran hull design. China may also be planning to build a new cruiser design. ONI states that

Less than a decade ago China’s surface force could be characterized as an eclectic mix of vintage, modern, converted, imported, and domestic platforms utilizing a variety weapons and sensors and with widely ranging capabilities and varying reliability. By the second decade of the 2000s, surface ship acquisition had shifted entirely to Chinese designed units, equipped primarily with Chinese weapons and sensors, though some engineering components and subsystems remain imported or license-produced in-country....

The PLA(N) surface force has made particularly strong gains in anti-surface warfare (ASuW), with sustained development of advanced anti-ship cruise missiles (ASCMs) and over-the-horizon targeting systems.⁶⁸

⁶⁵ 2014 DOD CMSD, p. 68.

⁶⁶ 2014 DOD CMSD, pp. 36-37. On page 68, DOD states that “The formation of carrier battle groups will enable the PLA Navy to conduct comprehensive sea control and power projection operations and enhance its long-range operational capabilities.” For an additional discussion of Chinese efforts to acquire aircraft carriers and develop naval aviation, see Andrew Erickson, “A Work in Progress: China’s Development of Carrier Strike,” *Jane’s Navy International* (<https://janes.ihs.com>), June 19, 2014.

⁶⁷ 2013 DOD CMSD, p. 7.

⁶⁸ [Hearing on] Trends in China’s Naval Modernization [before] U.S. China Economic and Security Review Commission[,] Testimony [of] Jesse L. Karotkin, [Senior Intelligence Officer for China, Office of Naval Intelligence, January 30, 2014], accessed February 12, 2014, p. 3.

Press Reports of Potential New Type 055 Cruiser (or Destroyer)

Photographs showing the mockup of what appears to be the deckhouse (i.e., “superstructure”) of a large surface combatant have led some observers to conclude that China may be planning to build a new cruiser (or destroyer), called the Type 055, that might displace roughly 10,000 tons.⁶⁹ If China is planning to build a cruiser, that would make China the only country known to be planning to build a ship referred to as a cruiser. The U.S. Navy’s most recent cruiser was procured in FY1988 and entered service in 1994, and the Navy’s 30-year shipbuilding plan includes no ships identified as cruisers. The three Zumwalt (DDG-1000) class destroyers currently being built for the U.S. Navy, however, will each displace more than 15,000 tons. The U.S. Navy’s other cruisers and destroyers have displacements of 9,000 to 9,500 tons.

A December 30, 2014, press report states:

A picture has just emerged on the Chinese internet showing that construction of the first Type 055 destroyer may have started. The Type 055 guided missile destroyer is the next generation destroyer designed for the People’s Liberation Army Navy (PLAN or Chinese Navy).

According to Chinese sources, the picture was taken last week at the Changxing Jiangnan shipyard (member of CSSC - China State Shipbuilding Corporation) near Shanghai. It shows a sign with the mention "Commencement Ceremony for the Construction of 055 destroyer number 1". Such ceremonies are common practice in Chinese naval shipyards and should the picture be authentic, this would indicate that construction of the first Type 055 destroyer has indeed just started with the first cut of steel ceremony.

According to Chinese media, the Chinese government awarded the contract for construction of the first ship of the class to Changxing Jiangnan shipyard in August. According to the same sources, the second Type 055 destroyer will be built at the Dalian naval shipyard (Dalian Shipbuilding Industry Company member of CSIC - China Shipbuilding Industry Corporation).

Construction of a Type 055 Shore Integration Facility (SIF) started in early 2014 at the Ship Design and Research Center (701 Institute) of CSIC at the Wuhan University of Science and Technology. A model of the PLAN’s Aircraft Carrier was built at the same location in 2009. Based on pictures of the Type 055 SIF taken in September 2014, construction was almost over. This could indicate that land based testing has already started and it would then make sense timing wise to start construction of the first unit (it will likely take over one year to launch the first hull in the water)....

[The set of weapons that observers believe the ship will be equipped with] is close to the one found on board Type 052D destroyers (Kunming/Luyang III class) but with an overall better integration and what appears to be a sleeker design....

⁶⁹ David Axe, “Looks Like China’s Building a Giant New Warship, Possible Missile Cruiser Could Outweigh Rival Surface Combatants,” *War Is Boring* (<https://medium.com/war-is-boring>), undated; David Axe, “New Chinese Cruiser—Not as Big as We Thought, But Still Pretty Big,” *War Is Boring* (<https://medium.com/war-is-boring>), undated; Bill Gertz, “China Reveals New Carrier Jet Prior to Hagel Visit,” *The Washington Free Beacon*, April 9, 2014; Jeffrey Lin and P.W. Singer, “Learning More About China’s New Massive Warship Plan (055 Cruiser),” *Popular Science* (www.popsci.com), May 1, 2014; Bill Gertz, “Inside the Ring: China’s Missile Cruiser A Major Step To Naval Warfare Buildup,” *Washington Times* (www.washingtontimes.com), May 7, 2014.

Using recent Google Earth satellite imagery, the Type 055 SIF in Wuhan measures close to 130 meters in length, with most of its bow and its helicopter deck missing. The rest is pure estimation but Type 055 may end up measuring about 190 meters in length with a close to 12,000 tons displacement.⁷⁰

Sovremenny-Class Destroyers

China in 1996 ordered two Sovremenny-class destroyers from Russia; the ships entered service in 1999 and 2001. China in 2002 ordered two additional Sovremenny-class destroyers from Russia; the ships entered service in 2005 and 2006. Sovremenny-class destroyers are equipped with the Russian-made SS-N-22 Sunburn ASCM, a highly capable ASCM.

Six New Indigenously Built Destroyer Classes

China since the early 1990s has put into service six new classes of indigenously built destroyers, including three variations of one class. The classes are called the Luhu (Type 052), Luhai (Type 051B), Luyang I (Type 052B), Luyang II (Type 052C), Luyang III (Type 052D), and Louzhou (Type 051C) designs. Compared to China's remaining older Luda (Type 051) class destroyers, which entered service between 1971 and 1991, these six new indigenously built destroyer classes are substantially more modern in terms of their hull designs, propulsion systems, sensors, weapons, and electronics. The Luyang II-class ships (**Figure 7**) and the Luyang III-class ships appear to feature phased-array radars that are outwardly somewhat similar to the SPY-1 radar used in the U.S.-made Aegis combat system. Like the older Luda-class destroyers, these six new destroyer classes are armed with ASCMs.

⁷⁰ "Focus - PLAN Type 055 Destroyer," *NavyRecognition.com*, December 30, 2014. See also Sam LaGrone, "Chinese Carrier-On-Land Facility Adds Destroyer," *USNI News*, January 26, 2015.

Figure 7. Luyang II (Type 052C) Class Destroyer



Source: Photograph provided to CRS by Navy Office of Legislative Affairs, December 2010.

As shown in **Table 2**, China between 1994 and 2007 commissioned only one or two ships in its first four new indigenously built destroyers classes, suggesting that these classes were intended as stepping stones in a plan to modernize the PLA Navy's destroyer technology incrementally before committing to larger-scale series production of Luyang II- and Luyang III-class destroyers. As shown in **Table 2**, after commissioning no new destroyers in 2008-2012, commissionings of new Luyang II- and Luyang III-class destroyers appear to have resumed. Regarding the 2008-2012 gap in commissionings, one observer states, "The relocation of JiangNan shipyard and indigenization of [the] DA80/DN80 gas turbine (QC-280) delayed the production of follow-on units [of Luyang II-class destroyers] for several years."⁷¹ In March 2014, it was reported that China had commissioned its first Luyang III class destroyer into service, and that a second is on sea trials.⁷²

⁷¹ Blog entry entitled "2012 in Review," December 28, 2012, accessed March 21, 2013 at <http://www.informationdissemination.net/2012/12/2012-in-review.html>.

⁷² Ridzwan Rahmat, "PLAN Commissions First Type 052D DDG, Puts Second on Sea Trials," *IHS Jane's 360* (www.janes.com), March 23, 2014.

Table 2. PLA Navy Destroyer Commissionings

Actual (1994-2013) and Projected (2014-2017)

	Sovremenny (Russian-made)	Luhu (Type 052)	Luhai (Type 051B)	Luyang I (Type 052B)	Lyugang II (Type 052C)	Louzhou (Type 051C)	Luyang III (Type 052D)	Annual total	Cumulative total
1994		1						1	1
1995								0	1
1996		1						1	2
1997								0	2
1998								0	2
1999	1		1					2	4
2000								0	4
2001	1							1	5
2002								0	5
2003								0	5
2004				2	1			3	8
2005	1				1			2	10
2006	1					1		2	12
2007						1		1	13
2008								0	13
2009								0	13
2010								0	13
2011								0	13
2012								0	13
2013					2			2	15
2014					2		3	5	20
2015							2	2	22
2016							2	2	24
2017							1 ^a	1	25

Source: *Jane's Fighting Ships 2014-2015*, and previous editions.

a. *Jane's Fighting Ships 2014-2015* states that a total of 12 Luyang III-class ships is expected (page 140).

DOD states that

Construction of the LUYANG II-class DDG[s] (Type 052C) continued [over the past year], with one ship entering service in 2012, and an additional three ships under various stages of construction and sea trials, bringing the total number of ships of this class to six by the end of 2013. Additionally, China launched the lead ship in a follow-on class, the LUYANG III-class DDG (Type 052D), which will likely enter service in 2014. The LUYANG III incorporates the PLA Navy's first multipurpose vertical launch system, likely capable of launching ASCM, land attack cruise missiles (LACM), surface-to-air missiles (SAM), and anti-submarine rockets. China is projected to build more than a dozen of these ships to replace its aging LUDA-class destroyers (DD[s]).⁷³

⁷³ 2103 DOD CMSD, p. 7.

A February 15, 2015, press report states that

[China's] sixth Type 052C destroyer entered service on Feb. 9, reports the People's Navy Daily, a paper published by the People's Liberation Army Navy.

In addition to the six Type 052C destroyers, the PLA also has the Type 052D guided-missile destroyer or Kunming class, which uses Active Phased Array Radar....

The report said China plans to build a total of 12 Type 052D guided-missile destroyers. Together with the six Type 052C, the PLA Navy will eventually have 18 Zhonghua Shendun or "Chinese Aegis" destroyers.⁷⁴

Four New Indigenously Built Frigate Classes

China since the early 1990s has put into service four new classes of indigenously built frigates, two of which are variations of two others. The classes are called the Jiangwei I (Type 053 H2G), Jiangwei II (Type 053H3), Jiangkai I (Type 054), and Jiangkai II (Type 054A) designs. Compared to China's remaining older Jianghu (Type 053) class frigates, which entered service between the mid-1970s and 1989, the four new frigate classes feature improved hull designs and systems, including improved AAW capabilities. As shown in **Table 3**, production of Jiangkai II-class ships (**Figure 8**) continues, and *Jane's* projects an eventual total of at least 20.

Figure 8. Jiangkai II (Type 054A) Class Frigate



Source: Photograph provided to CRS by Navy Office of Legislative Affairs, December 2010.

⁷⁴ "PLA Commissions Sixth Type 052C Destroyer," *Want China Times*, February 15, 2015. See also "Third-Generation Warships To be Commissioned To Whole Navy," *China Military Online English Edition*, January 26, 2015, which states: "A total of six 052C guided missile destroyers were produced for this class."

DOD states that “China has continued the construction of the workhorse JIANGKAI II-class FFG[s] (Type 054A), with 12 ships currently in the fleet and six or more in various stages of construction, and yet more expected.”⁷⁵

Table 3. PLA Navy Frigate Commissionings

Actual (1991-2013) and Projected (2014-2015)

	Jiangwei I (Type 053 H2G)	Jiangwei II (Type 053H3)	Jiangkai I (Type 054)	Jiangkai II (Type 054A)	Annual total	Cumulative total
1991	1				1	1
1992	1				1	2
1993	1				1	3
1994	1				1	4
1995					0	4
1996					0	4
1997					0	4
1998		1			1	5
1999		4			4	9
2000		1			1	10
2001					0	10
2002		2			2	12
2003					0	12
2004		1			1	13
2005		1	1		2	15
2006			1		1	16
2007					0	16
2008				4	4	20
2009					0	20
2010				3	3	23
2011				2	2	25
2012				4	4	29
2013				3	3	32
2014				3	2	34
2015				1 ^a	1	35

Source: *Jane's Fighting Ships 2014-2015*, and previous editions.

a. *Jane's Fighting Ships 2014-2015* states that a total of at least 20 Jiangkai II-class ships is expected (page 144).

Type 056 Corvette

China is building a new type of corvette (i.e., a light frigate, or FFL) called the Jiangdao class or Type 056 (**Figure 9**). *Jane's Fighting Ships 2014-2015* states that the first 8 ships in the class entered service in 2013, another 10 were projected to enter service in 2014, and that “a class of at least 30 is expected if the class is to consolidate replacement of older classes such as the Jianghu-class frigates and Houxin-class attack craft.”⁷⁶ DOD states that nine of the ships entered service in

⁷⁵ 2013 DOD CMSD, p. 7.

⁷⁶ *Jane's Fighting Ships 2014-2015*, p. 148.

2013, and that “China may build an additional 20 to 30 vessels of this class.”⁷⁷ A November 12, 2014, trade press report states that the 18th ship in the class was commissioned into service in November 2014.⁷⁸

Figure 9. Type 056 Corvette

Shown under construction



Source: Blog entry entitled “PLAN’s New Type 056 Class,” August 12, 2012, accessed October 12, 2012, at <http://www.informationdissemination.net/2012/08/plans-new-type-056-class.html>.

One observer states that

The [Type] 056 program seems to follow an even more aggressive production schedule than [Type] 022 FACs [fast attack craft]. We are seeing four shipyards (HuDong, HuangPu, WuChang and LiaoNan) producing [Type] 056s simultaneously before the first [Type] 056 was ever launched. In fact, the first [Type] 056 launched from both HP and HD shipyard had their funnels and the bow section reworked after they were already launched.⁷⁹

Houbei (Type 022) Fast Attack Craft

As an apparent replacement for at least some of its older fast attack craft, or FACs (including some armed with ASCMs), China in 2004 introduced a new type of ASCM-armed fast attack craft, called the Houbei (Type 022) class (**Figure 10**), that uses a stealthy, wave-piercing,

⁷⁷ 2014 DOD CMSD, p. 9.

⁷⁸ Sam LaGrone, “China Commissions New Sub Hunting Corvette,” *USNI News* (<http://news.usni.org>), November 12, 2014.

⁷⁹ Blog entry entitled “2012 in Review,” December 28, 2012, accessed March 21, 2013 at <http://www.informationdissemination.net/2012/12/2012-in-review.html>.

catamaran hull.⁸⁰ Each boat can carry eight C-802 ASCMs. The Houbei class was built in at least six shipyards; construction of the design appeared to stop in 2009 after a production run of about 60 units.

Figure 10. Houbei (Type 022) Class Fast Attack Craft

With an older Luda-class destroyer behind



Source: Photograph provided to CRS by Navy Office of Legislative Affairs, December 2010.

Surface Ships Operated by Non-PLAN Maritime Law Enforcement Agencies

In addition to the PLAN surface combatants discussed above, China operates numerous additional surface ships in maritime law enforcement (MLE) agencies that are outside the PLAN. China in 2013 consolidated four of its six MLE agencies into a new China Coast Guard (CCG). China usually uses CCG ships, rather than PLAN ships, to assert and defend its maritime territorial claims and fishing interests in the South China Sea and East China Sea, although PLAN ships are available as backup forces. PLAN ships have also conducted exercises in parts of the South China Sea that appear intended, at least in part, at asserting China's claims over those waters.⁸¹ While China's CCG ships are often unarmed or lightly armed, they can nevertheless be effective in confrontations with unarmed fishing vessels or other ships. China is rapidly modernizing its inventory of CCG ships, and some of China's newest CCG ships are relatively large.⁸² **Figure 11** shows a picture of a CCG ship.

⁸⁰ For an article discussing how the Type 022 design appears to have been derived from the designs of Australian high-speed ferries, see David Lague, "Insight: From a Ferry, a Chinese Fast-Attack Boat," *Reuters*, June 1, 2012.

⁸¹ For additional discussion, see CRS Report R42784, *Maritime Territorial and Exclusive Economic Zone (EEZ) Disputes Involving China: Issues for Congress*, by Ronald O'Rourke. See also CRS Report R42930, *Maritime Territorial Disputes in East Asia: Issues for Congress*, by Ben Dolven, Mark E. Manyin, and Shirley A. Kan.

⁸² See, for example, Ryan Martinson, "Power to the Provinces: The Devolution of China's Maritime Rights Protection," *China Brief* (<http://www.jamestown.org/programs/chinabrief/>), September 10, 2014.

Figure 11. China Coast Guard Ship



Source: Picture accompanying Jeff. W. Benson, “Clash for Naval Power in the Asia Pacific,” *USNI News* (<http://news.usni.org>), November 25, 2013, accessed May 23, 2014.

Yuzhao (Type 071) Amphibious Ship

China has put into service a new class of amphibious ships called the *Yuzhao* or *Type 071 class* (**Figure 12**). *Jane’s Fighting Ships 2014-2015* states that the first three ships in the class were commissioned into service in 2007, 2011, and 2012.⁸³ A fourth ship in the class may now be under construction⁸⁴ The Type 071 design has an estimated displacement of more than 18,500 tons,⁸⁵ compared with about 15,900 tons to 16,700 tons for the U.S. Navy’s Whidbey Island/Harpers Ferry (LSD-41/49) class amphibious ships, which were commissioned into service between 1985 and 1998, and about 25,900 tons for the U.S. Navy’s new San Antonio (LPD-17) class amphibious ships, the first of which was commissioned into service in 2006.

⁸³ *Jane’s Fighting Ships 2014-2015*, p. 153.

⁸⁴ See Ridzwan Rahmat, “Images Suggest Fourth Chinese Type 071 LPD Is In Build,” *Jane’s Defence Weekly* (<https://janes.ihs.com>), October 21, 2014; “More Amphibious Ships for Chinese Navy,” *Information Dissemination* (www.informationdissemination.net), October 13, 2014; Ridzwan Rahmat, “Images Suggest China Building Fourth Type 071 LPD,” *Jane’s Defence Weekly*, October 29, 2014: 16.

⁸⁵ Unless otherwise indicated, displacement figures cited in this report are full load displacements. *Jane’s Fighting Ships 2014-2015*, p. 153, does not provide a full load displacement for the Type 071 class design. Instead, it provides a standard displacement of 18,500 tons. Full load displacement is larger than standard displacement, so the full load displacement of the Type 071 design is more than 18,500 tons.

Figure 12. Yuzhao (Type 071) Class Amphibious Ship
With two Houbei (Type 022) fast attack craft behind



Source: Photograph provided to CRS by Navy Office of Legislative Affairs, December 2010.

Reported Potential Type 081 Amphibious Ship

DOD states that “China might begin construction on a new Type 081-class amphibious assault ship within the next five years.”⁸⁶ *Jane’s Fighting Ships 2014-2015* states that “There are reports that construction of a Type 081 LHD is under consideration. The ship is believed to be of the order of 20,000 tonnes and may be based on the Type 0781 hull.”⁸⁷ An August 26, 2013, press report stated that that construction of the ship has begun and that it might displace 35,000 tons.⁸⁸ A January 25, 2015, press report states:

Hong Kong’s *Ming Pao*... newspaper reported on Friday [January 23] that the People’s Liberation Army (PLA) is building large amphibious assault ships to bolster gaps in its naval strategic doctrine....

According to the report, in 2004 the push towards the adoption of amphibious assault ships garnered consensus across China’s military....

The PLA quickly became aware of the many inadequacies of its Type 071 Kunlun Shan-class... amphibious transport dock during conflicts in Africa. Despite its ability to carry two Russian-designed Zubr-class air cushion landing crafts (LCAC), currently the largest

⁸⁶ 2014 DOD CMSD, p. 38. Elsewhere in the report (page 9), DOD states that “it appears likely that China will build its first amphibious assault ship during this decade.”

⁸⁷ *Jane’s Fighting Ships 2014-2015*, p. 153.

⁸⁸ Kyodo News International, “China Building 1st Amphibious Assault Ship in Shanghai,” *GlobalPost* (www.globalpost.com), August 26, 2013.

military hovercraft of its kind, the Type 071 vessel is plagued by a lack of firepower and inability to fill command and air support roles in combat.

The same inadequacies in military humanitarian missions were repeated during the subsequent armed conflicts in Libya, which hastened the adoption of amphibious crafts by the PLA, the report said.

In addition, the report said that the PLA might be motivated to match the capabilities of the U.S. Navy's America amphibious class landing crafts.

In response, China's dockyards are scrambling to build its own home-grown amphibious assault craft, with a displacement of 50,000 long tons, said the report, and the Shanghai Jiangnan-Changxing Shipbuilding Company Limited... has been commissioned to build at least four amphibious assault ships.⁸⁹

By comparison, U.S. Navy LHD/LHA-type amphibious assault ships displace 41,000 to 45,000 tons. **Figure 13** shows an unconfirmed conceptual rendering of a possible design for the Type 081 LHD.

Figure 13. Type 081 LHD (Unconfirmed Conceptual Rendering of a Possible Design)



Source: Global Times Forum, accessed July 31, 2012, at <http://forum.globaltimes.cn/forum/showthread.php?p=72083>.

⁸⁹ "PLA To Build Amphibious Assault Ships: Report," *Focus Taiwan News Channel*, January 25, 2015.

Potential Roles for Type 071 and Type 081 Ships

Although larger amphibious ships such as the Type 071 and the Type 081 would be of value for conducting amphibious landings in Taiwan-related conflict scenarios, some observers believe that China is building such ships more for their value in conducting other operations, such as operations for asserting and defending China's territorial claims in the East China Sea and South China Sea, humanitarian assistance and disaster relief (HA/DR) operations, maritime security operations (such as anti-piracy operations), and non-combatant evacuation operations (NEOs). Politically, larger amphibious ships can also be used for naval diplomacy (i.e., port calls and engagement activities) and for impressing or intimidating foreign observers. DOD states that

The PLA is capable of accomplishing various amphibious operations short of a full-scale invasion of Taiwan. With few overt military preparations beyond routine training, China could launch an invasion of small Taiwan-held islands in the South China Sea such as Pratas or Itu Aba. A PLA invasion of a medium-sized, better defended offshore island such as Matsu or Jinmen is within China's capabilities....

Large-scale amphibious invasion is one of the most complicated and difficult military operations the PLA might pursue in a cross-Strait contingency.... China does not appear to be building the conventional amphibious lift required to support such a campaign....

The PLA Navy currently lacks the amphibious lift capacity that a large-scale invasion of Taiwan would require.⁹⁰

Air Cushioned Landing Craft

In June 2013, it was reported that China in May 2013 had taken delivery of four large, Ukrainian-made air-cushioned landing craft (LCACs). The craft reportedly have a range of 300 nautical miles, a maximum speed of 63 knots, and a payload capacity of 150 tons. Some experts reportedly discounted the operational utility of the LCACs, describing them as "giant toys."⁹¹

Land-Based Aircraft and Unmanned Aerial Vehicles (UAVs)

Land-Based Aircraft

China has introduced modern land-based fighters and strike fighters into the PLA Air Force and PLA Naval Air Force. These include Russian-made Su-27s and Su-30s and indigenously produced J-10s and J-11s. At least some of the strike fighters are or will be armed with modern ASCMs. China's land-based naval aircraft inventory includes, among other things, 24 Russian-made Su-30 MKK 2 Flanker land-based fighters, whose delivery was completed in 2004. The Su-30 is a derivative of the Su-27. Some of the Su-30s might eventually be fitted with the Russian-made AS-17A/B ASCM. (China's Air Force operates at least 150 Su-27s; these aircraft could be used for fleet-defense operations.) China's navy also operates 100 ASCM-armed JH-7 land-based fighter-bombers that were delivered between 1998 and 2004, and older ASCM-armed land-based maritime bombers.

⁹⁰ 2014 DOD CMSD, pp. 55, 56.

⁹¹ Minnie Chan, "Experts Dismiss PLA Navy's Landing Craft From Ukraine as Giant Toys," *South China Morning Post*, June 25, 2013.

China in January 2011 reportedly began testing a stealthy, land-based, fighter-type aircraft, called the J-20. Some observers believe, based on the aircraft's size and design, that it might be intended as a land-based strike aircraft for attacking ships at sea.⁹²

China in June 2012 reportedly reached agreement with Russia to license-produce long-range TU-22 Backfire bombers; the planned force of 36 Backfires would be armed with ASCMs.⁹³

UAVs

DOD states that "acquisition and development of longer-range unmanned aerial vehicles (UAV[s]), including the BZK-005, and unmanned combat aerial vehicles (UCAV[s]), will increase China's ability to conduct long-range reconnaissance and strike operations."⁹⁴ A September 21, 2013, press report states:

The government and military are striving to put China at the forefront of drone manufacturing, for their own use and for export, and have made an all-out push to gather domestic and international technology to support the program....

China is now dispatching its own drones into potential combat arenas. Every major arms manufacturer in China has a research center devoted to drones, according to Chinese and foreign military analysts. Those companies have shown off dozens of models to potential foreign buyers at international air shows.

Chinese officials this month sent a drone near disputed islands administered by Japan; debated using a weaponized drone last year to kill a criminal suspect in Myanmar; and sold homemade drones resembling the Predator, an American model, to other countries for less than a million dollars each. Meanwhile, online photographs reveal a stealth combat drone, the Lijian, or Stealth Sword, in a runway test in May.

Military analysts say China has long tried to replicate foreign drone designs. Some Chinese drones appearing at recent air shows have closely resembled foreign ones. Ian M. Easton, a military analyst at the Project 2049 Institute in Virginia, said cyberespionage was one tool in an extensive effort over years to purchase or develop drones domestically using all available technology, foreign and domestic.

⁹² See, Bill Sweetman, "Chinese J-20 Stealth Fighter In Taxi Tests," *AviationWeek.com*, January 3, 2011; Jeremy Page, "A Chinese Stealth Challenge," *Wall Street Journal*, January 5, 2011: 1; Phil Stewart, "U.S. Downplays Chinese Stealth Fighter Status," *Reuters.com*, January 5, 2011; Agence France-Presse, "US Downplays Concern Over Chinese Stealth Fighter," *DefenseNews.com*, January 6, 2011; Tony Capaccio, "China's J-20 Stealth Fighter Meant to Counter F-22, F-35, U.S. Navy Says," *Bloomberg.com*, January 6, 2011; David A. Fulgham, et al., "Stealth Slayer?" *Aviation Week & Space Technology*, January 17, 2011: 20-21, Andrew S. Erickson and Gabriel B. Collins, "China's New Project 718/J-20 Fighter: Development outlook and strategic implications," *China SignPost*, January 17, 2011, 13 pp.; Dave Majumdar, "U.S. Opinions Vary Over China's Stealthy J-20," *Defense News*, January 24, 2011: 16; Stephen Trimble, "J-20: China's Ultimate Aircraft Carrier-Killer?" *The DEW Line* (www.flightglobal.com), February 9, 2011; Carlo Kopp, "An Initial Assessment of China's J-20 Stealth Fighter," *China Brief*, May 6, 2011: 9-11; David Axe, "Stealth Fighter or Bomber?" *The Diplomat* (<http://the-diplomat.com>), July 26, 2011; Bill Sweetman, "Chinese J-20 Stealth Fighter Advances," *Aviation Week Defense Technology International*, January 31, 2012.

⁹³ Norman Friedman, "Back(fire) to the Future," *U.S. Naval Institute Proceedings*, August 2012: 90-91.

⁹⁴ 2013 DOD CMSD, p. 95. See also Ian M. Easton and L.C. Russell Hsiao, *The Chinese People's Liberation Army's Unmanned Aerial Vehicle Project: Organizational Capacities and Operational Capabilities*, Project 2049 Institute, March 11, 2013, 28 pp.; Bill Gertz, "Game of Drones," *Washington Free Beacon*, March 26, 2013.

The Chinese military has not released statistics on the size of its drone fleet, but a Taiwan Defense Ministry report said that as of mid-2011, the Chinese Air Force alone had more than 280 drone units, and analysts say the other branches have thousands, which means China's fleet count is second only to the 7,000 or so of the United States. "The military significance of China's move into unmanned systems is alarming," said a 2012 report by the Defense Science Board, a Pentagon advisory committee....

A signal moment in China's drone use came on Sept. 9, when the navy sent a surveillance drone near the disputed Diaoyu Islands, which Japan administers and calls the Senkakus. Japanese interceptor jets scrambled to confront it. This was the first time China had ever deployed a drone over the East China Sea. The Chinese Defense Ministry said "regular drills" had taken place "at relevant areas in the East China Sea, which conform to relevant international laws and practices."

The drone appeared to be a BZK-005, a long-range aircraft used by the Chinese Navy that made its public debut in 2006 at China's air show in Zhuhai, said an American official....

"I think this is really just the beginning of a much broader trend we're going to see—for China to increase its ability to monitor the East China Sea and the Western Pacific, beyond the Philippines, and to increase the operational envelope of their strike capabilities," [Mr. Easton] said....

Chinese strategists have discussed using drones in attack situations if war with the United States were to break out in the Pacific, according to the Project 2049 report. Citing Chinese military technical material, the report said the People's Liberation Army's "operational thinkers and scientists envision attacking U.S. aircraft-carrier battle groups with swarms of multimission U.A.V.'s in the event of conflict."⁹⁵

Nuclear and Electromagnetic Pulse (EMP) Weapons

A July 22, 2011, press report states that "China's military is developing electromagnetic pulse weapons that Beijing plans to use against U.S. aircraft carriers in any future conflict over Taiwan, according to an intelligence report made public on Thursday [July 21].... The report, produced in 2005 and once labeled 'secret,' stated that Chinese military writings have discussed building low-yield EMP warheads, but 'it is not known whether [the Chinese] have actually done so.'"⁹⁶

Maritime Surveillance and Targeting Systems

China reportedly is developing and deploying maritime surveillance and targeting systems that can detect U.S. ships and submarines and provide targeting information for Chinese ASBMs and other Chinese military units. These systems reportedly include land-based over-the-horizon backscatter (OTH-B) radars, land-based over-the-horizon surface wave (OTH-SW) radars, electro-optical satellites, radar satellites, and seabed sonar networks.⁹⁷ DOD states that

⁹⁵ Edward Wong, "Hacking U.S. Secrets, China Pushes For Drones," *New York Times*, September 21, 2013.

⁹⁶ Bill Gertz, "Beijing Develops Pulse Weapons," *Washington Times*, July 22, 2011: 1. Except for "[July 21]," materials in brackets as in original.

⁹⁷ See *2011 DOD CMSD*, pp. 3 and 38; Ben Blanchard, "China Ramps Up Military Use of Space With New Satellites – Report," *Reuters*, July 11, 2011; Andrew Erickson, "Satellites Support Growing PLA Maritime Monitoring and Targeting Capabilities," *China Brief*, February 10, 2011: 13-18; Torbjorg Hemmingsen, "Enter the Dragon: Inside China's New Model Navy," *Jane's Navy International*, May 2011: 14-16, 18, 20, 22, particularly the section on target (continued...)

The PLA Navy is also improving its over-the-horizon (OTH) targeting capability with sky wave and surface wave OTH radars, which can be used in conjunction with reconnaissance satellites to locate targets at great distances from China (thereby supporting long-range precision strikes, including employment of ASBMs).⁹⁸

Chinese Naval Operations Away from Home Waters

Chinese navy ships in recent years have begun to conduct operations away from China's home waters. Although many of these operations have been for making diplomatic port calls, some of them have been for other purposes, including in particular anti-piracy operations in waters off Somalia. DOD states that

The PLA Navy remains at the forefront of China's military efforts to extend its operational reach beyond the western Pacific and into what China calls the "far seas." Missions in these areas include: protecting important sea lanes from terrorism, maritime piracy, and foreign interdiction; providing humanitarian assistance/disaster relief; conducting naval diplomacy and regional deterrence; and training to prevent a third party, such as the United States, from interfering with operations off China's coast in a Taiwan, East China Sea, or South China Sea conflict. The PLA Navy's ability to perform these missions is modest but growing as it gains more experience operating in distant waters and acquires larger and more advanced platforms. The PLA Navy's goal over the coming decades is to become a stronger regional force that is able to project power across the greater Asia-Pacific region for long-term, high-intensity operations. However, logistics and intelligence support remain key obstacles, particularly in the Indian Ocean.

In the last several years, the PLA Navy's distant seas experience has derived primarily from counterpiracy missions in the Gulf of Aden and long-distance task group deployments beyond the first island chain in the western Pacific. China continues to sustain a three-ship presence in the Gulf of Aden to protect Chinese merchant shipping from maritime piracy. This operation is China's first enduring naval operation beyond the Asia region.⁹⁹

Some observers believe that China may want to eventually build a series of naval and other military bases in the Indian Ocean—a so-called "string of pearls"—so as to support Chinese naval operations along the sea line of communication linking China to Persian Gulf oil sources.¹⁰⁰ Other observers argue that although China has built or is building commercial port facilities in the Indian Ocean, China to date has not established any naval bases in the Indian Ocean and instead appears to be pursuing what U.S. officials refer to as a "places not bases" strategy (meaning a

(...continued)

tracking on pages 15-16; Simon Rabinovitch, "China's Satellites Cast Shadow Over US Pacific Operations," *Financial Times*, July 12, 2011; Andrew S. Erickson, "Eyes in the Sky," *U.S. Naval Institute Proceedings*, April 2010: 36-41.

⁹⁸ 2013 DOD CMSD, p. 42. See also Shane Bilsborough, "China's Emerging C4ISR Revolution," *The Diplomat* (<http://thediplomat.com>), August 13, 2013; Andrew Tate, "China Launches Latest of Military, 'Experimental' Satellites," *Jane's Defence Weekly* (<http://www.janes.com>), September 28, 2014; William Lowther, "Chinese Spy Satellites 'Might Threaten Navy,'" *Taipei Times* (www.taipeitimes.com), October 2, 2014.

⁹⁹ 2014 DOD CMSD, p. 37.

¹⁰⁰ Bill Gertz, "China Builds Up Strategic Sea Lanes," *Washington Times*, January 18, 2005, p.1. See also Daniel J. Kostecka, "The Chinese Navy's Emerging Support Network in the Indian Ocean," *China Brief*, July 22, 2010: 3-5; Edward Cody, "China Builds A Smaller, Stronger Military," *Washington Post*, April 12, 2005, p. 1; Indrani Bagchi, "China Eyeing Base in Bay of Bengal?" *Times of India*, August 9, 2008, posted online at http://timesofindia.indiatimes.com/China_eyeing_base_in_Bay_of_Bengal/articleshow/3343799.cms; Eric Ellis, "Pearls for the Orient," *Sydney Morning Herald*, July 9, 2010.

collection of places for Chinese navy ships to occasionally visit for purposes of refueling and restocking supplies, but not bases).¹⁰¹ DOD states that

Limited logistical support remains a key obstacle preventing the PLA Navy from operating more extensively beyond East Asia, particularly in the Indian Ocean. China desires to expand its access to logistics in the Indian Ocean and will likely establish several access points in this area in the next 10 years. These arrangements likely will take the form of agreements for refueling, replenishment, crew rest, and low-level maintenance.¹⁰²

Numbers of Chinese Ships and Aircraft; Comparisons to U.S. Navy

Numbers Provided by ONI in 2013

Table 4 shows figures provided by ONI in 2013 on numbers of Chinese navy ships in 2000, 2005, and 2010, and projected figures for 2015 and 2020, along with the approximate percentage of ships within these figures considered by ONI to be of modern design.

Table 4. Numbers of PLA Navy Ships Provided by ONI in 2013

Ship type	2000	2005	2010	2015	2020
Numbers					
Diesel attack submarines (SSs)	60	51	54	57 to 62	59 to 64
Nuclear-powered attack submarines (SSNs)	5	6	6	6 to 8	6 to 9
Ballistic missile submarines	1	2	3	3 to 5	4 to 5
Aircraft carriers	0	0	0	1	1 to 2
Destroyers	21	21	25	28 to 32	30 to 34
Frigates	37	43	49	52 to 56	54 to 58
Corvettes	0	0	0	20 to 25	24 to 30
Amphibious ships	60	43	55	53 to 55	50 to 55
Missile-armed coastal patrol craft	100	51	85	85	85
Approximate percent of modern design					
Diesel attack submarines	7	40	50	70	75
Nuclear-powered attack submarines	0	33	33	70	100
Destroyers	20	40	50	70	85
Frigates	25	35	45	70	85

¹⁰¹ Christopher D. Yung, “Burying China’s ‘String of Pearls,’” *The Diplomat*, January 22, 2015; Daniel J. Kostecka, “A Bogus Asian Pearl,” *U.S. Naval Institute Proceedings*, April 2011: 48-52; Daniel J. Kostecka, “Places and Bases: The Chinese Navy’s Emerging Support Network in the Indian Ocean,” *Naval War College Review*, Winter 2011: 59-78; Daniel J. Kostecka, “Hambantota, Chittagong, and the Maldives – Unlikely Pearls for the Chinese Navy,” *China Brief*, November 19, 2010: 8-11; Daniel J. Kostecka, “The Chinese Navy’s Emerging Support Network in the Indian Ocean,” *China Brief*, July 22, 2010: 5.

¹⁰² 2014 DOD CMSD, p. 38. See also Brendan Thomas-Noone, “The Master Plan: Could This Be China’s Overseas Basing Strategy?” *The National Interest* (<http://nationalinterest.org>), November 6, 2014.

Source: Craig Murray, Andrew Berglund, and Kimberly Hsu, *China’s Naval Modernization and Implications for the United States*, U.S.-China Economic and Security Review Commission (USCC), August 26, 2013, Figures 1 through 4 on pp. 6-7. The source notes to Figures 1 through 4 state that the numbers and percentages “were provided by the U.S. Office of Naval Intelligence. U.S. Office of Naval Intelligence, *PLA Navy Orders of Battle 2000-2020*, written response to request for information provided to the U.S.-China Economic and Security Review Commission, Suitland, MD, June 24, 2013.” Citing this same ONI document, the USCC publication states in footnotes on pages 6 and 7 that “Modern submarines are those able to employ submarine-launched intercontinental ballistic missiles or antiship cruise missiles,” and that “Modern surface ships are those able to conduct multiple missions or that have been extensively upgraded since 1992.”

Numbers Provided by ONI in 2009

Table 5 shows figures provided by ONI in 2009 on numbers of Chinese navy ships and aircraft from 1990 to 2009, and projected figures for 2015 and 2020. *The figures in the table lump older and less capable ships together with newer and more capable ships discussed above.*

Table 5. Numbers of PLA Navy Ships and Aircraft Provided by ONI in 2009

(Figures include both older and less capable units and newer and more capable units)

	1990	1995	2000	2005	2009	Projection for 2015	Projection for 2020
Ships							
Ballistic missile submarines	1	1	1	2	3	4 or 5?	4 or 5?
Attack submarines (SSNs and SSs)	80	82	65	58	59	~70	~72
SSNs	5	5	5	6	6	n/a	n/a
SSs	75	77	60	52	53	n/a	n/a
Aircraft carriers	0	0	0	0	0	1?	2?
Destroyers	14	18	21	25	26	~26	~26
Frigates	35	35	37	42	48	~45	~42
Subtotal above ships	130	136	124	127	136	~146 or ~147?	~146 or ~147?
Missile-armed attack craft	200	165	100	75	80+	n/a	n/a
Amphibious ships	65	70	60	56	58	n/a	n/a
Large ships (LPDs/LHDs)	0	0	0	0	1	~6?	~6?
Smaller ships	65	70	60	56	57	n/a	n/a
Mine warfare ships	n/a	n/a	n/a	n/a	40	n/a	n/a
Major auxiliary ships	n/a	n/a	n/a	n/a	50	n/a	n/a
Minor auxiliary ships and support craft	n/a	n/a	n/a	n/a	250+	n/a	n/a
Aircraft							
Land-based maritime strike aircraft	n/a	n/a	n/a	n/a	~145	~255	~258
Carrier-based fighters	0	0	0	0	0	~60	~90
Helicopters	n/a	n/a	n/a	n/a	~34	~153	~157
Subtotal above aircraft	n/a	n/a	n/a	n/a	~179	~468	~505

Source: Prepared by CRS. Source for 2009, 2015, and 2020: *2009 ONI report*, page 18 (text and table), page 21 (text), and (for figures not available on pages 18 or 21), page 45 (CRS estimates based on visual inspection of ONI graph entitled “Estimated PLA[N] Force Levels”). Source for 1990, 1995, 2000, and 2005: Navy data provided to CRS by Navy Office of Legislative Affairs, July 9, 2010.

Notes: n/a is not available. The use of question marks for the projected figures for ballistic missile submarines, aircraft, carriers, and major amphibious ships (LPDs and LHDs) for 2015 and 2020 reflects the difficulty of resolving these numbers visually from the graph on page 45 of the ONI report. The graph shows more major

amphibious ships than ballistic missile submarines, and more ballistic missile submarines than aircraft carriers. Figures in this table for aircraft carriers include the *Liaoning*. The ONI report states on page 19 that China “will likely have an operational, domestically produced carrier sometime after 2015.” Such a ship, plus the *Liaoning*, would give China a force of 2 operational carriers sometime after 2015.

The graph on page 45 shows a combined total of amphibious ships and landing craft of about 244 in 2009, about 261 projected for 2015, and about 253 projected for 2015.

Since the graph on page 45 of the ONI report is entitled “Estimated PLA[N] Force Levels,” aircraft numbers shown in the table presumably do not include Chinese air force (PLAAF) aircraft that may be capable of attacking ships or conducting other maritime operations.

Numbers Presented in Annual DOD Reports to Congress

DOD states, “The PLA Navy has the largest force of major combatants, submarines, and amphibious warfare ships in Asia. China’s naval forces include some 77 principal surface combatants, more than 60 submarines, 55 medium and large amphibious ships, and roughly 85 missile-equipped small combatants.”¹⁰³ **Table 6** shows numbers of Chinese navy ships as presented in annual DOD reports to Congress on military and security developments involving China (previously known as the annual report on China military power). As with **Table 5**, the figures in **Table 6** lump older and less capable ships together with newer and more capable ships discussed above. DOD stated in 2011 that the percentage of modern units within China’s submarine force has increased from less than 10% in 2000 and 2004 to about 47% in 2008 and 50% in 2009, and that the percentage of modern units within China’s force of surface combatants has increased from less than 10% in 2000 and 2004 to about 25% in 2008 and 2009.¹⁰⁴

Table 6. Numbers of PLA Navy Ships Presented in Annual DOD Reports to Congress

(Figures include both older and less capable units and newer and more capable units)

Year of DOD report ^a	2000	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Nuclear-powered attack submarines	5	5	~60	n/a	6	5	5	5	6	6	5	5	5	5
Diesel attack submarines	~60	~ 50	~60	n/a	51	50	53	54	54	54	49	48	49	51
Aircraft carriers	0	0	0	0	0	0	0	0	0	0	0	0	1 ^b	1
Destroyers	~20	~ 60	> 60	n/a	21	25	25	29	27	25	26	26	23	24
Frigates	~40	~ 60	> 60	n/a	43	45	47	45	48	49	53	53	52	49
Corvettes	0	0	0	0	0	0	0	0	0	0	0	0	0	8 ^b
Missile-armed coastal patrol craft	n/a	~ 50	~ 50	n/a	51	45	41	45	70	85	86	86	85	85
Amphibious ships: LSTs and LPDs	almost 50	~ 40	> 40	n/a	20	25	25	26	27	27	27	28	29	29
Amphibious ships: LSMs	50	~ 40	> 40	n/a	23	25	25	28	28	28	28	23	26	28

Source: Table prepared by CRS based on data in 2000-2014 editions of annual DOD report to Congress on military and security developments involving China (known for 2009 and prior editions as the report on China military power).

Notes: n/a means data not available in report. **LST** means tank landing ship; **LPD** means transport dock ship; **LSM** means medium landing ship.

¹⁰³ 2014 DOD CMSD, p. 7.

¹⁰⁴ 2011 DOD CMSD, p. 43 (figure).

- a. The DOD report generally covers events of the prior calendar year. Thus, the 2014 edition of the report covers events during 2013.
- b. First year that this category was included in the table in DOD's annual report.

Comparing U.S. and Chinese Naval Capabilities

U.S. and Chinese naval capabilities are sometimes compared by showing comparative numbers of U.S. and Chinese ships. Although numbers of ships (or aggregate fleet tonnages) can be relatively easy to compile from published reference sources, they are highly problematic as a means of assessing relative U.S. and Chinese naval capabilities, for the following reasons:

- **A fleet's total number of ships (or its aggregate tonnage) is only a partial metric of its capability.** In light of the many other significant contributors to naval capability,¹⁰⁵ navies with similar numbers of ships or similar aggregate tonnages can have significantly different capabilities, and navy-to-navy comparisons of numbers of ships or aggregate tonnages can provide a highly inaccurate sense of their relative capabilities. In recent years, the warfighting capabilities of navies have derived increasingly from the sophistication of their internal electronics and software. This factor can vary greatly from one navy to the next, and often cannot be easily assessed by outside observation. As the importance of internal electronics and software has grown, the idea of comparing the warfighting capabilities of navies principally on the basis of easily observed factors such as ship numbers and tonnages has become increasingly less valid, and today is highly problematic.
- **Total numbers of ships of a given type (such as submarines, destroyers, or frigates) can obscure potentially significant differences in the capabilities of those ships, both between navies and within one country's navy.**¹⁰⁶ The potential for obscuring differences in the capabilities of ships of a given type is particularly significant in assessing relative U.S. and Chinese capabilities, in part because China's navy includes significant numbers of older, obsolescent ships. Figures on total numbers of Chinese submarines, destroyers, frigates, and coastal patrol craft lump older, obsolescent ships together with more modern and more capable designs.¹⁰⁷ This CRS report shows numbers of more modern and more capable submarines, destroyers, and frigates in **Table 1**, **Table 2**, and **Table 3**, respectively.
- **A focus on total ship numbers reinforces the notion that increases in total numbers necessarily translate into increases in aggregate capability, and that decreases in total numbers necessarily translate into decreases in aggregate capability.** For a Navy like China's, which is modernizing in some

¹⁰⁵ These include types (as opposed to numbers or aggregate tonnage) of ships; types and numbers of aircraft; the sophistication of sensors, weapons, C4ISR systems, and networking capabilities; supporting maintenance and logistics capabilities; doctrine and tactics; the quality, education, and training of personnel; and the realism and complexity of exercises.

¹⁰⁶ Differences in capabilities of ships of a given type can arise from a number of other factors, including sensors, weapons, C4ISR systems, networking capabilities, stealth features, damage-control features, cruising range, maximum speed, and reliability and maintainability (which can affect the amount of time the ship is available for operation).

¹⁰⁷ For an article discussing this issue, see Joseph Carrigan, "Aging Tigers, Mighty Dragons: China's bifurcated Surface Fleet," *China Brief*, September 24, 2010: 2-6.

ship categories by replacing larger numbers of older, obsolescent ships with smaller numbers of more modern and more capable ships, this is not necessarily the case. As shown in **Table 5**, for example, China's submarine force today has fewer boats than it did in the 1990, but has greater aggregate capability than it did in 1990, because larger numbers of older, obsolescent boats have been replaced by smaller numbers of more modern and more capable boats. A similar point might be made about China's force of missile-armed attack craft. For assessing navies like China's, it can be more useful to track the growth in numbers of more modern and more capable units. This CRS report shows numbers of more modern and more capable submarines, destroyers, and frigates in **Table 1**, **Table 2**, and **Table 3**, respectively.

- **Comparisons of total numbers of ships (or aggregate tonnages) do not take into account the differing global responsibilities and homeporting locations of each fleet.** The U.S. Navy has substantial worldwide responsibilities, and a substantial fraction of the U.S. fleet is homeported in the Atlantic. As a consequence, only a certain portion of the U.S. Navy might be available for a crisis or conflict scenario in China's near-seas region, or could reach that area within a certain amount of time. In contrast, China's navy has limited responsibilities outside China's near-seas region, and its ships are all homeported along China's coast at locations that face directly onto China's near-seas region.
- **Comparisons of numbers of ships (or aggregate tonnages) do not take into account maritime-relevant military capabilities that countries might have outside their navies,** such as land-based anti-ship ballistic missiles (ASBMs), land-based anti-ship cruise missiles (ASCMs), and land-based Air Force aircraft armed with ASCMs or other weapons. Given the significant maritime-relevant non-navy forces present in both the U.S. and Chinese militaries, this is a particularly important consideration in comparing U.S. and Chinese military capabilities for influencing events in the Western Pacific. Although a U.S.-China incident at sea might involve only navy units on both sides, a broader U.S.-China military conflict would more likely be a force-on-force engagement involving multiple branches of each country's military.
- **The missions to be performed by one country's navy can differ greatly from the missions to be performed by another country's navy.** Consequently, navies are better measured against their respective missions than against one another. Although Navy A might have less capability than Navy B, Navy A might nevertheless be better able to perform Navy A's intended missions than Navy B is to perform Navy B's intended missions. This is another significant consideration in assessing U.S. and Chinese naval capabilities, because the missions of the two navies are quite different.

DOD Response to China Naval Modernization

Renewed DOD Emphasis on Asia-Pacific Region

Two DOD strategy and budget documents—a strategic defense guidance document that was released on January 5, 2012,¹⁰⁸ and a document outlining selected program decisions for DOD’s FY2013 budget that was released on January 26, 2012¹⁰⁹—state that U.S. military strategy will place an increased emphasis on the Asia-Pacific region, and that as one result, there will be a renewed emphasis on air and naval forces in DOD plans. Administration officials have stated that notwithstanding constraints on U.S. defense spending, DOD will seek to protect initiatives relating to the U.S. military presence in the Asia-Pacific region. Although Administration officials state that the renewed emphasis on the Asia-Pacific region is not directed at any single country, many observers believe it is in no small part intended as a response to China’s military modernization effort and its assertive behavior regarding its maritime territorial claims.

Air-Sea Battle (ASB) Concept (Now Renamed JAM-GC)

DOD has been developing a new Air-Sea Battle (ASB) concept that is intended to increase the joint operating effectiveness U.S. naval and Air Force units, particularly in operations for countering anti-access forces. The ASB development effort was announced in the 2010 Quadrennial Defense Review. DOD has established an Air-Sea Battle Office to guide the implementation of the concept.¹¹⁰ Although DOD officials state that the ASB concept is not directed at any particular adversary, many observers believe it is focused to a large degree, if not principally, on countering Chinese and Iranian anti-access forces.

On June 3, 2013, DOD released an unclassified summary of the ASB Concept; the document builds on earlier statements from DOD officials on the topic. DOD’s unclassified summary of the ASB document is reprinted in **Appendix B**.

In February 2018, it was reported that

With [an] improved understanding of operational requirements to address A2/AD challenges in the global commons, the military services have agreed to rename the “ASB Concept” as the “Joint Concept for Access and Maneuver in the Global Commons” (JAM-GC).

This new name reflects several important ideas for Joint Force success in overcoming A2/AD challenges. The most obvious change is to reflect that overcoming A2/AD challenges requires the integration of capabilities from all five war-fighting domains, not just air and sea. Furthermore, “Access and Maneuver” reflects the overall importance of operational access and freedom of action, while “Global Commons” identifies the scope of the new joint concept.

¹⁰⁸ Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, January 2012, cover letters and pp. 2, 4-5. For further discussion of this document, see CRS Report R42146, *Assessing the January 2012 Defense Strategic Guidance (DSG): In Brief*, by Catherine Dale and Pat Towell.

¹⁰⁹ Department of Defense, *Defense Budget: Priorities and Choices*, January 2012, pp. 4, 5, 6, 7, 9.

¹¹⁰ Christopher P. Cavalas, “Air-Sea Battle Office Targets DoD Blind Spots,” *NavyTimes.com*, November 10, 2011; Gabe Starosta, “Pentagon Stands Up new AirSea Battle Office,” *Inside the Navy*, November 14, 2011; Ann Roosevelt, “DoD Office Created To Implement Air-Sea Battle Concept,” *Defense Daily*, November 14, 2011: 6; Michael Fabey, “Pentagon Acknowledges New Air-Sea Battle Office,” *Aerospace Daily & Defense Report*, November 14, 2011: 3.

The JAM-GC will describe the required characteristics of a future force that can overcome the challenges of A2/AD environments in the global commons. This will include capabilities to: deploy into a theater of operation to a position where Joint Forces can be employed effectively, and with acceptable levels of risk; effectively command and control Joint Forces in a heavily disrupted electromagnetic-spectrum environment; deter an adversary from proscribed action through demonstration of capability, presence and will; conduct operational maneuver (movement in combination with fires) in an operational area with acceptable levels of risk; project power as needed to achieve objectives; and sustain and supply operations in the face of determined opposition.

Experimentation and implementation have resulted in lessons learned that support the evolution of the “ASB Concept” into a supporting concept to the JOAC [Joint Operational Access Concept]. This evolution is consistent with the JOAC’s intent to adapt and develop U.S. power-projection capabilities in order to maintain operational access and freedom of action.

Work continues on developing counters to the A2/AD problem set. Collaboration among the fleets and forces, concept development staffs and service warfare centers is ongoing. In the coming months, a team of subject-matter experts and concept writers will collaborate to author the JAM-GC to capture insights and lessons learned from the initial years of ASB development. Meanwhile, the services continue to support the activities detailed in the three-year fiscal year 2015–2017 ASB implementation master plan, as well as the memorandum of understanding between the services that codifies the organizational infrastructure and senior governance structure for the ASB Office. Ties between the present multiservice organizational structure and the Joint Staff J-7 (Joint Force Development) have also been expanded and strengthened.

Through the further development and implementation of the JAM-GC, the services, working with allies and partners, remain committed to forging a closer and more resilient networked, integrated force capable of establishing and maintaining freedom of action and operational access whenever and wherever it is needed.¹¹¹

August 2013 Press Report on Revisions to War Plans

An August 2, 2013, press report stated that

The U.S. military is conducting a sweeping overhaul of its war plans for potential conflicts from the Middle East to the Pacific, as commanders adapt to a future of dwindling numbers of ground troops.

Plans that had presumed the availability of large U.S. forces for invasions and occupations are being redrafted to incorporate strategies such as quick-reaction ground units, air power and Navy ships, according to officials. A big part of the new plans will be options for the use of cyberweapons, which can disable enemies’ offensive and defensive capabilities....

... officials said the military had looked at existing plans for conflicts in the Middle East involving Iran, as well as conflicts in Asia, particularly in the South China Sea and East China Sea, where U.S. allies and partners have conflicting territorial claims with China....

¹¹¹ Terry S. Morris et al., “Securing Operational Access: Evolving the Air-Sea Battle Concept,” *The National Interest*, February 11, 2015. See also Paul McLeary, “New US Concept Melds Air, Sea and Land,” *Defense News*, January 24, 2015.

A defense official said that with the war in Afghanistan coming to an end, the U.S. is at “a strategic inflection point.” War plans hadn't been updated to conform with revisions to military strategy outlined by President Barack Obama in 2012.

Defense officials said Defense Secretary Chuck Hagel has received regular updates on the work, and has reviewed the revised plans for Asia.¹¹²

Navy Response to China Naval Modernization

The U.S. Navy has taken a number of steps in recent years that appear intended, at least in part, at improving the U.S. Navy's ability to counter Chinese maritime anti-access capabilities, including but not limited to those discussed below. A November 14, 2012, article by Admiral Jonathan Greenert, the Chief of Naval Operations, provides an overview of Navy activities associated with the U.S. strategic rebalancing toward the Asia-Pacific (which Administration officials state is not directed at any one state in particular); the text of the article is presented in **Appendix C**.

Force Posture and Basing Actions

Navy force posture and basing actions include the following, among others:

- The final report on the 2006 Quadrennial Defense Review (QDR) directed the Navy “to adjust its force posture and basing to provide at least six operationally available and sustainable carriers and 60% of its submarines in the Pacific to support engagement, presence and deterrence.”¹¹³
- More generally, the Navy intends to increase the share of its ships that are homeported in the Pacific from the current figure of about 55% to 60% by 2020.
- The Navy states that, budgets permitting, the Navy will seek to increase the number of Navy ships that will be stationed in or forward-deployed to the Pacific on a day-to-day basis from 51 in 2014 to 58 in 2015 and 67 by 2020.¹¹⁴
- In terms of qualitative improvements, the Navy has stated that it will assign its newest and most capable ships and aircraft, and its most capable personnel, to the Pacific.
- The Navy will increase the number of attack submarines homeported at Guam to four, from a previous total of three.¹¹⁵
- The Navy has announced an intention to station up to four Littoral Combat Ships (LCSs) at Singapore by 2017,¹¹⁶ and an additional seven LCSs in Japan by 2022.¹¹⁷

¹¹² Julian E. Barnes, “Pentagon Conducts Overhaul Of War Plans,” *Wall Street Journal*, August 2, 2013: 5.

¹¹³ U.S. Department of Defense, *Quadrennial Defense Review Report*. Washington, 2006. (February 6, 2006) p. 47.

¹¹⁴ Victor Battle, “US Navy ‘Shaping Events’ in South China Sea,” *VOA News* (www.voanews.com), May 20, 2014. See also Mike McCarthy, “CNO Sees More Integration With Asian Allies,” *Defense Daily*, May 20, 2014: 1-2.

¹¹⁵ “Fourth Attack Sub to be Homeported in Guam,” *Navy News Service*, February 10, 2014.

¹¹⁶ Jim Wolf, “U.S. Plans 10-Month Warship Deployment To Singapore,” *Reuters.com*, May 10, 2012; Jonathan Greenert, “Sea Change, The Navy Pivots to Asia,” *Foreign Policy* (www.foreignpolicy.com), November 14, 2012.

¹¹⁷ Zachary Keck, “U.S. Chief of Naval Operations: 11 Littoral Combat Ships to Asia by 2012,” *The Diplomat* (continued...)

- In April 2014, the United States and the Philippines signed an agreement that will provide U.S. forces with increased access to Philippine bases.¹¹⁸

In addition to the above actions, U.S. Marines have begun six-month rotational training deployments through Darwin, Australia, with the number of Marines in each deployment scheduled to increase to 2,500 in 2016.¹¹⁹

Acquisition Programs

As mentioned earlier (see “Limitations and Weaknesses” in “Background”), China’s navy exhibits limitations or weaknesses in several areas, including antisubmarine warfare (ASW) and mine countermeasures (MCM). Countering China’s naval modernization might thus involve, among other things, actions to exploit such limitations and weaknesses, such as developing and procuring Virginia (SSN-774) class attack submarines, torpedoes, unmanned underwater vehicles (UUVs), and mines.

Many of the Navy’s programs for acquiring highly capable ships, aircraft, and weapon systems can be viewed as intended, at least in part, at improving the U.S. Navy’s ability to counter Chinese maritime anti-access capabilities. Examples of highly capable ships now being acquired include Ford (CVN-78) class aircraft carriers,¹²⁰ Virginia (SSN-774) class attack submarines,¹²¹ and Arleigh Burke (DDG-51) class Aegis destroyers, including the new Flight III version of the DDG-51, which is to be equipped with a new radar for improved air and missile defense operations.¹²² The procurement rate of Virginia-class submarines was increased to two per year in FY2011, and the Navy wants to start procuring the Flight III version of the DDG-51 in FY2016.

Examples of highly capable aircraft now being acquired by the Navy include F-35C carrier-based Joint Strike Fighters (JSFs),¹²³ F/A-18E/F Super Hornet strike fighters and EA-18G Growler electronic attack aircraft,¹²⁴ E-2D Hawkeye early warning and command and control aircraft, the

(...continued)

(<http://thediplomat.com>), May 17, 2013.

¹¹⁸ See, for example, Mark Landler, “U.S. and Philippines Agree to a 10-Year Pact on the Use of Military Bases,” *New York Times*, (www.nytimes.com), April 27, 2014; Associated Press, “Obama Says US-Philippines Military Pact Will Improve Asia’s Security,” Fox News (www.foxnews.com), April 28, 2014; Luis Ramirez, “US-Philippines Defense Deal to Improve Asia Security,” *VOA News* (www.voanews.com), April 28, 2014; Armando J. Heredia, “New Defense Agreement Between The Philippines and U.S.: The Basics,” *USNI News* (<http://news.usni.org>), April 29, 2014; Ankit Panda, “US-Philippines Enhanced Defense Cooperation Agreement Bolsters ‘Pivot to Asia’,” *The Diplomat* (<http://thediplomat.com>), April 29, 2014; “Philippines To Give U.S. Forces Access To Up To Five Military Bases,” *Reuters* (www.reuters.com), May 2, 2014; Carl Thayer, “Analyzing the US-Philippines Enhanced Defense Cooperation Agreement,” *The Diplomat* (<http://thediplomat.com>), May 2, 2014.

¹¹⁹ Seth Robson, “US Increasing Number of Marines On Rotation To Australia,” *Stars and Stripes* (*Stripes.com*), June 15, 2013.

¹²⁰ For more on the CVN-78 program, see CRS Report RS20643, *Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress*, by Ronald O’Rourke.

¹²¹ For more on the Virginia-class program, see CRS Report RL32418, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress*, by Ronald O’Rourke.

¹²² For more on the DDG-51 program, including the planned Flight III version, see CRS Report RL32109, *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress*, by Ronald O’Rourke.

¹²³ For more on the F-35 program, see CRS Report RL30563, *F-35 Joint Strike Fighter (JSF) Program*, by Jeremiah Gertler.

¹²⁴ For more on the F/A-18E/F and EA-18G programs, see CRS Report RL30624, *Navy F/A-18E/F and EA-18G* (continued...)

P-8A Multi-mission Maritime Aircraft (MMA),¹²⁵ and the follow-on Unmanned Carrier Launched Airborne Surveillance and Strike (UCLASS) system.

The Navy is also developing a number of new weapon technologies that might be of value in countering Chinese maritime anti-access capabilities, such as an electromagnetic rail gun (EMRG) whose potential missions include air and missile defense, and high-power free electron lasers (FELs) and solid state lasers (SSLs), whose potential missions also include air and missile defense.¹²⁶

An October 10, 2011, press report states that Admiral Jonathan Greenert, the Chief of Naval Operations (CNO), in a memorandum dated September 23, 2011, “has launched a new review to identify warfighting investments that could counter Chinese military methods for disrupting key battlefield information systems.” According to the report, the memorandum “requests options for warfighting in ‘the complex electromagnetic environment’ and for countering ‘anti-access/area-denial’ threats—terms closely associated with China’s military.” The report quotes the memorandum as stating that “Today’s weapons rely on EM [electromagnetic] sensors, EM communications and EM seekers to complete their ‘kill chains,’ while defenders are increasingly turning to EM methods for protection,” and that “some kill chains never leave the EM environment at all, damaging an adversary’s military capability by affecting control systems alone—no bomb or missile required.” The report states that the memorandum “directs the group to ‘generate innovative concepts for [the] Navy to employ the EM environment as a primary line of operation in a 2025-2030 warfighting campaign.’”¹²⁷

In a December 2011 journal article, Greenert stated that

regional powers in 2025 could use ballistic and cruise missiles, submarines, and guided rockets and artillery to prevent military forces or legitimate users from entering an area (“anti-access,” or A2) or operating effectively within an area (“area-denial,” or AD). Those capabilities can be characterized as defensive, reducing opposition to them, and they can be deployed from the country’s mainland territory, making attacks against them highly escalatory. Their intended purpose, however, is clear—intimidation of neighboring countries, including U.S. allies and partners. Aggressors can threaten to hold key maritime crossroads at risk, render territorial claims moot, and assert that intervention by the United States or others in these disputes can be delayed or prevented. The stated or unstated implication is that their neighbors should capitulate to the aggressor’s demands.

To help defend our allies and protect our interests, U.S. forces in 2025 will need to be able to operate and project power despite adversary A2/AD capabilities. Over the next decade naval and air forces will implement the new AirSea Battle Concept and put in place the tactics, procedures, and systems of this innovative approach to the A2/AD challenge....

(...continued)

Aircraft Program, by Jeremiah Gertler.

¹²⁵ For an article discussing the use of P-8 for countering Chinese submarines, see Jeremy Page, “As China Deploys Nuclear Submarines, U.S. P-8 Poseidon Jets Snoop on Them,” *Wall Street Journal* (<http://online.wsj.com>), October 24, 2014.

¹²⁶ For more on the Navy’s laser-development efforts, see CRS Report R41526, *Navy Shipboard Lasers for Surface, Air, and Missile Defense: Background and Issues for Congress*, by Ronald O’Rourke.

¹²⁷ Christopher J. Castelli, “Memo: Navy Seeks To Counter China’s Battle-Disruption Capabilities,” *Inside the Navy*, October 10, 2011.

Over the next decade, maintaining the Navy's war-fighting edge and addressing fiscal constraints will require significant changes in how we develop the force. We will need to shift from a focus on platforms to instead focus on what the platform carries. We have experience in this model. Aircraft carriers, amphibious ships and the littoral combat ships are inherently reconfigurable, with sensor and weapon systems that can evolve over time for the expected mission. As we apply that same modular approach to each of our capabilities, the weapons, sensors, unmanned systems, and electronic-warfare systems that a platform deploys will increasingly become more important than the platform itself.

That paradigm shift will be prompted by three main factors. First, the large number, range of frequencies, and growing sophistication of sensors will increase the risk to ships and aircraft—even “stealthy” ones—when operating close to an adversary's territory. Continuing to pursue ever-smaller signatures for manned platforms, however, will soon become unaffordable. Second, the unpredictable and rapid improvement of adversary A2/AD capabilities will require faster evolution of our own systems to maintain an advantage or asymmetrically gain the upper hand. This speed of evolution is more affordable and technically possible in weapons, sensors, and unmanned systems than in manned platforms.

The third factor favoring a focus on payloads is the changing nature of war. Precision-guided munitions have reduced the number and size of weapons needed to achieve the same effect. At the same time, concerns for collateral damage have significantly lowered the number of targets that can be safely attacked in a given engagement. The net effect is fewer weapons are needed in today's conflicts.

Together, those trends make guided, precision stand-off weapons such as Tomahawk land-attack missiles, joint air-surface stand-off missiles, and their successors more viable and cost-effective alternatives to increasingly stealthy aircraft that close the target and drop bombs or shoot direct-attack missiles. To take full advantage of the paradigm shift from platform to payload, the Fleet of 2025 will incorporate faster, longer-range, and more sophisticated weapons from ships, aircraft, and submarines. In turn, today's platforms will evolve to be more capable of carrying a larger range of weapons and other payloads.

Those other payloads will include a growing number of unmanned systems. Budget limitations over the next 10 to 15 years may constrain the number of ships and aircraft the Navy can buy....

The future Fleet will deploy a larger and improved force of rotary wing unmanned aerial vehicles (UAVs) including today's Fire Scout and soon, the armed Fire-X. Those vehicles were invaluable in recent operations in Libya and in counterterrorism operations around the Central Command area of responsibility. Deploying from the deck of a littoral combat ship, a detachment of Fire Scouts can provide continuous surveillance more than 100 miles away. Those systems will expand the reach of the ship's sensors with optical and infrared capabilities, as well as support special operations forces in the littorals. Even more significant, the Fleet of 2025 will include UAVs deploying from aircraft carrier decks. What started a decade ago as the unmanned combat air system will be operating by 2025 as an integral element of some carrier air wings, providing surveillance and some strike capability at vastly increased ranges compared with today's strike fighters. Once that aircraft is fielded, it will likely take on additional missions such as logistics, electronic warfare, or tanking.

Submarines will deploy and operate in conjunction with a family of unmanned vehicles and sensors by 2025 to sustain the undersea dominance that is a clear U.S. asymmetric advantage. Large-displacement unmanned underwater vehicles (UUVs) will deploy from ships, shore, or Virginia-class submarine payload tubes to conduct surveillance missions. With their range and endurance, large UUVs could travel deep into an adversary's A2/AD envelope to deploy strike missiles, electronic warfare decoys, or mines. Smaller UUVs will

be used by submarines to extend the reach of their organic sensors, and will operate in conjunction with unattended sensors that can be deployed from surface combatants, submarines, and P-8A patrol aircraft. The resulting undersea network will create a more complete and persistent “common operational picture” of the underwater environment when and where we need it. This will be essential to finding and engaging adversary submarines, potentially the most dangerous A2/AD capability.

The undersea picture is extremely important in terms of countering enemy mining. The most basic of A2/AD weapons, mines can render an area of ocean unusable for commercial shipping for weeks or months while we laboriously locate and neutralize them. Even the threat of mines is enough to severely restrict ship movements, significantly affecting trade and global economic stability if it happens in key choke points such as the Malacca or Hormuz straits. The mine countermeasure capabilities we are developing for littoral combat ships and MH-60 aircraft rely heavily on unmanned sensors to rapidly build the underwater picture, and unmanned neutralization systems to disable mines. By 2025 those systems will be fully fielded, and their portable nature could allow them to be another swappable payload on a range of combatants....

Electronic warfare (EW) and cyber operations are increasingly essential to defeating the sensors and command and control (C2) that underpin an opponent’s A2/AD capabilities. If the adversary is blinded or unable to communicate, he cannot aim long-range ballistic and cruise missiles or cue submarines and aircraft. Today, Navy forces focus on deconflicting operations in the electromagnetic spectrum or cyber domains. By 2025, the Fleet will fully operationalize those domains, more seamlessly managing sensors, attacks, defense, and communications, and treating EW and cyber environments as “maneuver spaces” on par with surface, undersea, or air.

For example, an electronic jammer or decoy can defeat individual enemy radar, and thus an enemy C2 system using the radar’s data. A cyber operation might be able to achieve a similar effect, allowing U.S. forces to avoid detection. This is akin to using smoke and “rubber-duck” decoys in World War II to obscure and confuse the operational picture for Japanese forces, allowing U.S. ships to maneuver to an advantageous position. The future Fleet will employ EW and cyber with that same sense of operational integration.¹²⁸

An August 20, 2012, press report stated that the Air-Sea Battle concept prompted Navy officials to make significant shifts in the service’s FY2014-FY2018 budget plan, including new investments in ASW, electronic attack and electronic warfare, cyber warfare, the F-35 Joint Strike Fighter (JSF), the P-8A maritime patrol aircraft, and the Broad Area Maritime Surveillance (BAMS) UAV (a maritime version of the Global Hawk UAV). The report quoted Greenert as saying that the total value of the budget shifts was certainly in the hundreds of millions of dollars, and perhaps in the “low billions” of dollars.¹²⁹

A July 13, 2013, blog post states that

¹²⁸ Jonathan Greenert, “Navy, 2025: Forward Warfighters,” *U.S. Naval Institute Proceedings*, December 2011: 20. Greenert’s statement about stationing several LCSs at Singapore followed statements by other Administration officials dating back to June 2011 about operating a small number of LCSs out of Singapore. See, for example, Wong Maye-E (Associated Press), “Gates Pledges Wider U.S. Military Presence in Asia,” *USA Today*, June 4, 2011; and Dan de Luce (Agence France-Presse), “Gates: New Weapons For ‘Robust’ U.S. Role in Asia,” *DefenseNews.com*, June 3, 2011.

¹²⁹ Christopher J. Castelli, “CNO: Air-Sea Battle Driving Acceleration Of Key Programs In POM-14,” *Inside the Navy*, August 20, 2012. POM-14 is the Program Objective Memorandum (an internal DOD budget-planning document) for the FY2014 DOD budget.

a new and dangerous mystery weapon has America's admirals scared.

That's according to a recent approval for up to \$65 million over three years from the Naval Research Laboratory to defense contractor ITT Exelis. The funds, according to a Navy document, are for a suite of 24 electronic warfare systems to be mounted on U.S. warships sailing near Chinese waters.

The reason? It's "necessary to thwart an immediate threat for naval fleet operations," the Navy stated. The sailing branch wants the new defenses in place by March 2014.

The urgent notice, first spotted by Military & Aerospace Electronics, is an unusually stark warning for the planet's mightiest fleet. Navy officials told the magazine the undisclosed danger is a "newly discovered threat," which caused U.S. Pacific Fleet commander Adm. Cecil Haney to fast-track the project.

The Navy isn't saying what the threat is, which country developed it or when it was discovered by the Americans. Requests to the Navy for comment were not returned.

But it's possible to make informed guesses. As the trade magazine notes, "shipboard electronic warfare systems typically are designed to detect and jam enemy radar threats—particularly the electronics in *radar-guided anti-ship missiles*." (Our emphasis.)

And it's reasonably safe to assume if there's a new missile out there, it's Chinese....

To be clear, nobody outside the Navy knows for sure what's got the sailing branch so startled. Until the Navy discloses exactly what the threat is, everyone will be guessing. Besides China, the other players in this scenario are, of course, Russia, Iran and North Korea.¹³⁰

A July 28, 2013, blog post states that

The U.S. Navy has asked missile manufacturers to quickly design and build them a target drone that will simulate sub-sonic Chinese anti-ship missiles. Previously the U.S. Navy had spent a lot of effort developing and building similar drones to simulate super-sonic anti-ship missiles. Apparently someone did the math and realized that the most likely near-term opponents (China, North Korea, or Iran) all had a lot of Chinese sub-sonic missiles.¹³¹

Training and Forward-Deployed Operations

The Navy in recent years has increased antisubmarine warfare (ASW) training for Pacific Fleet forces and conducted various forward-deployed operations in the Western Pacific, including exercises and engagement operations with Pacific allied and partner navies, as well as operations

¹³⁰ "Mystery Weapon Terrifies America's Admirals," *War is Boring* (<https://medium.com/war-is-boring>), July 13, 2013, accessed September 5, 2013, at <https://medium.com/war-is-boring/9b7312dc7bf5>. See also John Keller, "ITT Exelis To Help Navy With New EW System To Protect Ships From Recently Discovered Threat," *Military and Aerospace Electronics* (www.militaryaerospace.com), July 9, 2013, accessed September 5, 2013, at <http://www.militaryaerospace.com/articles/2013/07/itt-shipboard-ew.html>.

¹³¹ James Dunnigan, "U.S. Navy Hurries Preparations For War With China," *Strategy Page* (www.strategypage.com), July 28, 2013, accessed September 5, 2013, at <http://www.strategypage.com/dls/articles/U.S.-Navy-Hurries-Preparations-For-War-With-China-7-28-2013.asp>.

that appear to have been aimed at monitoring Chinese military operations.¹³² In a December 2011 journal article, Admiral Jonathan Greenert, the Chief of Naval Operations, stated:

Critical to shaping the environment is cooperation with partners and allies across the range of operations. At the high end [of operations], we will expand our combined efforts with allies in Japan, South Korea, and Australia to train and exercise in missions such as antisubmarine warfare and integrated air and missile defense. Over the next decade, we will also increase deployments of ships and aircraft for the cooperative missions our other allies and partners need most. Our ships [sic] in Singapore will conduct cooperative counterpiracy or countertrafficking operations around the South China Sea. Similarly, 2025 may see [land-based] P-8A Poseidon [maritime patrol] aircraft or unmanned broad area maritime surveillance aerial vehicles periodically deploy to the Philippines or Thailand to help those nations with maritime domain awareness....

As Secretary of State Hillary Clinton noted in a recent *Foreign Policy* article, the Asia-Pacific region will be emphasized in our forward posture.... We will continue our robust rotational deployments to the western Pacific, complemented with our forward-stationed navy and marine forces in Japan, Guam, Singapore, and Australia.¹³³

A July 2, 2013, blog post states that

The U.S. Navy's multi-national exercises in the Pacific theater are growing in size and taking on new dimensions due to the U.S. military's overall strategic re-balance or "pivot" to the region, service officials explained.

Although many of the multi-national exercises currently underway have been growing in recent years, the U.S. military's strategic focus on the area is having a profound impact upon training activities there, Navy officials acknowledge....

"The Pacific re-balance is allowing us to do things we have not been able to do in the past. Some of our allies were looking for something a little more compatible with what they had. The LCS [Littoral Combat Ship] allows us to better train and adapt to our partner navies who have been operating smaller, shallow-draft platforms for years," said [Lt. Anthony] Falvo [spokesman, U.S. Pacific Fleet].¹³⁴

Statements of Confidence

Countering China's naval modernization effort can also involve stating publicly (while withholding classified details) the U.S. Navy's ability to counter improved Chinese maritime forces. Such public statements could help prevent Chinese overconfidence that might lead to incidents, while also reassuring regional allies, partners, and neutrals. Conversely, some observers might argue, having an ability to counter Chinese maritime military forces but not stating it publicly could invite Chinese overconfidence and thereby be destabilizing.

¹³² Incidents at sea in recent years between U.S. and Chinese ships and aircraft in China's Exclusive Economic Zone (EEZ) appear to involve, on the U.S. side, ships and aircraft, such as TAGOS ocean surveillance ships and EP-3 electronic surveillance aircraft, whose primary apparent mission is to monitor foreign military operations.

¹³³ Jonathan Greenert, "Navy, 2025: Forward Warfighters," *U.S. Naval Institute Proceedings*, December 2011: 20.

¹³⁴ Kris Osborn, "Navy Pivots Training to Match Pacific Transition," *DOD Buzz* (www.dodbuzz.com), July 2, 2013.

Issues for Congress

Future Size of U.S. Navy

One potential oversight issue for Congress, particularly in the context of constraints on U.S. defense spending, concerns whether the U.S. Navy in coming years will be large enough to adequately counter improved Chinese maritime anti-access forces while also adequately performing other missions around the world of interest to U.S. policymakers. Some observers are concerned that a combination of growing Chinese naval capabilities and budget-driven reductions in the size of the U.S. Navy could encourage Chinese military overconfidence and demoralize U.S. allies and partners in the Pacific, and thereby destabilize or make it harder for the United States to defend its interests in the region.¹³⁵

Navy officials state that, to carry out Navy missions around the world in coming years, the Navy will need to achieve and maintain a fleet of 306 ships of various types and numbers. Many observers are concerned that constraints on Navy budgets in coming years will result in a fleet with considerably fewer than 306 ships.¹³⁶ The issue of whether the U.S. Navy in coming years will be large enough to adequately counter improved Chinese maritime anti-access forces is part of a larger debate about whether the military pillar of the U.S. strategic rebalancing to the Asia-Pacific region is being adequately resourced.

Potential oversight questions for Congress include the following:

- Under the Administration's plans, will the Navy in coming years be large enough to adequately counter improved Chinese maritime anti-access forces while also adequately performing other missions around the world of interest to U.S. policymakers?
- What might be the political and security implications in the Asia-Pacific region of a combination of growing Chinese naval capabilities and budget-driven reductions in the size of the U.S. Navy?
- If the Navy is reduced in size, and priority in the allocation of deployed Navy ships is given to maintaining Navy forces in the Pacific, what will be the impact on Navy force levels in other parts of the world, such as the Persian Gulf/Indian Ocean region or the Mediterranean Sea, and consequently on the Navy's ability to adequately perform its missions in those parts of the world?
- To what extent could the operational impacts of a reduction in Navy ship numbers be mitigated through increased use of forward homeporting, multiple crewing, and long-duration deployments with crew rotation (i.e., "Sea Swap")? How feasible are these options, and what would be their potential costs and benefits?

¹³⁵ See, for example, Seth Cropsey, "China's Growing Challenge To U.S. Naval Power," *Wall Street Journal*, June 21, 2013: 13.

¹³⁶ For further discussion, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by Ronald O'Rourke.

Long-Range Carrier-Based Aircraft and Long-Range Weapons

Another potential oversight issue for Congress concerns Navy plans for developing and procuring long-range carrier-based aircraft and long-range ship- and aircraft-launched weapons. Aircraft and weapons with longer ranges could help Navy ships and aircraft achieve results while remaining outside the ranges of Chinese A2/AD systems that can pose a threat to their survivability.¹³⁷

UCLASS Aircraft

Some observers have stressed a need for the Navy to proceed with its plans for developing and deploying a long-range, carrier-based, unmanned UAV called the Unmanned Carrier Launched Airborne Surveillance and Strike (UCLASS) aircraft. Some of these observers view the acquisition of a long-range carrier-based UAV as key to maintaining the survivability and mission effectiveness of aircraft carriers against Chinese A2/AD systems in coming years.¹³⁸

The operational requirements for the UCLASS aircraft been a matter of some debate, with a key issue being how much stealth and weapons payload—and consequently, how much ability to penetrate heavily defended airspace and conduct strike missions—the UCLASS aircraft should have.¹³⁹ The issue was the topic of a July 16, 2014, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee.

Long-Range Anti-Ship and Land Attack Missiles

Some observers have stressed a need for the Navy to proceed with the development and acquisition of a longer-ranged, next-generation replacement for the Navy's current Harpoon ASCM, and a next-generation replacement for the Navy's Tomahawk land attack cruise missile. These observers view the acquisition of such weapons as key to maintaining the survivability and mission effectiveness of Navy surface combatants when operating within range of Chinese A2/AD systems, including Chinese surface combatants armed with capable ASCMs. The Navy has initiated efforts to develop such new weapons, and is also experimenting with a new, long-range antiship variant of the Tomahawk.¹⁴⁰ A proposal in the Navy's FY2016 budget to end procurement of new Tomahawks following a final procurement of 100 missiles in FY2016 has become an oversight issue for Congress.¹⁴¹ At a February 25, 2015, hearing on Department of the

¹³⁷ For an article that provides an overview discussion of the issue, see Robert Haddick, "The Real U.S.-China War Asia Should Worry About: The 'Range War,'" *The National Interest* (<http://nationalinterest.org>), July 25, 2014.

¹³⁸ See, for example, Mark Gunzinger and Bryan Clark, "Commentary: The Next Carrier Air Wing," *DefenseNews.com*, February 24, 2014.

¹³⁹ See, for example, Dave Majumdar, "Requirements Debate Continues to Delay UCLASS RFP," *USNI News* (<http://news.usni.org>), March 24, 2014; Mike McCarthy, "NAVIAR Chief Says Navy Seeking Optimal Balance On UCLASS," *Defense Daily*, March 7, 2014.

¹⁴⁰ See, for example, Tony Osborne, "New Seeker Could Put Tomahawk In Long-Range Anti-Ship Missile Race," *Aviation Week & Space Technology*, November 12, 2014; Sam LaGrone, "Video: Tomahawk Strike Missile Punches Hole Through Moving Maritime Target," *USNI News*, February 9, 2015; Christopher P. Cavas, "Raytheon Working on Tomahawk With Active Seeker," *Defense News*, February 13, 2015.

¹⁴¹ See, for example, Mike McCarthy, "Navy Will Take Another Look At Tomahawks In 2017," *Defense Daily*, March 23, 2015: 4; Lara Seligman and Lee Hudson, "Raytheon: Navy's FY-16 Tomahawk Request Won't Sustain Production Line," *Inside the Navy*, February 9, 2015. See also James Feldkamp, "Tomahawk: Vital to the Future of U.S. Seapower," *Real Clear Defense*, March 2, 2015; Kirk S. Lippold, "Obama Can't Skimp on Tomahawks," *Politico*, March 25, 2015.

Navy acquisition programs before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, Department of the Navy officials stated:

The Tomahawk Weapons System is the Navy's premier precision strike standoff weapon for deep strike against various fixed and re-locatable targets and can be launched from both Surface Ships and Submarines. The current variant is the Tactical Tomahawk (TACTOM BLK IV), which preserves Tomahawk's long-range precision-strike capability while significantly increasing responsiveness and flexibility. TACTOM's improvements include in-flight retargeting, the ability to loiter over the battlefield, in-flight missile health and status monitoring, and battle damage indication imagery (providing a digital look-down "snapshot" of the battlefield via a satellite data link). Other Tomahawk improvements include rapid mission planning and execution via Global Positioning System (GPS) onboard the launch platform and improved anti-jam GPS.

The FY 2016 President's Budget requests \$184.8 million in WPN [the Weapons Procurement, Navy appropriation account] for procurement of an additional 100 BLK IV TACTOM vertical launch system weapons and associated support, \$71.2 million in OPN for the Tomahawk support equipment, and \$25.2 million in RDT&E to minimize factory shutdown time until the start of BLK IV recertification and modernization in FY 2019. The BLK IV recertification and upgrade program includes advanced communications, electronics, and software navigation upgrades that will ensure Tomahawk BLK IV remains operationally viable until the end of its service life in the 2040s. The Navy is determining whether there are warfighter capability gaps in light of advances and proliferation of adversary anti-access/area denial technology that may be addressed via additional Tomahawk upgrades.

For ASuW [anti-surface warfare], President's Budget FY 2016 continues to accelerate the acquisition of the Long Range Anti-Ship Missile (LRASM) air-launched variant, which will achieve early operational capability on F/A-18E/F aircraft in FY 2019 as an Increment I capability. As part of the long-term strike weapon strategy, the Department is investing in a Next Generation Strike Capability (NGSC) that includes a survivable, long range, multi-mission, multi-platform conventional strike capability by the mid-2020s. NGSC will combine the current maritime Offensive Anti-Surface Warfare (OaSuW) Increment II and Next Generation Land Attack Weapons (NGLAW) projects into a single multi-mission development effort as the acquisition follow-on program to the current OASuW Increment I (LRASM) and Land Strike (Tomahawk Modernization) investments. NGSC will focus on assessing, maturing and incorporating emergent technologies to determine the best path forward for the follow-on improved land/maritime strike capabilities.¹⁴²

Long-Range Air-to-Air Missile

Another potential issue for Congress is whether the Navy should develop and procure a long-range air-to-air missile for its carrier-based strike fighters. Such a weapon might improve the survivability of Navy carrier-based strike fighters in operations against Chinese aircraft armed with capable air-to-air missiles, and help permit Navy aircraft carriers to achieve results while

¹⁴² Statement of the Honorable Sean J. Stackley, Assistant Secretary of the Navy (Research, Development and Acquisition) and Vice Admiral Joseph P. Mulloy, Deputy Chief of Naval Operations for Integration of Capabilities and Resources, and Lieutenant General Kenneth J. Glueck, Jr., Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command, Before the Subcommittee on Seapower and Projection Forces of the House Armed Services Committee on Department of the Navy Seapower and Projection Forces Capabilities, February 25, 2015, p. 26.

remaining outside the ranges of Chinese A2/AD systems that can pose a threat to their survivability.

During the Cold War, Navy F-14 carrier-based fighters were equipped with a long-range air-to-air missile called the Phoenix. The F-14/Phoenix combination was viewed as key to the Navy's ability to effectively counter Soviet land-based strike aircraft equipped with long-range ASCMs that appeared designed to attack U.S. Navy aircraft carriers. A successor to the Phoenix called the Advanced Air-to-Air Missile (AAAM) was being developed in the late 1980s, but the AAAM program was cancelled as a result of the end of the Cold War. The Navy today does not have a long-range air-to-air missile, and DOD has announced no program to develop such a weapon.

Air-Sea Battle Concept (Now Renamed JAM-GC)

Another potential oversight issue for Congress concerns the Air-Sea Battle concept (ASB), which became a matter of some controversy before it was renamed Joint Concept for Access and Maneuver in the Global Commons (JAM-GC). (For background on the renaming of ASB as JAM-GC, see "Air-Sea Battle (ASB) Concept (Now Renamed JAM-GC)" in "Background.")

While there seemed to be little disagreement over the goal within the ASB effort to improve the joint operating effectiveness U.S. naval and Air Force units, there was controversy about the effectiveness of the ASB concept as a means of deterring potential Chinese aggression and reassuring U.S. allies and partners in the region, and about whether attacking land targets on the Chinese mainland—something that some observers believe to be an element of the ASB—would pose an unwanted degree of risk of escalating a smaller crisis or conflict into a larger one. As an alternative to ASB, some observers advocated an alternative military strategy, which they call Offshore Control, that would not involve attacking land targets in China.¹⁴³ Other observers defended ASB and/or criticized Offshore Control.¹⁴⁴ How this debate will be affected, if at all, by the renaming of ASB as JAM-GC is not yet certain.

Navy's Ability to Counter China's ASBMs

Another potential oversight issue for Congress concerns the Navy's ability to counter China's ASBMs. Although China's projected ASBM, as a new type of weapon, might be considered a "game changer," that does not mean it cannot be countered. There are several potential approaches for countering an ASBM that can be imagined, and these approaches could be used in combination. The ASBM is not the first "game changer" that the Navy has confronted; the Navy in the past has developed counters for other new types of weapons, such as ASCMs, and is likely exploring various approaches for countering ASBMs.

¹⁴³ See, for example, "T.X. Hammes and R.D. Hooker Jr., "America's Ultimate Strategy in a Clash with China," *The National Interest* (<http://nationalinterest.org>), June 10, 2014. See also Erik Slavin, "Analysts: Air-Sea Battle Concept Carries Risks in Possible Conflict with China," *Stars and Stripes* (www.stripes.com), September 28, 2014.

¹⁴⁴ See, for example, Bill Dries, "How to Have a Big Disastrous War with China," *The National Interest* (<http://nationalinterest.org>), June 27, 2014. See also Wendell Minnick, "China Threat: Air-Sea Battle vs. Offshore Control?" *Defense News* (www.defensenews.com), June 23, 2014; Chris Mclachlan, "The Political Perils of Offshore Balancing," *The Diplomat* (<http://thediplomat.com>), October 21, 2014.

Breaking the ASBM's Kill Chain

Countering China's projected ASBMs could involve employing a combination of active (i.e., "hard-kill") measures, such as shooting down ASBMs with interceptor missiles, and passive (i.e., "soft-kill") measures, such as those for masking the exact location of Navy ships or confusing ASBM reentry vehicles. Employing a combination of active and passive measures would attack various points in the ASBM "kill chain"—the sequence of events that needs to be completed to carry out a successful ASBM attack. This sequence includes detection, identification, and localization of the target ship, transmission of that data to the ASBM launcher, firing the ASBM, and having the ASBM reentry vehicle find the target ship.

Attacking various points in an opponent's kill chain is an established method for countering an opponent's military capability. A September 30, 2011, press report, for example, quotes Lieutenant General Herbert Carlisle, the Air Force's deputy chief of staff for operations, plans, and requirements, as stating in regard to Air Force planning that "We've taken [China's] kill chains apart to the 'nth' degree."¹⁴⁵ In an interview published on January 14, 2013, Admiral Jonathan Greenert, the Chief of Naval Operations, stated:

In order for one to conduct any kind of attack, whether it is a ballistic missile or cruise missile, you have got to find somebody. Then, you have got to make sure it is somebody you want to shoot. Then, you've got to track it, you've got to hold that track. Then, you deliver the missile. We often talk about what I would call hard kill—knocking it down, a bullet on a bullet—or soft kill; there is jamming, spoofing, confusing; and we look at that whole spectrum of operations.

And frankly, it is cheaper in the left-hand side of that spectrum.¹⁴⁶

To attack the ASBM kill chain, Navy surface ships, for example, could operate in ways (such as controlling electromagnetic emissions or using deception emitters) that make it more difficult for China to detect, identify, and track those ships.¹⁴⁷ The Navy could acquire weapons and systems for disabling or jamming China's long-range maritime surveillance and targeting systems, for attacking ASBM launchers, for destroying ASBMs in various stages of flight, and for decoying and confusing ASBMs as they approach their intended targets. Options for destroying ASBMs in flight include developing and procuring improved versions of the SM-3 BMD interceptor missile

¹⁴⁵ David A. Fulghum, "USAF: Slash And Burn Defense Cuts Will Cost Missions, Capabilities," *Aerospace Daily & Defense Report*, September 30, 2011: 6.

¹⁴⁶ "Interview: Adm. Jon Greenert," *Defense News*, January 14, 2013: 30. The reference to "the left-hand side of that spectrum" might be a reference to soft kill measures.

¹⁴⁷ For a journal article discussing actions by the Navy during the period 1956-1972 to conceal the exact locations of Navy ships, see Robert G. Angevine, "Hiding in Plain Sight, The U.S. Navy and Dispersed Operations Under EMCON, 1956-1972," *Naval War College Review*, Spring 2011: 79-95. See also Jonathan F. Sullivan, *Defending the Fleet From China's Anti-Ship Ballistic Missile: Naval Deception's Roles in Sea-Based Missile Defense*, A Thesis submitted to the Faculty of the Graduate School of Arts and Sciences of Georgetown University in partial fulfillment of the requirements for the degree of Master of Arts in Security Studies, April 15, 2011, accessed August 10, 2011 at <http://gradworks.umi.com/1491548.pdf>; Jon Solomon, "Deception and the Backfire Bomber: Reexamining the Late Cold War Struggle Between Soviet Maritime Reconnaissance and U.S. Navy Countertargeting," *Information Dissemination* (www.informationdissemination.net), October 27, 2014; John Solomon, "Deception and the Backfire Bomber, Part II," *Information Dissemination* (www.informationdissemination.net), October 28, 2014; John Solomon, "Deception and the Backfire Bomber, Part III," *Information Dissemination* (www.informationdissemination.net), October 29, 2014; John Solomon, "Deception and the Backfire Bomber, Part IV," *Information Dissemination* (www.informationdissemination.net), October 30, 2014.

(including the planned Block IIA version of the SM-3), accelerating the acquisition of the Sea-Based Terminal (SBT) interceptor (the planned successor to the SM-2 Block IV terminal-phase BMD interceptor),¹⁴⁸ accelerating development and deployment of the electromagnetic rail gun (EMRG), and accelerating the development and deployment of shipboard high-power free electron lasers (FELs) and solid state lasers (SSLs). Options for decoying and confusing ASBMs as they approach their intended targets include equipping ships with systems, such as electronic warfare systems or systems for generating radar-opaque smoke clouds or radar-opaque carbon-fiber clouds, that could confuse an ASBM's terminal-guidance radar.¹⁴⁹

An August 9, 2014, press report states that Admiral Harry B. Harris, Jr., Commander, U.S. Pacific Fleet, in response to a question about the threat posed to U.S. Navy aircraft carriers by China's ASBMs, stated, "We are very well aware of the capabilities that China has and is trying to develop and I'm very confident we would be able to carry out any mission that we have to." The press report states that Harris said he could not state the nature of the technology used to counter the ASBM, but that "We work in it every day. I'm confident of our ability to defeat any Chinese missile threat and to be able to do whatever we need to do."¹⁵⁰

A May 29, 2014, press report states:

When the next-generation aircraft carrier CVN 78 Gerald R. Ford takes to the seas later this decade, it will face one of the most dangerous threats to the U.S. maritime military behemoth—the Chinese DF-21 anti-ship ballistic missile (ASBM).

But U.S. Navy officials remain confident that the technological improvements to the Ford as well as the other ships shielding the carrier from attack should be able to protect the vessel...

... zeroing in on a carrier with such a missile is more difficult than it seems, says Rear Adm. Michael Manazir, director of air warfare.

Eyeing the Ford from the ship's flight deck, he notes: "People think this is a big target. But they have to get to the carrier and then discern that it is a carrier."

In addition, the U.S. Navy has a layered network of defensive systems.

"It's a series of systems," Manazir explains during a recent exclusive tour of the Ford at the Newport News Shipbuilding yard in the Tidewater part of Virginia. "We want to attack it on the left side of the kill chain."¹⁵¹

A May 21, 2014, press report states:

¹⁴⁸ For more on the SM-3, including the Block IIA version, and the SBT, see CRS Report RL33745, *Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress*, by Ronald O'Rourke.

¹⁴⁹ Regarding the option of systems for generating radar-opaque smoke clouds, Thomas J. Culora, "The Strategic Implications of Obscurants," *Naval War College Review*, Summer 2010: 73-84; Scott Tait, "Make Smoke!" U.S. Naval Institute Proceedings, June 2011: 58-63. Regarding radar-opaque carbon-fiber clouds, see "7th Fleet Tests Innovative Missile Defense System," Navy News Services, June 26, 2014; Kevin McCaney, "Navy's Carbon-Fiber Clouds Could Make Incoming Missiles Miss Their Targets," *Defense Systems* (<http://defensesystems.com>), June 27, 2014.

¹⁵⁰ Greg Sheridan, "China's Military Provocation in The Pacific An Accident Waiting to Happen," *The Australian*, August 9, 2014.

¹⁵¹ Michael Fabey, "Ford Carriers Sport New Radars To Deflect Threats," *Aviation Week & Space Technology* (<http://aviationweek.com>), May 29, 2014.

When asked whether a new Chinese anti-ship weapon—the DF-21D missile—might render carriers obsolete in the Pacific, [Admiral Jonathan] Greenert [the Chief of Naval Operations] said the U.S. is developing countermeasures to protect the prized vessels from the weapon that is sometimes referred to as a “carrier killer.”

“It’s a good weapon that they’ve developed. But there’s nothing that doesn’t have vulnerabilities, and we continue to pursue ideas in that regard. ... We’re working quite feverishly on that, and I’m pretty comfortable with where we can operate our carriers,” Greenert said.

The Navy chief said the U.S. has “lots of intelligence” on the Chinese weapon, but wouldn’t elaborate, nor would he discuss what specific steps the military is taking to counter it.

In the future, Greenert said that new electromagnetic weapons, unmanned aircraft and other standoff weapons will help mitigate the threat of anti-ship missiles.¹⁵²

An April 24, 2014, press report states that

The U.S. Navy has no silver-bullet concept to defeat the Chinese DF-21 anti-ship ballistic missile (ASBM), but will rather rely on a network of defensive systems to do the job.

“It’s a series of systems,” Rear Adm. Michael Manazir, director of air warfare, tells the Aviation Week Intelligence Network (AWIN). “We want to attack it on the left side of the kill chain.”

During an exclusive tour and interview this month of the next-generation aircraft carrier CVN-78 Gerald R. Ford while under construction at the Newport News Shipbuilding yard in Virginia, Manazir says, “People think this is a big target. But they have to get to the carrier and then discern that it is a carrier.”

The Navy’s various networks of defensive shields aboard the carrier, and other vessels elsewhere, will make that very difficult, he says.”¹⁵³

A March 16, 2012, blog entry states:

China has developed a missile that would turn an aircraft carrier into a 2-billion-dollar hulk of twisted metal, flame, and dead sailors. Publicly, the U.S. Navy downplays its importance. Privately, the sailors are working out several different options to kill it before it kills them.

Adm. Jonathan Greenert, the Navy’s top officer, explained to reporters during a Friday [March 16] breakfast meeting that the Navy has ways of exploiting some of the DF-21D missile’s formidable technical capabilities, even before opening fire and praying.

As Greenert sees it, there’s a menu of options. Some involve convincing the DF-21D that the carrier is in a different place. Others involve masking the electronic emissions of the carrier. Still others are more traditional—like blasting the missile out of the salty air.

¹⁵² Jon Harper, “Navy’s Top Admiral: Reducing Carrier Fleet Would Burn Out Sailors, Ships,” *Stars and Stripes* (www.stripes.com), May 21, 2014.

¹⁵³ Michael Fabey, “U.S. Navy Looks To ‘Series of Systems’ To Counter Chinese Anti-Ship Missile,” *Aerospace Daily & Defense Report*, April 24, 2014: 5.

“You want to spoof them, preclude detection, jam them, shoot them down if possible, get them to termination, confuse it,” Greenert said. “The concept is end-to-end, and the capabilities therein [are] what we’re pursuing”

First up: the missile’s guidance systems. This is where Greenert wants the Navy’s investment in jamming and electronic warfare generally to pay off.

“If whatever is launched has a seeker, can you jam it?” Greenert mused. “Yes, no, maybe so? What would it take to jam it?” For now, that’s a job for the flying, jamming Growlers which messed with Moammar Gadhafi’s anti-aircraft systems in Libya last year. Later on, the Navy will have a next-generation jammer, also built onto some of its jets, which it wants to use to infect enemy systems with malware. Alternatively or in supplement, the strike group would go radio silent, to stop the missile from homing in on its electronic emissions.

Then comes the “more popular” part, Greenert said: shooting the missile down. The Aegis missile-defense cruisers included in an aircraft carrier strike group would be tasked with that over the next decade. Afterward, the Navy wants to use giant shipboard lasers to burn through incoming missiles. But it’s by no means clear the Navy really can clear all the technological obstacles to oceanic laser warfare by its mid-2020s deadline.

And shooting down this new missile isn’t a guaranteed proposition. “When do you have to engage it? On the way up? Mid-course? Terminal?” Greenert said.

His answer: all of the above. “We call it links of a chain,” Greenert said. “We want to break as many links as possible.” Navy weapons have to be ready to disable the DF-21D—either through jamming it or shooting it—during “all” phases of its trajectory.

There’s also something that Greenert didn’t mention: he has time on his side.

The Navy conceded in December 2010 that the DF-21D had reached “initial operating capability.” But its intelligence chief quickly added that blowing up a carrier is still past China’s means. Hitting a moving object is difficult. Testing the thing at sea is too. Then China needs to integrate the missile into its general surface warfare plans. And after all that come the countermeasures Greenert outlined. Solving all that takes time.

And while China works on that, the Navy will continue its own development. If Greenert is freaked out by a weapon that can punch through one of the most potent symbols of American power, he’s doing a good job of hiding it in public.¹⁵⁴

Endo-Atmospheric Target for Simulating DF-21D ASBM

A December 2011 report from DOD’s Director, Operational Test and Evaluation (DOT&E)—the DOT&E office’s annual report for FY2011—states the following in its section on test and evaluation resources:

¹⁵⁴ Spencer Ackerman, “How To Kill China’s ‘Carrier-Killer’ Missile: Jam, Spoof And Shoot,” *Danger Room* (*Wired.com*), March 16, 2012, accessed online at <http://www.wired.com/dangerroom/2012/03/killing-chinas-carrier-killer/>. The word “[are],” in brackets, as in original. See also Otto Kreisher, “China’s Carrier Killer: Threat and Theatrics,” *Air Force Magazine*, December 2013: 44-47; and “Who’s Afraid of the DF-21D,” *Information Dissemination* (www.informationdissemination.net), October 10, 2013.

Anti-Ship Ballistic Missile Target

A threat representative Anti-Ship Ballistic Missile (ASBM) target for operational open-air testing has become an immediate test resource need. China is fielding the DF-21D ASBM, which threatens U.S. and allied surface warships in the Western Pacific. While the Missile Defense Agency has exo-atmospheric targets in development, no program currently exists for an endo-atmospheric target. The endo-atmospheric ASBM target is the Navy's responsibility, but it is not currently budgeted. The Missile Defense Agency estimates the non-recurring expense to develop the exo-atmospheric target was \$30 million with each target costing an additional \$30 million; the endo-atmospheric target will be more expensive to produce according to missile defense analysts. Numerous Navy acquisition programs will require an ASBM surrogate in the coming years, although a limited number of targets (3-5) may be sufficient to validate analytical models.¹⁵⁵

A February 28, 2012, press report stated:

"Numerous programs will require" a test missile to stand in for the Chinese DF-21D, "including self-defense systems used on our carriers and larger amphibious ships to counter anti-ship ballistic missiles," [Michael Gilmore, the Pentagon's director of operational test and evaluation] said in an e-mailed statement....

"No Navy target program exists that adequately represents an anti-ship ballistic missile's trajectory," Gilmore said in the e-mail. The Navy "has not budgeted for any study, development, acquisition or production" of a DF-21D target, he said.

Lieutenant Alana Garas, a Navy spokeswoman, said in an e-mail that the service "acknowledges this is a valid concern and is assessing options to address it. We are unable to provide additional details."...

Gilmore, the testing chief, said his office first warned the Navy and Pentagon officials in 2008 about the lack of an adequate target. The warnings continued through this year, when the testing office for the first time singled out the DF-21D in its annual public report....

The Navy "can test some, but not necessarily all, potential means of negating anti-ship ballistic missiles," without a test target, Gilmore said.¹⁵⁶

The December 2012 report from DOT&E (i.e., DOT&E's annual report for FY2012) did not further discuss this issue; a January 21, 2013, press report stated that this is because the details of the issue are classified.¹⁵⁷

Navy's Ability to Counter China's Submarines

Another potential oversight issue for Congress concerns the Navy's ability to counter China's submarines. Some observers raised questions about the Navy's ability to counter Chinese

¹⁵⁵ Department of Defense, Director, Operational Test and Evaluation, *FY 2011 Annual Report*, December 2011, p. 294.

¹⁵⁶ Tony Capaccio, "Navy Lacks Targets To Test U.S. Defenses Against China Missile," *Bloomberg Government (bgov.com)*, February 28, 2012. See also Christopher J. Castelli, "DOD IG Questions Realism Of Targets Used To Simulate Enemy Missiles," *Inside Missile Defense*, March 21, 2012.

¹⁵⁷ Christopher J. Castelli, "DOD Testing Chief Drops Public Discussion Of ASBM Target Shortfall," *Inside the Navy*, January 21, 2013.

submarines following an incident on October 26, 2006, when a Chinese Song-class submarine reportedly surfaced five miles away from the Japan-homeported U.S. Navy aircraft carrier *Kitty Hawk* (CV-63), which reportedly was operating at the time with its strike group in international waters in the East China Sea, near Okinawa.¹⁵⁸

Improving the Navy's ability to counter China's submarines could involve further increasing ASW training exercises, procuring platforms (i.e., ships and aircraft) with ASW capabilities, and/or developing technologies for achieving a new approach to ASW that is distributed and sensor-intensive (as opposed to platform-intensive).¹⁵⁹ Countering wake-homing torpedoes more effectively could require completing development work on the Navy's new anti-torpedo torpedo (ATT) and putting the weapon into procurement.¹⁶⁰

Navy's Fleet Architecture

Another potential oversight issue for Congress concerns the Navy's fleet architecture. Some observers, viewing the anti-access aspects of China's naval modernization effort, including ASBMs, ASCMs, and other anti-ship weapons, have raised the question of whether the U.S. Navy should respond by shifting over time to a more highly distributed fleet architecture featuring a reduced reliance on carriers and other large ships and an increased reliance on smaller ships.¹⁶¹ Supporters of this option argue that such an architecture could generate comparable aggregate fleet capability at lower cost and be more effective at confounding Chinese maritime anti-access

¹⁵⁸ Bill Gertz, "China Sub Secretly Stalked U.S. Fleet," *Washington Times*, November 13, 2006: 13; Philip Creed, "Navy Confirms Chinese Sub Spotted Near Carrier," *NavyTimes.com*, November 13, 2006; Bill Gertz, "Defenses On [sic] Subs To Be Reviewed," *Washington Times*, November 14, 2006; En-Lai Yeoh, "Fallon Confirms Chinese Stalked Carrier," *NavyTimes.com*, November 14, 2006; Bill Gertz, "Admiral Says Sub Risked A Shootout," *Washington Times*, November 15, 2006; Jeff Schogol, "Admiral Disputes Report That Kitty Hawk, Chinese Sub Could Have Clashed," *Mideast Starts and Stripes*, November 17, 2006.

¹⁵⁹ Navy officials in 2004-2005 spoke of their plans for achieving distributed, sensor-intensive ASW architecture. (See Otto Kreisher, "As Underwater Threat Re-Emerges, Navy Renews Emphasis On ASW," *Seapower*, October 2004, p. 15, and Jason Ma, "ASW Concept Of Operations Sees 'Sensor-Rich' Way Of Fighting Subs," *Inside the Navy*, February 7, 2005.) Such an approach might involve the use of networked sensor fields, unmanned vehicles, and standoff weapons. (See Jason Ma, "Autonomous ASW Sensor Field Seen As High-Risk Technical Hurdle," *Inside the Navy*, June 6, 2005. See also Jason Ma, "Navy's Surface Warfare Chief Cites Progress In ASW Development," *Inside the Navy*, January 17, 2005. More recent press reports discuss research on ASW concepts involving bottom-based sensors, sensor networks, and unmanned vehicles; see Richard Scott, "GLINT In the Eye: NURC Explores Novel Autonomous Concepts For Future ASW," *Jane's International Defence Review*, January 2010: 34-35; Richard Scott, "DARPA Goes Deep With ASW Sensor Network," *Jane's International Defence Review*, March 2010: 13; Richard Scott, "Ghost In The Machine: DARPA Sets Course Towards Future Unmanned ASW Trail Ship," *Jane's Navy International*, April 2010: 10-11; Norman Friedman, "The Robots Arrive," *Naval Forces*, No. IV, 2010: 40-42, 44, 46; Bill Sweetman, "Darpa Funds Unmanned Boat For Submarine Stalking," *Aerospace Daily & Defense Report*, January 6, 2011: 5; Richard Scott, "Networked Concepts Look to Square the ASW Circle," *Jane's International Defence Review*, January 2011: 42-47; Richard Scott, "DARPA's Unmanned ASW Sloop Concept Casts Lines," *Jane's Navy International*, January/February 2011: 5.) See also Jeremy Page, "Underwater Drones Join Microphones to Listen for Chinese Nuclear Submarines," *Wall Street Journal* (<http://online.wsj.com>), October 24, 2014; Richard Scott, "Nodes, Networks And Autonomy: Charting A Course For Future ASW," *Jane's International Defence Review*, December 2014: 47-51.

¹⁶⁰ For articles discussing torpedo defense systems, including ATTs, see Richard Scott, "Ships Shore Up," *Jane's Defence Weekly*, September 1, 2010: 22-23, 25, 27; Mike McCarthy, "NAVSEA Seeks Industry Thoughts On Torpedo Defense Systems," *Defense Daily*, November 29, 2011: 4-5.

¹⁶¹ See, for example, David C. Gompert, *Sea Power and American Interests in the Western Pacific*, RAND, Santa Monica (CA), 2013, 193 pp. (RR-151-OSD)

capabilities. Skeptics, including supporters of the currently planned fleet architecture, question both of these arguments.¹⁶²

Another question bearing on fleet architecture concerns the future role of Navy unmanned vehicles in countering Chinese anti-access forces. A July 16, 2012, press report states:

The Navy is eyeing potential investments in revolutionary unmanned systems with greater autonomy than today's drones to counter advanced Chinese weapons capable of threatening U.S. warships, according to draft guidance for a new assessment.

Although Defense Department and naval leaders have previously called for drones with greater levels of autonomy, the "specific pathways" for the introduction of enabling technologies have not yet been identified, states the draft terms of reference for the Naval Research Advisory Committee's planned review.¹⁶³

¹⁶² The question of whether the U.S. Navy concentrates too much of its combat capability in a relatively small number of high-value units, and whether it should shift over time to a more highly distributed fleet architecture, has been debated at various times over the years, in various contexts. Much of the discussion concerns whether the Navy should start procuring smaller aircraft carriers as complements or replacements for its current large aircraft carriers.

Supporters of shifting to a more highly distributed fleet architecture argue that the Navy's current architecture, including its force of 11 large aircraft carriers, in effect puts too many of the Navy's combat-capability eggs into a relatively small number of baskets on which an adversary can concentrate its surveillance and targeting systems and its anti-ship weapons. They argue that although a large Navy aircraft carrier can absorb hits from multiple conventional weapons without sinking, a smaller number of enemy weapons might cause damage sufficient to stop the carrier's aviation operations, thus eliminating the ship's primary combat capability and providing the attacker with what is known as a "mission kill." A more highly distributed fleet architecture, they argue, would make it more difficult for China to target the Navy and reduce the possibility of the Navy experiencing a significant reduction in combat capability due to the loss in battle of a relatively small number of high-value units.

Opponents of shifting to a more highly distributed fleet architecture argue that large carriers and other large ships are not only more capable, but proportionately more capable, than smaller ships, that larger ships are capable of fielding highly capable systems for defending themselves, and that they are much better able than smaller ships to withstand the effects of enemy weapons, due to their larger size, extensive armoring and interior compartmentalization, and extensive damage-control systems. A more highly distributed fleet architecture, they argue, would be less capable or more expensive than today's fleet architecture. Opponents of shifting to a more highly distributed fleet architecture argue could also argue that the Navy has already taken an important (but not excessive) step toward fielding a more distributed fleet architecture through its plan to acquire 55 Littoral Combat Ships (LCSs), which are small, fast surface combatants with modular, "plug-and-flight" mission payloads. (For more on the LCS program, see CRS Report RL33741, *Navy Littoral Combat Ship (LCS) Program: Background and Issues for Congress*, by Ronald O'Rourke.

The issue of Navy fleet architecture, including the question of whether the Navy should shift over time to a more highly distributed fleet architecture, was examined in a report by DOD's Office of Force Transformation (OFT) that was submitted to Congress in 2005. OFT's report, along with two other reports on Navy fleet architecture that were submitted to Congress in 2005, are discussed at length in CRS Report RL33955, *Navy Force Structure: Alternative Force Structure Studies of 2005—Background for Congress*, by Ronald O'Rourke. The functions carried out by OFT have since been redistributed to other DOD offices. See also Wayne P. Hughes, Jr., *The New Navy Fighting Machine: A Study of the Connections Between Contemporary Policy, Strategy, Sea Power, Naval Operations, and the Composition of the United States Fleet*, Monterey (CA), Naval Postgraduate School, August 2009, 68 pp.; Timothy C. Hanifen, "At the Point of Inflection," *U.S. Naval Institute Proceedings*, December 2011: 24-31; and the blog entry available online at <http://www.informationdissemination.net/2011/06/navy-is-losing-narratives-battle.html>.

¹⁶³ Christopher J. Castelli, "Investments In Drone Autonomy Eyed To Counter China's A2/AD Weapons," *Inside the Navy*, July 16, 2012.

Legislative Activity for FY2016

FY2016 National Defense Authorization Act (H.R. 1735/S. 13776)

House

The House Armed Services Committee, in its report (H.Rept. 114-102 of May 5, 2015) on H.R. 1735, states:

Tomahawk Block IV

The budget request contained \$184.8 million in Weapons Procurement, Navy for procurement of 100 Tomahawk missiles, which is a decrease of 96 missiles below the minimum sustaining rate. The budget request also would terminate Tomahawk Block IV procurement beginning in fiscal year 2017.

The committee is concerned by the Secretary of the Navy's recommendation to terminate procurement of the Nation's only long-range, surface-launched land-attack cruise missile production capability prior to finalizing concept development of the Next Generation Land Attack Weapon, which is not planned to be operationally fielded until 2024 at the earliest. Furthermore, the committee is concerned that the capability to recertify current inventory Block IV Tomahawk missiles could be put at risk if the Secretary of the Navy decides to shutter the Tomahawk Block IV production line in fiscal year 2017. In addition, the Secretary has not clearly articulated how the inventory of long-range cruise missiles will be replenished if the current stock of Tomahawk missiles is utilized to fulfill test, training, and warfighting requirements between 2016–24. The committee is also concerned that the Navy is well below all categories of inventory requirements and is discouraged that the Navy is only using one category of inventory requirements in stating that there is no risk by terminating Tomahawk Block IV production in fiscal year 2017.

Finally, the committee notes that although the fiscal year 2016 budget request is 96 missiles below the minimum sustaining rate, the Secretary has committed to procure 47 Tomahawk Block IV missiles in fiscal year 2016 using \$45.5 million provided in the Overseas Contingency Operations account of the Department of Defense Appropriations Act, 2015 (division C of Public Law 113–235). As a result, the committee understands that an additional 49 missiles are required in fiscal year 2016 to meet minimum sustaining rate.

Therefore, the committee recommends \$214.8 million, an increase of \$30.0 million, in Weapons Procurement, Navy for procurement of 149 Tomahawk missiles and to reduce risk to the Tomahawk missile industrial base. The committee supports continuing the minimum sustaining rate of Tomahawk Block IV to fully satisfy inventory requirements and bridge transition to Tomahawk Block IV recertification and modernization. (Page 26)

Senate

Section 1262 of S. 1376 as reported by the Senate Armed Services Committee (S.Rept. 114-49 of May 19, 2015) states:

SEC. 1262. Sense of Congress reaffirming the importance of implementing the rebalance to the Asia-Pacific region.

(a) Findings.—Congress makes the following findings:

(1) The United States has a longstanding national interest in maintaining security in the Asia-Pacific region.

(2) The Asia-Pacific region is home to the world's three largest economies, four most populous countries, and five largest militaries. The Asia-Pacific's rapid economic growth and mounting security tensions require a renewed focus from the United States on the region to maintain security, expand prosperity, and support common values.

(3) In 2011, President Barack Obama announced that the United States would rebalance to the Asia-Pacific. Since then, there have been a number of actions taken to strengthen the United States posture and relationships in the region, including the negotiation of the Enhanced Defense Cooperation Agreement with the Philippines, the distributed laydown of the United States Marines Corps in the Pacific, the rotational stationing of the Littoral Combat Ship in Singapore, and a new comprehensive partnership with Vietnam on defense and security.

(4) Leaders in regional states remain concerned about a variety of regional military challenges. These include China's military modernization and its increasingly assertive actions in the East and South China Sea and North Korea's continued belligerence and its pursuit of nuclear and ballistic missile technology. United States allies and partners are looking to the United States to demonstrate its willingness and ability to maintain regional peace and security by fully implementing the rebalance to the Asia-Pacific.

(5) In April 2015, the Commander of the United States Pacific Command Admiral Samuel Locklear warned, "Our relative superiority I think has declined and continues to decline... we rely very heavily on power projection, which means we have to be able to get the forces forward...". Admiral Locklear also noted, "Any significant force structure moves out of my AOR in the middle of a rebalance would have to be understood and have to be explained because it would counterintuitive to a rebalance to move significant forces in another direction."

(b) Sense of Congress.—It is the sense of Congress that—

(1) in order to maintain the credibility of the United States rebalance, it is vital that the United States continue to shift forces to the Asia-Pacific region to strengthen the ability of the United States Armed Forces to project power to shape the choices of regional states and to deter, and if necessary defend, against hostile military actions;

(2) United States allies and partners in the Asia-Pacific region, as well as potential adversaries, would take note of any withdrawal of forces from the Asia-Pacific theater;

(3) any withdrawal of United States forces from Outside the Continental United States ("OCONUS") Asia-Pacific region or from United States Pacific Command would therefore seriously undermine the rebalance; and

(4) in order to properly implement United States rebalance policy, United States forces under the operational control of the United States Pacific Command should be increased consistent with commitments already made by the Department of Defense and aligned with the requirement to maintain a balance of military power that favors the United States and United States allies in the Asia-Pacific region.

Regarding Section 1262, S.Rept. 114-49 states:

Sense of Congress reaffirming the importance of implementing the rebalance to the Asia-Pacific region (Sec. 1262)

The committee recommends a provision that would express the sense of the Senate that the United States continue to implement the rebalance of U.S. forces to the Asia-Pacific region. The committee believes that the withdrawal of U.S. forces from the Pacific theater of operations would undermine the rebalance and that forces should be increased consistent with commitments already made by the Department of Defense and aligned with the requirement to maintain a balance of military power that favors the United States and its allies in the region. (Page 234)

S.Rept. 114-49 also states:

Tomahawk

The budget request included \$184.8 million in Weapons Procurement, Navy to procure 100 Tomahawk missiles. The future years defense program envisions shutting down the Tomahawk production line after the fiscal year 2016 procurement.

The committee is concerned about the Navy's decision to truncate production. The Tomahawk is a combat-proven missile, having been used well over 2,000 times in the last two decades, most recently against targets in Syria during Operation Inherent Resolve in September 2014 and remains the country's first-strike weapon of choice. The Navy has stated that the current Tomahawk inventory is sufficient for munitions requirements and will meet the Navy's needs until its replacement is operational in the mid-2020s. The Next Generation Land Attack Weapon, however, is only in initial planning stages and is not due to enter service until 2024. The committee believes the assumption of this much risk in a capability as important as long-range strike is not prudent in the current and projected security environment.

Additionally, the Navy plans to begin recertification of its existing Block IV missiles beginning in 2019. By its own analysis, the Navy recognizes that the existence of a production gap between the end of new missile builds and the start of recertification will put tremendous strain on the Tomahawk supplier base and involve millions of dollars to requalify suppliers for recertification. The committee is concerned by the Navy's plan as it moves toward recertification.

The committee believes that it would be imprudent to ramp down and close production of the Tomahawk missile at this time. Therefore, the committee recommends an increase of \$30.0 million to keep Tomahawk production at the minimum sustaining rate of 196 missiles per year. (Pages 22-23)

S.Rept. 114-49 also states:

Standoff precision guided weapons

As the air and missile defense capabilities of potential adversaries rapidly advance, the ability of the U.S. Armed Forces to employ short-range precision guided weapons such as Joint Direct Attack Munitions (JDAMs) will be increasingly challenged. The capability to employ precision guided weapons at standoff ranges in large numbers will be necessary to ensure operational success in any high-end engagement. Advanced weapons such as the Joint Air-to-Surface Standoff Missile—Extended Range (JASSM-ER), the Long Range Anti-Ship Missile (LRASM), the Tomahawk missile and others will be key elements in attack

execution, but are cost prohibitive to use in the numbers that future strike scenarios may require.

The committee is concerned the Navy is not adequately planning for a future environment in which large scale use of standoff precision guided munitions is a prerequisite for victory. The committee directs the Secretary of the Navy to provide, prior to submission of the fiscal year 2017 budget request, a report on the Navy's plan for standoff precision guided munitions in the 2025–2030 timeframe to include ship-, submarine- and air-launched weapons. The report should include what actions are being taken to ensure that cost-effective solutions are part of the planning. The Navy should provide this information in an unclassified report with an accompanying classified annex. (Pages 40-41)

S.Rept. 114-49 also states:

Unmanned Carrier-Launched Airborne Surveillance and Strike System

The budget request included \$134.7 million in PE 64501N for the Unmanned Carrier-Launched Airborne Surveillance and Strike (UCLASS) system. The committee notes the directed pause in the program during the Department of Defense's Intelligence, Surveillance, and Reconnaissance (ISR) Strategic Portfolio Review, which will inform the Department's fiscal year 2017 budget submission. Therefore, the committee recommends a decrease of \$134.7 million due to excess fiscal year 2015 funds that may be used to wholly offset fiscal year 2016 budget requirements.

The committee looks forward to reviewing the results of the Department of Defense ISR Strategic Portfolio Review and also the report directed in section 217 of the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015. (page 59)

S.Rept. 114-49 also states:

Unmanned Carrier-Launched Surveillance and Strike (UCLASS) Program

The committee believes that survivable, air-refuelable, unmanned combat aircraft are critical for countering emerging anti-access/area-denial (A2/AD) challenges to U.S. power projection. In this context, the committee views sea-based unmanned combat aircraft as particularly important for giving aircraft carrier air wings an enduring role in the joint family of airborne, long-range, surveillance-strike systems—and thus, maintaining the operational effectiveness and strategic utility of the U.S. carrier fleet. Based on the progress to date in the ongoing Unmanned Combat Air System Demonstration program, the committee is confident that, while additional risk-reduction and experimentation appears necessary, low- to medium-risk acquisition of advanced carrier-based, unmanned combat aircraft could be feasible in the 2020–2025 timeframe.

The committee remains concerned, however, that the Navy's current requirements for the UCLASS program place disproportionate emphasis on unrefueled endurance to support organic ISR support to the carrier strike group.

The committee sees great promise in the integration of unmanned combat aircraft into future carrier air wings. The committee notes with concern that absent a restructuring of the planned carrier air wing that incorporates unmanned combat aircraft in operationally significant numbers, the relevance of the aircraft carrier—the centerpiece of American global power projection capability—may increasingly be called into question by friends and prospective adversaries alike. (Pages 216-217)

Appendix A. January 2014 ONI Testimony

This appendix presents the prepared statement of Jesse L. Karotkin, ONI's Senior Intelligence Officer for China, for a January 30, 2014, hearing before the U.S.-China Economic and Security Review Commission on China's military modernization and its implications for the United States. The text of the statement is as follows:

TRENDS IN CHINA'S NAVAL MODERNIZATION

US CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

TESTIMONY

JESSE L. KAROTKIN

Introduction

At the dawn of the 21st Century, the People's Liberation Army Navy (PLA(N)) remained largely a littoral force. Though China's maritime interests were rapidly changing, the vast majority of its naval platforms offered very limited capability and endurance, particularly in blue water. Over the past 15 years the PLA(N) has carried out an ambitious modernization effort, resulting in a more technologically advanced and flexible force. This transformation is evident not only the PLA(N)'s Gulf of Aden counter-piracy presence, which is now in its sixth year, but also in the navy's more advanced regional operations and exercises. In contrast to its narrow focus a just decade ago, the PLA(N) is evolving to meet a wide range of missions including conflict with Taiwan, enforcement of maritime claims, protection of economic interests, as well as counter-piracy and humanitarian missions.

The PLA(N) currently possesses approximately 77 principal surface combatants, more than 60 submarines, 55 medium and large amphibious ships, and roughly 85 missile-equipped small combatants. Although overall order-of-battle has remained relatively constant in recent years, the PLA(N) is rapidly retiring legacy combatants in favor of larger, multi-mission ships, equipped with advanced anti-ship, anti-air, and anti-submarine weapons and sensors. During 2013 alone, over fifty naval ships were laid down, launched, or commissioned, with a similar number expected in 2014. Major qualitative improvements are occurring within naval aviation and the submarine force, which are increasingly capable of striking targets hundreds of miles from the Chinese mainland.

The introduction of long-range anti-ship cruise missiles across the force, coupled with non-PLA(N) weapons such as the DF-21D anti-ship ballistic missile, and the requisite C4ISR architecture to support targeting, will allow China to significantly expand its "counter-intervention" capability further into the Philippine Sea and South China Sea over the next decade. Many of these capabilities are designed specifically to deter or prevent U.S. military intervention in the region.

Even if order-of-battle numbers remain relatively constant through 2020, the PLA(N) will possess far more combat capability due to the rapid rate of acquisition coupled with improving operational proficiency. Beijing characterizes its military modernization effort as a "three-step development strategy" that entails laying a "solid foundation" by 2010, making "major progress" by 2020, and being able to win "informationized wars by the mid-21st century." Although the PLA(N) faces capability gaps in some key areas, including deep-water anti-submarine warfare and joint operations, they have achieved their "strong foundation" and are emerging as a well equipped, competent, and more professional force.

A Multi-Mission Force

As China began devoting greater resources to naval modernization in the late 1990s, virtually all of its ships, submarines were essentially single-mission platforms, poorly equipped to operate beyond the support of land-based defenses. The PLA(N) has subsequently acquired larger, multi-mission platforms, capable of long-distance deployments and offshore operations. China's latest Defense White Paper, released in 2013, noted that the PLA(N) "endeavors to accelerate the modernization of its forces for comprehensive offshore operations... [and] develop blue water capabilities." The LUYANG III-class DDG (052D), which will likely enter service this year, embodies the trend towards a more flexible force with advanced air defenses and long-range strike capability.

China has made the most demonstrable progress in anti-surface warfare (ASuW), deploying advanced, long-range ASCMs throughout the force. With the support from improved C4ISR, this investment significantly expands the area that surface ships, submarines, and aircraft and are able to hold at risk. The PLA(N) has also made notable gains in anti-air warfare (AAW), enabling the recent expansion of blue-water operations. Just over a decade ago, just 20 percent of PLA(N) combatants were equipped with a rudimentary point air defense capability. As a result, the surface force was effectively tethered to the shore. Initially relying on Russian surface to air missiles (SAMs) to address this gap, newer PLA(N) combatants are equipped with indigenous medium-to-long range area air defense missiles, modern combat management systems, and air-surveillance sensors.

Although progress in anti-submarine warfare (ASW) is less pronounced, there are indications that the PLA(N) is committed to addressing this gap. More surface platforms are being equipped with modern sonar systems, to include towed arrays and hangars to support shipboard helicopters. Additionally, China appears to be developing a Y-8 naval variant that is equipped with a magnetic anomaly detector (MAD) boom, typical of ASW aircraft. Over the next decade, China is likely to make gains in ASW, both from improved sensors and operator proficiency.

China's submarine force remains concentrated almost exclusively on ASuW, with exception of the JIN SSBN, which will likely commence deterrent patrols in 2014. The type-095 guided missile attack submarine, which China will likely construct over the next decade, may be equipped with a land-attack capability. The deployment of LACMs on future submarines and surface combatants could enhance China's ability to strike key U.S. bases throughout the region, including Guam.

Naval aviation is also expanding its mission set and capability in maritime strike, maritime patrols, anti-submarine warfare, airborne early warning, and logistics. Although it will be several years before the *Liaoning* aircraft carrier and its air wing can be considered fully operational, this development signals a new chapter in Chinese naval aviation. By 2020, carrier-based aircraft will be able to support fleet operations in a limited air-defense role. Although some older air platforms remain in the inventory, the PLA(N) is clearly shifting to a naval aviation force that is equipped to execute a wide variety of missions both near and far from home.

PLA(N) Surface Force

China analysts face a perpetual challenge over how to accurately convey the size and capability of China's surface force. As U.S. Navy CAPT Dale Rielage noted in [the U.S. Naval Institute] *Proceedings* last year, key differences in the type of PLA(N) ships (in comparison to the U.S. Navy) make it extremely difficult to apply a common basis for comparing the order of battle. A comprehensive tally of ships that includes hundreds of small patrol craft, mine warfare craft, and coastal auxiliaries provides a deceptively inflated picture

of China's actual combat capability. Conversely, a metric based on ship displacement returns the opposite effect, given the fact that many of China's modern ships, such as the 1,500 ton JIANGDAO FFL, are small by U.S. standards, and equipped primarily for regional missions.

To accurately capture potential impact of China's naval modernization, it is necessary to provide a more detailed examination of the ships and capabilities in relation to the missions they are likely intended to fulfill. For the sake of clarity, the term "modern" is used in this paper to describe a surface combatant that possesses a multi-mission capability, incorporates more than a point air defense capability, and has the ability to embark a helicopter. As of early 2014, the PLA(N) possesses 27 destroyers (17 of which are modern), 48 frigates (31 of which are modern), 10 new corvettes, 85 modern missile-armed patrol craft, 56 amphibious ships, 42 mine warfare ships, over 50 major auxiliary ships, and over 400 minor auxiliary ships and service/support craft.

During the 1990s, China began addressing immediate capability gaps by importing modern surface combatants, weapon systems, and sensors from Russia. Never intended as a long-term solution, the PLA(N) simultaneously sought to design and produce its own weapons and platforms from a mix of imported and domestic technology. Less than a decade ago China's surface force could be characterized as an eclectic mix of vintage, modern, converted, imported, and domestic platforms utilizing a variety weapons and sensors and with widely ranging capabilities and varying reliability. By the second decade of the 2000s, surface ship acquisition had shifted entirely to Chinese designed units, equipped primarily with Chinese weapons and sensors, though some engineering components and subsystems remain imported or license-produced in-country.

Until recently, China tended to build small numbers of a large variety of ships, often changing classes rapidly as advancements were made. In the period between 1995 and 2005 alone, China constructed or purchased major surface combatants and submarines in at least different 15 classes. Using a combination of imported technology, reverse engineering, and indigenous development, the PRC has rapidly narrowed the technology and capability gap between itself and the world's modern navies. Additionally, China is implementing much longer production runs of advanced surface combatants and conventional submarines, suggesting a greater satisfaction in their recent ship designs.

The PLA(N) surface force has made particularly strong gains in anti-surface warfare (ASuW), with sustained development of advanced anti-ship cruise missiles (ASCMs) and over-the-horizon targeting systems. Most PLA(N) combatants carry variants of the YJ-8A ASCM (~65-120nm), while the LUYANG II-class (052D) destroyer is fitted with the YJ-62 (~120nm), and the newest class, LUYANG III-class destroyer is fitted with a new vertically-launched ASCM. As these extended range weapons require sophisticated over-the-horizon-targeting (OTH-T) capability to realize their full potential, China has invested heavily in maritime reconnaissance systems at the national and tactical levels, as well as communication systems and datalinks to enable the flow of accurate and timely targeting data.

In addition to extended range ASCMs, the LUYANG III DDG, which is expected to enter the force in 2014, may also be equipped with advanced SAMs, anti-submarine missiles, and possibly an eventual land-attack cruise missile (LACM) from its multipurpose vertical launch system. These modern, high-end combatants will likely provide increased weapons stores and overall flexibility as surface action groups venture more frequently into blue water in the coming years.

Further enabling this trend, China's surface force has achieved sustained progress in shipboard air defense. The PLA(N) is retiring legacy destroyers and frigates that possess at most a point air defense capability, while constructing newer ships with medium-to-long

range area air defense missiles. The PLA(N) has produced a total of six LUYANG II DDG with the HHQ-9 surface-to-air missile (~55nm), and the LUYANG III DDG will carry an extended-range variant of the HHQ-9. At least fifteen JIANGKAI II FFGs (054A), with the vertically-launched HHQ-16 (~20-40nm) are now operational, with more under construction. Sometimes referred to as the “workhorse” of the PLA(N) these modern frigates have proven instrumental in sustaining China’s counter-piracy presence in the Gulf of Aden.

The new generation of destroyers and frigates utilize modern combat management systems and air-surveillance sensors, such as the Chinese SEA EAGLE and DRAGON EYE phased-array radars. While older platforms with little or no air defense capability remain in the inventory, the addition of these newer units allows the PLA(N)’s surface force to operate with increased confidence outside of shore-based air defense systems, as one or two ships can now provide air defense for the entire task group. Currently, approximately 65 percent of China’s destroyers and frigates are modern. By 2020 that figure will rise to an estimated 85 percent.

The PLA(N) has also phased out hundreds of Cold War-era missile patrol boats and patrol craft as they shifted from a coastal defense orientation to a more active, offshore orientation over the past two decades. During this period China acquired a modern coastal-defense and area-denial capability with 60 HOUBEI class guided missile patrol boats. The HOUBEI design integrates a high-speed wave-piercing catamaran hull, waterjet propulsion, considerable signature-reduction features, and the YJ-8A ASCM. While not equipped for coastal patrol duties, the HOUBEI is an essential component of the PLA(N)’s ability to react at short notice to threats within China’s exclusive economic zone (EEZ) and slightly beyond.

In 2012 China began producing the new JIANGDAO class corvette (FFL), which, in contrast to the HOUBEI, is optimized to serve as the primary naval patrol platform in China’s EEZ and potentially defend China’s territorial claims in the South China Sea (SCS) and East China Sea (ECS). The 1500-ton JIANGDAO is equipped for littoral warfare with 76mm, 30mm, and 12.7mm guns, four YJ-8 ASCMs, torpedo tubes, and a helicopter landing area. The JIANGDAO is ideally-suited for general medium-endurance patrols, counter-piracy, and other littoral duties in regional waters, but is not sufficiently armed or equipped for major combat operations in blue-water. At least ten JIANGDAOs are already operational and thirty or more units may be built, replacing both older small patrol craft as well as some of the PLA(N)’s aging JIANGHU I frigates. The rapid construction of JIANGDAO FFLs accounts for a significant share of ship construction in 2012 and 2013.

In recent years, China’s amphibious acquisition has shifted decisively towards larger, high-end, ships. Since 2007 China has commissioned three YUZHAO class amphibious transport docks (LPD), which provide a considerably greater capacity and flexibility compared to previous landing ships. At 20,000 tons, the YUZHAO is the largest domestically produced Chinese warship and has deployed as far as the Gulf of Aden. The YUZHAO can carry up to four of the new air cushion landing craft YUYI LCUA (similar to LCAC), as well as four or more helicopters, armored vehicles, and troops on long-distance deployments. Additional YUZHAOs are expected to be built, as well as a follow-on amphibious assault ship (LHA) design that is larger and with a full-deck flight deck for additional helicopters.

The major investment in a large-deck LPD signaled the PLA(N)’s emerging interest in expeditionary warfare and over-the horizon amphibious assault capability, as well as a flexible platform for humanitarian assistance/disaster relief (HA/DR) and counter-piracy capabilities. In contrast, the PLA(N) appears to have suspended all construction of lower-end tank landing ships (LST/LSM) since 2006, following a spate of acquisition in the early 2000s.

The expanded set of missions further into the western Pacific and Indian Ocean, including counter-piracy deployments, HA/DR missions, survey voyages and goodwill port visits have increased demands on PLA(N)'s limited fleet of ocean-going replenishment and service vessels. In 2013 the PLA(N) added two new FUCHI replenishment oilers (AORs) bringing the total AOR force level to seven ships. These ships constantly rotate in support of Gulf of Aden (GOA) counter-piracy deployments.

In addition, the PLA(N) recently added three state-of-the-art DALAO submarine rescue ships (ASR) and three DASAN fast-response rescue ships (ARS). Other recent additions include the ANWEI hospital ship (AH), the DANYAO AF (island resupply), YUAN WANG 5&6 (satellite and rocket launch telemetry), three KANHAI AG (SWATH-hull survey ships), two YUAN WANG 21 missile tenders (AEM), and the large DAGUAN AG, which provides berthing and logistical support to the KUZNETSOV aircraft carrier *Liaoning*.

Traditionally, anti-submarine warfare (ASW) has lagged behind ASuW and AAW as a priority for the PLA(N). Some moderate progress still continues, with more surface ships possessing modern sonars, to include towed arrays, as well as hangars to support shipboard helicopters. Given these developments, the PLA(N) surface force may be more capable of identifying adversary submarines in limited areas by 2020.

Over the past decade, China's surface force has made steady proficiency gains and become much more operationally focused. Beginning in 2009, the Gulf of Aden deployments have provided naval commanders and crews with their first real experience with extended deployments and overseas logistics. We have also witnessed an increase in the complexity of training and exercises and an expansion of operating areas both within and beyond the First Island Chain. To increase realism, the force engages in opposing force training and employs advanced training aids. In 2012 the surface force conducted an unprecedented seven deployments to the Philippine Sea. This was followed by nine Philippine Sea deployments in 2013. Extended surface deployments and more advanced training build core warfare proficiency in ASuW, ASW and AAW. Furthermore, these deployments reflect efforts to "normalize" distant seas training in line with General Staff Department (GSD) guidelines.

China's Aircraft Carrier Program

With spectacular ceremony in September 2012, China commissioned its first carrier, the *Liaoning*. China is currently engaged in the long and complicated path of learning to operate fixed wing aircraft from the carrier's deck. The first launches and recoveries of the J-15 aircraft occurred in November 2012, with additional testing and training occurring in 2013. Despite recent progress, it will take several years before Chinese carrier-based air regiments are operational. The PLA's newspaper, *Jiefangjun Bao* recently noted, "Aircraft Carrier development is core to the PLA(N), and could serve as a deterrent to countries who provoke trouble at sea, against the backdrop of the U.S. pivot to Asia and growing territorial disputes in the South China Sea and East China Sea."

The *Liaoning* is much less capable of power projection than the U.S. Navy's NIMITZ-class carriers. Not only does *Liaoning*'s smaller size limit the total number of aircraft it can carry, but also the ski-jump configuration significantly limits aircraft fuel and ordnance load for take offs. Furthermore, China does not yet possess specialized supporting aircraft such as the E-2C Hawkeye, which provides tactical airborne early warning (AEW). The *Liaoning* is suited for fleet air defense missions, rather than US-style, long range power projection. Although it has a full suite of weapons and combat systems, *Liaoning*'s primary role for the coming years will be to develop the skills required for carrier aviation and to train its first groups of pilots and deck crews.

China's initial carrier air regiment will consist of the Shenyang J-15 *Flying Shark*, which is externally similar to the Russian Su-33 *Flanker D*. However, the aircraft is thought to possess many of the domestic avionics and armament capabilities of the Chinese J-11B *Flanker*. Likely armament for the J-15 includes PL-8 and PL-12 air-to-air missiles and modern ASCMs. Six J-15 prototypes are currently involved in testing and at least one two-seat J-15S operational trainer has been observed.

China is fully aware of the inherent limitations of the mid-sized, ski-jump carrier. While Beijing has provided no public information on the size and configuration of its next carrier, there is intense speculation that China may adopt a catapult launching system. Recent media reports suggest that China recently commenced construction of its first indigenously produced carrier.

Finally, as China expands carrier operations beyond the immediate region, it will almost certainly be constrained by a lack of distant bases and support infrastructure. Although commercial ports can provide some peacetime support, Beijing may eventually find it expedient to abandon its longstanding, self-imposed prohibition on foreign basing.

PLA(N) Submarine Force

China has long regarded its submarine force as a critical element of regional deterrence, particularly when conducting "counter-intervention" against modern adversary. The large, but poorly equipped force of the 1980s has given way to a more modern submarine force, optimized primarily for regional anti-surface warfare missions near major sea lines of communication. Currently, the submarine force consists of five nuclear attack submarines, four nuclear ballistic missile submarines, and 53 diesel attack submarines.

In reference to the submarine force, the term "modern" applies to second generation submarines, capable of employing anti-ship cruise missiles or submarine-launched intercontinental ballistic missiles. By 2015 approximately 70 percent of China's entire submarine force will be modern. By 2020, 75 percent of the conventional force will be modern and 100 percent of the SSN force will be modern.

Currently, most of the force is conventionally powered, without towed arrays, but equipped with increasingly long range ASCMs. Submarine launched ASCMs with ranges well in excess of 100nm not only enhance survivability of the shooter, but also enable a small number of units to hold a large maritime area at risk. A decade ago, only a few of China's submarines were equipped to launch a modern anti-ship cruise missile. Given the rapid pace of acquisition, well over half of China's nuclear and conventional attack submarines are now ASCM equipped, and by 2020, the vast majority of China's submarine force will be armed with advanced, long-range ASCMs.

China's small nuclear attack submarine force is capable of operating further from the Chinese mainland, conducting intelligence, surveillance and reconnaissance (ISR), as well as ASuW missions. Currently, China's submarines are not optimized for either anti-submarine warfare or land attack missions.

Like the surface force, China's submarine force is trending towards a more streamlined mix of units, suggesting the PLA(N) is relatively satisfied with recent designs. For its diesel-electric force alone, between 2000 and 2005, China constructed MING SS, SONG SS, the first YUAN SSP, and purchased 8 KILO SS from Russia. While all of these classes remain in the force, only the YUAN SSP is currently in production. Reducing the number of different classes in service helps streamline maintenance, training and interoperability.

The YUAN SSP is China's most modern conventionally powered submarine. Eight are currently in service, with as many as 12 more anticipated. Its combat capability is similar to the SONG SS, as both are capable of launching Chinese-built anti-ship cruise missiles, but the YUAN SSP also possesses an air independent power (AIP) system and may have incorporated quieting technology from the Russian-designed KILO SS. The AIP system provides a submarine a source of power other than battery or diesel engines while still submerged, increasing its underwater endurance, thereby reducing its vulnerability to detection.

The remainder of the conventional submarine force is a mix of SONG SS, MING SS, and Russian-built KILO SS. Of these, only the MING SS and four of the older KILO SS lack an ability to launch ASCMs. Eight of China's 12 KILO SS are equipped with the SS-N-27 ASCM, which provides a long-range anti-surface capability out to approximately 120nm. Although China's indigenous YJ-82 ASCM has a much shorter range, trends in surface and air-launched cruise missiles suggest that a future indigenous submarine-launched ASCM will almost certainly match or exceed the range of the SS-N-27.

China is now modernizing its relatively small nuclear-powered attack submarine force, following a protracted hiatus. The SHANG SSN's initial production run stopped after just two launches in 2002 and 2003. After nearly 10 years, China resumed production with four additional hulls of an improved variant, the first of which was launched in 2012. These six submarines will replace the aging HAN SSN on nearly a 1-for-1 basis over the next several years. Following the completion of the improved SHANG SSN, the PLA(N) will likely progress to the Type 095 SSN, which may provide a generational improvement in many areas such as quieting and weapon capacity, to include a possible land-attack capability.

Perhaps the most anticipated development in China's submarine force is the expected operational deployment of the JIN SSBN in 2014, which would mark China's first credible at-sea second-strike nuclear capability. With a range in excess of 4000nm, the JL-2 submarine launched ballistic missile (SLBM), will enable the JIN to strike Hawaii, Alaska, and possibly western portions of CONUS from East Asian waters. The three JIN SSBNs currently in service would be insufficient to maintain a constant at-sea presence for extended periods of time, but if the PLA Navy builds five units as some sources suggest, a continuous peacetime presence may become a viable option for the PLA(N).

Historically, the vast majority of Chinese submarine operations have been limited in duration. In recent years however, leadership emphasis on more realistic training and operational proficiency across the PLA appears to have catalyzed an increase in submarine patrol activity. Prior to 2008, the PLA(N) typically conducted a very small number of extended submarine patrols, typically fewer than 5 or 6 in a given year. Since that time, it has become common to see more than 12 patrols in a given year. This trend suggests the PLA(N) seeks to build operational proficiency, endurance, and training in ways that more accurately simulate combat missions.

PLA(N) Air Forces

The capabilities and role of the PLANAF have steadily evolved over the past decade. As navy combatants range further from shore and more effectively provide their own air defense, the PLANAF is able to concentrate on an expanded array of missions, including maritime strike, maritime patrols, anti-submarine warfare, airborne early warning, and logistics. Both helicopters and fixed wing aircraft will play an important role in enabling fleet operations over the next decade. Additionally, in the next few years the PLANAF will possess its first-ever sea-based component, with the *Liaoning* CV [aircraft carrier].

Every major PLA(N) surface combatant currently under construction is capable of embarking a helicopter, increasing platform capabilities in areas such as over the horizon targeting, anti-submarine warfare, and search and rescue (SAR). The PLA(N) operates three main helicopter variants: the Z-9, the Z-8, and the *Helix*. In order to keep pace with the rest of the PLA(N), the helicopter fleet will almost certainly expand in the near future.

The PLA(N)'s primary helicopter, the Z-9C, was originally obtained under licensed production from Aerospatiale (now Eurocopter) in the early 1980s. The Z-9C is capable of operating from any helicopter-capable PLA(N) combatant. It can be fitted with the KLC-1 search radar, dipping sonar, and is usually seen with a single lightweight torpedo. A new roof-mounted electro-optical (EO) turret, unguided rockets, and 12.7 mm machine gun pods have been observed on several Z-9Cs during counter piracy deployments. There are now approximately twenty operational Z-9Cs in the PLA(N) inventory and the helicopters are still under production. An upgraded naval version of the Z-9, designated the Z-9D, has been observed with ASCMs.

Like the Z-9, the Z-8 is a Chinese-produced helicopter based on a French design. In the late 1970s, the PLA(N) purchased and reverse engineered the SA 321 Super Frelon. This medium lift helicopter is capable of performing a wide variety of missions but is most often utilized for SAR, troop transport, and logistical support roles. It is usually observed with a rescue hoist and a nose radome and typically operates unarmed. The Z-8's size provides a greater cargo capacity compared to other PLA(N) helicopters, but is limited in its ability to deploy from most PLA(N) combatants. An AEW variant of the Z-8 has been observed operating with the *Liaoning*.

In 1999, the PLA(N) took delivery of an initial batch of eight Russian-built Ka-28 *Helix* helicopters. The PLA(N) typically uses the Ka-28 for ASW. They are fitted with a search radar, dipping sonar and can employ sonobuoys, torpedoes, depth charges, or mines. In 2010 China also ordered nine Ka-31 *Helix* AEW helicopters.

Fixed-wing Aircraft

Over the last two decades, the PLANAF has significantly upgraded its fighters and expanded the type of aircraft it operates. As a consequence, it can successfully perform a wide range of missions including offshore air defense, maritime strike, maritime patrol/antisubmarine warfare, and in the not too distant future, carrier-based operations. A decade ago, this modernization was largely reliant on exports from Russia, however, the PLANAF has recently benefited from the same domestic combat aircraft production that has propelled earlier PLAAF modernization.

Historically, the PLA(N) relied on older Chengdu J-7 variants and Shenyang J-8B/D *Finback* fighters for the offshore air defense mission. These aircraft were limited in range, avionics, and armament. The J-8 is perhaps best known in the West as the aircraft that collided with a U.S. Navy EP-3 reconnaissance aircraft in 2001. In 2002, the PLA(N) purchased 24 Su-30MK2, making it the first 4th generation fighter fielded with the navy. These aircraft feature an extended range and maritime radar systems, enabling the Su-30MK2 to strike enemy ships at long distances, while still maintaining a robust air-to-air capability.

Several years later, the PLA(N) began replacing older J-8B/Ds with the newer J-8F variant. The J-8F featured improved armament such as the PL-12 radar-guided air-to-air missile, upgraded avionics, and an improved engine with higher thrust. Today, the PLA(N) is taking deliveries of modern domestically produced 4th generation fighter aircraft such as the J-10A *Vigorous Dragon* and the J-11B *Flanker*. Equipped with modern radars, glass cockpits, and armed with PL-8 and PL-12 air-to-air missiles, PLA(N) J-10A and J-11B aircraft are among the most modern aircraft in China's inventory.

For maritime strike, the PLA(N) has relied on the H-6 *Badger* for decades. The H-6 is a licensed copy of the ex-Soviet Tu-16 *Badger*, which can employ advanced ASCMs against surface targets. As many as 30 *Badgers* likely remain in service with the PLA(N). Despite the older platform design, Chinese H-6 *Badgers* benefit from upgraded electronics and payloads. Noted improvements include the ability to carry a maximum of four ASCMs, compared with two on earlier H-6D variants. Some H-6s have been modified as tankers, increasing the PLA(N)'s flexibility and range. The JH-7 *Flounder*, with at least five regiments fielded across the three fleets also provides a maritime strike capability. The JH-7 is a domestically produced tandem-seat fighter/bomber, developed as a replacement for obsolete Q-5 *Fantan* light attack aircraft and H-5 *Beagle* bombers. The JH-7 can carry up to four ASCMs and two PL-5 or PL-8 short-range air-to-air missiles, providing it with considerable payload for maritime strike missions.

In addition to combat aircraft, the PLANAF is expanding its inventory of fixed-wing Maritime Patrol Aircraft (MPA), Airborne Early Warning (AEW), and surveillance aircraft. The Y-8, a Chinese license-produced version of the ex-Soviet An-12 *Cub*, forms the basic airframe for several PLA(N) special mission variants. As the navy pushes farther from the coast, long-range aircraft play a key role in providing a clear picture of surface and air contacts in the maritime environment.

Internet photos from 2012 suggest that the PLA(N) is also developing a Y-8 naval variant, equipped with a MAD (magnetic anomaly detector) boom, typical of ASW aircraft. This ASW aircraft features a large surface search radar mounted under the nose and multiple blade antennae on the fuselage for probable electronic surveillance. It also appears to incorporate a small EO/IR turret and an internal weapons bay forward of the main landing gear. The aircraft appeared in a primer yellow paint scheme, suggesting that it remains under development.

Unmanned Aerial Vehicles

In recent years China has developed several multi-mission UAVs for the maritime environment. There are some indications the PLA(N) has begun to integrate UAVs into their operations to enhance situational awareness. For well over a decade, China has actively pursued UAV technology and they are emerging among the worldwide leaders in UAV development. China's latest achievement was the unveiling of their first prototype unmanned combat aerial vehicle (UCAV), the *Lijan*, which features a blended-wing design as well as low observable technologies.

The PLA(N) will probably employ significant numbers of land and ship based UAVs to supplement manned ISR aircraft and aid targeting for various long-range weapons systems. UAVs will probably become one of the PLA(N)'s most valuable ISR assets in on-going and future maritime disputes and protection of maritime claims. UAVs are ideally suited for this mission set due to their long loiter time, slow cruising speed, and ability to provide near real-time information through the use of a variety of onboard sensors. The PLA(N) has been identified operating the Austrian Camcopter S-100 rotary-wing UAV from several combatants. Following initial evaluation and deployment of the Camcopter S-100, the PLA(N) will likely adopt a domestically produced UAV into ship-based operations.

Naval Mines

China has a robust mining capability and currently maintains a varied inventory estimated at over 50,000 mines. China also has developed a robust infrastructure for naval mine related research, development, testing, evaluation, and production. During the past few years China has gone from an obsolete mine inventory, consisting primarily of pre-WWII vintage moored contact and basic bottom influence mines, to a robust mine inventory consisting of a large

variety of mine types including moored, bottom, drifting, rocket propelled and intelligent mines. China will continue to develop more advanced mines in the future, possibly including extended-range propelled-warhead mines, anti-helicopter mines, and bottom influence mines equipped to counter minesweeping efforts.

Maritime C4ISR (Command, Control, Computers, Communication, Intelligence Surveillance and Reconnaissance)

China's steady expansion of naval missions beyond the littoral, including counter-intervention missions are enabled by a dramatic improvement in maritime C4ISR over the past decade. The ranges of China's modern anti-ship cruise missiles extend well beyond the range of a ship's own sensors. Emerging land-based weapons, such as the DF-21D anti-ship ballistic missile, with a range of more than 810nm are even more dependent on remote targeting. Modern navies depend heavily on their ability to build and disseminate a picture of all activities occurring in the air and sea.

For China, this provides a formidable challenge. In order to characterize activities in the "near seas," China must build a maritime and air picture covering nearly 875,000 square nautical miles (sqnm). The Philippine Sea, which could become a key interdiction area in a regional conflict, expands the battlespace by another 1.5 million sqnm. In this vast space, many navies and coast guards converge along with tens of thousands of fishing boats, cargo ships, oil tankers, and other commercial vessels.

In order to sort through this complex environment and enable more sophisticated operations, China has invested in a wide array of sensors. Direct reporting from Chinese ships and aircraft provides the most detailed and reliable information, but can only cover a fraction of the regional environment. A number of ground-based coastal radars provide overlapping coverage of coastal areas, but their range is limited.

To gain a broader view of activity in its near and far seas, China requires more sophisticated sensors. The skywave over-the-horizon radar provides awareness of a much larger area than conventional radars by bouncing signals off the ionosphere. China also operates a growing array of reconnaissance satellites, which allow observation of maritime activity virtually anywhere on the earth.

Conclusion

The PLA(N) is strengthening its ability to execute a range of regional missions in a "complex electromagnetic environment" as it simultaneously lays a foundation for sustained, blue water operations. Over the next decade, China will complete its transition from a coastal navy to a navy capable of multiple missions around the world. Current acquisition patterns, training, and operations provide a window into how the PLA(N) might pursue these objectives.

Given the pace of PLA(N) modernization, the gap in military capability between the mainland and Taiwan will continue to widen in China's favor over the coming years. The PRC views reunification with Taiwan as an immutable, long-term goal and hopes to prevent any other actor from intervening in a Taiwan scenario. While Taiwan remains a top-tier priority, the PLA(N) is simultaneously focusing resources on a growing array of potential challenges.

China's interests in the East and South China Seas include protecting its vast maritime claims and preserving access to regional resources. Beijing prefers to use diplomacy and economic influence to protect maritime sovereignty, and generally relies on patrols by the recently-consolidated China Coast Guard. However, ensuring maritime sovereignty will

remain a fundamental mission for the PLA(N). PLA(N) assets regularly patrol in most of China's claimed territory to conduct surveillance and provide a security guarantee to China's Coast Guard.

In the event of a crisis, the PLA(N) has a variety of options to defend its claimed territorial sovereignty and maritime interests. The PLA(N) could lead an amphibious campaign to seize key disputed island features, or conduct blockade or SLOC interdiction campaigns to secure strategic operating areas. China's realization of an operational aircraft carrier in the coming years may also enable Beijing to exert greater pressure on its SCS rivals. Recent acquisitions speak to a future in which the PLA(N) will be expected to perform a wide variety of tasks including assuring the nation's economic lifelines, asserting China's regional territorial interests, conducting humanitarian assistance and disaster relief, and demonstrating a Chinese presence beyond region waters.¹⁶⁴

¹⁶⁴ [Hearing on] Trends in China's Naval Modernization [before] U.S. China Economic and Security Review Commission[,] Testimony [of] Jesse L. Karotkin, [Senior Intelligence Officer for China, Office of Naval Intelligence, January 30, 2014], accessed February 12, 2014, 12 pp., at http://www.uscc.gov/sites/default/files/Karotkin_Testimony1.30.14.pdf.

Appendix B. Background Information on Air-Sea Battle Concept

This appendix provides additional background information on the Air-Sea Battle Concept.

October 10, 2013, Hearing

On October 10, 2013, the Seapower and Projection Forces subcommittee of the House Armed Services Committee held a hearing with several DOD officials as the witnesses that focused to a large degree on the Air-Sea Battle concept.¹⁶⁵ One of the witnesses—Rear Admiral Upper Half James G. Foggo III, Assistant Deputy Chief of Naval Operations (Operations, Plans and Strategy) (N3/N5B)—provided the following overview of ASB in his opening remarks:

So let me begin by answering the question, what is the AirSea Battle concept? The AirSea Battle concept was approved by the Secretary of Defense in 2011. It is designed to assure access to parts of the global commons, those areas of the AirSea, Cyberspace, and Space that no one necessarily owns but which we all depend on such as sea lines of communication.

Our adversaries' Anti-Access/Area Denial strategies employ a range of military capabilities that impede the free use of these ungoverned spaces. These military capabilities include new generations of cruise, ballistic, air to air, surface to air missiles with improved range, accuracy and lethality that are being produced and proliferated.

Quiet, modern submarines and stealthy fighter aircraft are being procured by many nations while naval mines are being equipped with mobility, discrimination and autonomy. Both space and cyberspace are becoming increasingly important and contested.

Accordingly, AirSea Battle in its concept is intended to defeat such threats to access and provide options to national leaders and military commanders to enable follow-on operations which could include military activities as well as humanitarian assistance and disaster response. In short, it is a new approach to warfare.

The AirSea Battle concept is also about force development in the face of rising technological challenges. We seek to build at the service level a pre-integrated joint force which empowers U.S. combatant commanders, along with allies and partners to engage in ways that are cooperative and networked across multiple domains—the land, maritime, air, space and cyber domains.

And our goal includes continually refining and institutionalizing these practices. When implemented, the AirSea Battle concept will create and codify synergies within and among our services that will enhance our collective war fighting capability and effectiveness.

So that's, in a nutshell, what the AirSea Battle concept is. But now, what is it not? Sir, you pointed out the AirSea Battle concept is not a strategy—to answer your question on the difference between AirLand Battle and the AirSea Battle concept. National or military

¹⁶⁵ The title of the hearing as posted on the House Armed Services Committee website was: “USAF, USN and USMC Development and Integration of Air/Sea Battle Strategy, Governance and Policy into the Services’ Annual Program, Planning, Budgeting and Execution (PPBE) Process.”

strategies employs ways and means to a particular and/or end-state, such as deterring conflict, containing conflict or winning conflict.

A concept in contrast is a description of a method or a scheme for employing military capabilities to attain specific objectives at the operational level of war. The overarching objective of the AirSea Battle concept is to gain and maintain freedom of action in the global commons.

The AirSea Battle does not focus on a particular adversary or a region. It is universally applicable across all geographic locations, and by addressing access challenges wherever, however, and whenever we confront them.

I said earlier that the AirSea Battle represents a new approach to warfare. Here's what I meant by that. Historically, when deterrence fails, it's our custom to amass large numbers of resources, leverage our allies for a coalition support and base access or over flight and build up an iron mountain of logistics, weapons and troops to apply overwhelming force at a particular space and time of our choosing.

This approach of build up, rehearse and roll back has proven successful from Operation Overlord in the beaches of Normandy in 1944 to Operation Iraqi Freedom in the Middle East. But the 21st Century operating environment is changing. Future generations of American service men and women will not fight their parents' wars.

And so I'll borrow a quote from Abraham Lincoln, written in a letter to this House on 1 December, 1862 when he said, "We must think anew, act anew. We must disenthrall ourselves from the past, and then we shall save our country."

New military approaches are emerging specifically intended to counter our historical methods of projecting power. Adversaries employing such an approach would seek to prevent or deny our ability to aggregate forces by denying us a safe haven from which to build up, rehearse, and roll back.

Anti-Access is defined as an action intended to slow deployment of friendly forces into a theater or cause us to operate from longer distances than preferred. Area Denial impedes friendly operations or maneuver in a theater where access cannot be prevented.

The AirSea Battle concept mitigates the threat of Anti-Access and Area Denial by creating pockets and corridors under our control. The reason conflict in Libya, Operation Odyssey Dawn in 2011, is a good example of this paradigm shift.

Though AirSea Battle was still in development, the fundamental idea of leveraging access in one domain to provide advantage to our forces in another was understood and employed against Libya's modest Anti-Access/Area Denial capability.

On day one of combat operations, cruise missiles launched from submarines and surface ships in the maritime domain targeted and destroyed Libya's lethal air defense missile systems; thereby enabling coalition forces to conduct unfettered follow-on strikes and destroy the Libyan Air Force and control the air domain.

Establishing a no-fly zone, key to interdicting hostile regime actions against innocent civilians—and that was our mission, to protect civilians—was effectively accomplished within 48 hours of receiving the execution order from the President. I was the J3 or the operations officer for Admiral Sam Locklear, Commander of Joint Task Force, Odyssey Dawn. And I transitioned from U.S.-led coalition operations to Operation Unified Protector as a taskforce commander for NATO.

During the entire campaign which lasted seven months, NATO reported in its UN After Action Report that there were just under 18,000 sorties flown, employing 7,900 precision guided munitions. That's a lot. More than 200 Tomahawk Land Attack Missiles were used, over half of which came from submarines.

The majority of the Libyan Regime Order of Battle, which included 800 main battle tanks, 2,500 artillery pieces, 2,000 armored personnel carriers, 360 fixed wing fighters and 85 transports were either disabled or destroyed during the campaign.

Not one American boot set foot on the ground; no Americans were killed in combat operations. We lost one F-15 due to mechanical failure but we recovered both pilots safely. Muammar Gaddafi, as you know, was killed by Libyan rebels in October, 2011.

The AirSea Battle Concept, in its classified form, was completed in November 2011, one month later. I provided Admiral Locklear with a copy of the AirSea Battle concept and we reviewed it on a trip to United Kingdom. Upon reading it, I thought back to the Libya campaign plan and I wondered how I might leverage the concepts of AirSea Battle to fight differently, to fight smarter.

Operation Odyssey Dawn accelerated from a non-combatant evacuation operation and humanitarian assistance to kinetic operations in a very short period. There was very little time for build-up and rehearse our forces. To coin a phrase from my boss, this was like a pickup game of basketball. And we relied on the flexibility, innovation and resiliency of the commanders of the forces assigned to the joint taskforce.

The Libyan regime's Anti Access Area Denial capability was limited as I said. And we were able to overwhelm and defeat it with the tools that we had. But we must prepare for a more stressing environment in the future. AirSea Battle does so, by providing commanders with a range of options, both kinetic and non-kinetic to mitigate or neutralize challenges to access in one or many domains simultaneously.

This is accomplished through development of networked integrated forces capable of attack in-depth to disrupt, destroy and defeat the adversary. And it provides maximum operational advantage to friendly joint and coalition forces. I'm a believer and so are the rest of the flag and general officers here at the table with me.¹⁶⁶

DOD Unclassified Summary Released June 2013

On June 3, 2013, DOD released an unclassified summary of the Air-Sea Battle concept.¹⁶⁷ The following pages reprint the document.

¹⁶⁶ Source: transcript of hearing.

¹⁶⁷ Air-Sea Battle Office, *Air-Sea Battle[:] Service Collaboration to Address Anti-Access & Area Denial Challenges*, May 2013, 12 pp., accessed July 5, 2013, at <http://www.defense.gov/pubs/ASB-ConceptImplementation-Summary-May-2013.pdf>, and at <http://navylive.dodlive.mil/files/2013/06/ASB-26-June-2013.pdf>. The latter of these two URLs provided a version with a smaller file size. For a DOD announcement of the document's release, see Jason Kelly, "Overview of the Air-Sea Battle Concept," Navy Live, June 3, 2013, accessed July 5, 2013, at <http://navylive.dodlive.mil/2013/06/03/overview-of-the-air-sea-battle-concept/>.

DOD officials had discussed the ASB concept in earlier statements; for example:

Admiral Jonathan Greenert, the Chief of Naval Operations, and General Mark Welsh, the Chief of Staff of the Air Force, discussed the ASB concept in a May 16, 2013, blog post; see Jonathan Greenert and Mark Welsh, "Breaking the Kill Chain[:] How to Keep America in the Game When Our Enemies Are Trying to Shut Us Out," *Foreign Policy*, May (continued...)

(...continued)

16, 2013, accessed July 5, 2013, at http://www.foreignpolicy.com/articles/2013/05/16/breaking_the_kill_chain_air_sea_battle.

- General Norton Schwartz, then-Chief of Staff of the Air Force, and Admiral Jonathan Greenert, the Chief of Naval Operations, discussed the ASB concept in a February 20, 2012, journal article; see Norton A. Schwartz and Jonathan W. Greenert, “Air-Sea Battle, Promoting Stability In An Era of Uncertainty,” *The American Interest*, February 20, 2012, accessed July 5, 2013, at <http://www.the-american-interest.com/article.cfm?piece=1212>.
- The Air-Sea Battle Office released a statement on the ASB concept on November 9, 2011; see “The Air-Sea Battle Concept Summary,” accessed July 5, 2013, at http://www.navy.mil/search/display.asp?story_id=63730.

AIR-SEA BATTLE

Service Collaboration to Address Anti-Access & Area Denial Challenges



May 2013

This document is an unclassified summary of the classified Air-Sea Battle Concept, version 9.0, dated May 12 and the Air-Sea Battle Master Implementation Plan (FY13), dated Sep 12.

FOREWORD: The Air-Sea Battle Concept

From its inception, the U.S. military has continuously adapted itself to meet evolving threats. At its core, the Air-Sea Battle (ASB) Concept is about reducing risk and maintaining U.S. freedom of action and reflects the Services' most recent efforts to improve U.S. capabilities. Similar to previous efforts, the Concept seeks to better integrate the Services in new and creative ways. It is a natural and deliberate evolution of U.S. power projection and a key support component of U.S. national security strategy for the 21st century.

Air Land Battle was developed in the 1970s and 1980s to counter a Soviet backed combined arms attack in Europe. A key component of AirLand Battle was the degradation of rear echelon forces before they could engage allied forces. This mission was largely assigned to the Air Force and led to unprecedented coordination between the Army and Air Force. The ASB Concept is similarly designed to attack-in-depth, but instead of focusing on the land domain from the air, the Concept describes integrated operations across all five domains (air, land, sea, space, and cyberspace) to create advantage. The ASB Concept further differentiates itself from its predecessor in that the ASB Concept also strives to protect our rear echelon across the same domains. This defensive aspect of ASB helps the Joint Force reduce risk in the face of increasingly longer range and more precise weapons which could affect our space-based platforms, land forces, airbases, capital ships, and network infrastructure.

While ASB is not a strategy, it is an important component of DoD's strategic mission to project power and sustain operations in the global commons during peacetime or crisis. Implementation of the ASB Concept, coordinated through the ASB office, is designed to develop the force over the long-term, and will continue to inform institutional, conceptual, and programmatic changes for the Services for years to come. The ASB Concept seeks to provide decision makers with a wide range of options to counter aggression from hostile actors. At the low end of the conflict spectrum, the Concept enables decision makers to engage with partners to assure access, maintain freedom of action, conduct a show of force, or conduct limited strikes. At the high end of the conflict spectrum, the Concept preserves the ability to defeat aggression and maintain escalation advantage despite the challenges posed by advanced weapons systems.

The ASB Concept is a limited but critical component in a spectrum of initiatives aimed at shaping the security environment. Similar to other concepts, ASB makes important contributions in both peace and war. The improved combat capabilities advocated by the concept may help shape the decision calculus of potential aggressors. Additionally, continued U.S. investments in the capabilities identified in the concept reassure our allies and partners, and demonstrate the U.S. will not retreat from, or submit to, potential aggressors who would otherwise try and deny the international community the right to international waters and airspace. When combined with security assistance programs and other whole-of-government efforts, the ASB Concept reflects the U.S. commitment to maintaining escalation advantage during conflict and sustaining security and prosperity in the global commons.

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1 | INTRODUCTION

The Department of Defense recognizes the need to explore and adopt options that will preserve U.S. ability to project power and maintain freedom of action in the global commons. In July 2009, the Secretary of Defense directed the Departments of the Navy and the Air Force to address this challenge and to embark on a new operational concept called Air-Sea Battle (ASB). Since then, the U.S. Army, Marine Corps, Navy, and Air Force have collaborated in new and innovative ways to address the anti-access/area denial (A2/AD) military problem set. Then in January 2012, the President of the United States and the Secretary of Defense introduced new strategic guidance in *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* that specifically tasked the U.S. military to project power despite A2/AD. In Fall 2012, all four of the Services' Vice Chiefs signed a memorandum of understanding establishing a framework to implement the ASB Concept through the development of a joint force capable of shaping and exploiting A2/AD environments in order to maintain freedom of action in the global commons, and secure operational access to enable concurrent or follow-on joint operations.

What follows is a fuller description of the military problem presented to U.S. and allied forces by A2/AD threats; how ASB addresses this problem; ASB's role in service and joint force development; and how ASB is being implemented. This reference is designed to provide an overview of the ASB Concept and what the Services are doing to operationalize or implement its tenets within their force development processes. At an unclassified level, this summary reference cannot wholly describe the concept or these actions. The original ASB Concept, its annexes, and the Fiscal Year 13 Implementation Master Plan (IMP) remain classified as they lay out the specific details of how the joint force should be developed to defeat A2/AD threats and how the Services are implementing those recommendations. These restricted documents are recommended reading for individuals with the requisite clearances and need to know. However, what is presented here is directly adapted from the ASB Concept and the FY13 IMP and carefully presents the core ideas and activities of ASB and its implementation.

2 | ANTI-ACCESS/AREA DENIAL (A2/AD)

A2/AD capabilities are those which challenge and threaten the ability of U.S. and allied forces to both get to the fight and to fight effectively once there. Notably, an adversary can often use the same capability for both A2 and AD purposes. It is the effect of A2/AD on U.S. and expeditionary operations that matters.

A2/AD capabilities and strategies to employ them combine to make U.S. power projection increasingly risky, and in some cases prohibitive, while enabling near-peer competitors and regional powers to extend their coercive strength well beyond their borders. In the most challenging scenarios, the U.S. may be unable to employ forces the way it has in the past: build up combat power in an area, perform detailed rehearsals and integration activities, and then conduct operations when and where desired. By acquiring these advanced A2/AD technologies, potential adversaries are changing the conditions of warfare that the U.S. has become accustomed to in the past half century.

ANTI-ACCESS (A2)	AREA-DENIAL (AD)
Action intended to slow deployment of friendly forces into a theater or cause forces to operate from distances farther from the locus of conflict than they would otherwise prefer. A2 affects <i>movement</i> to a theater.	Action intended to impede friendly operations within areas where an adversary cannot or will not prevent access. AD affects <i>maneuver within</i> a theater.

While A2/AD ideas are not new—the desire to deny an adversary both access and the ability to maneuver are timeless precepts of warfare—technological advances and proliferation threaten stability by empowering potentially aggressive actors with previously unattainable military capabilities. A new generation of cruise, ballistic, air-to-air, and surface-to-air missiles with improved range, accuracy, and lethality is being produced and proliferated. Modern submarines and fighter aircraft are entering the militaries of many nations, while sea mines are being equipped with mobility, discrimination and autonomy. Both space and cyberspace are becoming increasingly important and contested. The pervasiveness and advancement of computer technology and reliance on the internet and usable networks are creating means and opportunity for computer attack by numerous state and non-state aggressors, and the domain of space is now integral to such military capabilities as communications, surveillance, and positioning. In certain scenarios, even low-technology capabilities, such as rudimentary sea mines, fast-attack small craft, or shorter range artillery and missile systems render transit into and through the commons vulnerable to interdiction by coercive, aggressive actors, slowing or stopping free movement. The range and scale of possible effects from these capabilities presents a military problem that threatens the U.S. and allied expeditionary warfare model of power projection and maneuver.

The A2/AD threat exceeds any single or specific theater of operations, and creates problematic consequences for international security. For example, an aggressor can slow deployment of U.S. and allied forces to a theater, prevent

coalition operations from desired theater locations, or force friendly forces to operate from disadvantageous longer distances. Effectively undermining integrated U.S. and allied operations, the aggressor is likely to drive allies and partners to seek accommodation with potential aggressors, or to develop alternate means of self-defense with potentially destabilizing effects. Such an environment induces instability, erodes the credibility of U.S. deterrence, can necessitate escalation in U.S. and allied responses, and weakens U.S. international alliances including associated trade, economic, and diplomatic agreements.

PROBLEM STATEMENT

Adversary capabilities to deny access and areas to U.S. forces are becoming increasingly advanced and adaptive. These A2/AD capabilities challenge U.S. freedom of action by causing U.S. forces to operate with higher levels of risk and at greater distance from areas of interest. U.S. forces must maintain freedom of action by shaping the A2/AD environment to enable concurrent or follow-on operations.

A concept to address this operational problem must be based on realistic assumptions regarding how an adversary will employ A2/AD capabilities. The assumptions that underpin the ASB Concept reflect a conservative view of what an adversary could do, and have direct implications for how the U.S. can and should respond.

First, the *adversary will initiate military activities with little or no indications or warning*. While the adversary may signal or threaten in an attempt to deter U.S. or allied actions to maintain access, the adversary gains no advantage by telegraphing the commencement of hostilities – and does not need to. Capabilities such as ballistic and cruise missiles will be used with little warning, and ambiguous or minimal warning will be received of air and maritime deployments. The implications are that a short warning timeline requires the U.S. to maintain ready forces that are routinely integrated and prepared to conduct high risk operations against very capable adversaries.

Second, given the lack of indications or warning, *forward friendly forces will be in the A2/AD environment at the commencement of hostilities*. As a result, the steady state posture and capabilities of forces must be able to provide an immediate and effective response to adversary A2/AD attacks through high tempo operations in the A2/AD environment. Additional forces introduced into the threat environment should be able to promptly integrate into the existing force posture.

Third, *adversaries will attack U.S. and allied territory supporting operations against adversary forces*. In addition to attacking American aircraft, ships, space assets, networks, and people, denying access to U.S. forces requires attacks on bases from which U.S. and its allies are operating, including those on allied or partner territory. The implication is that the defense of all bases from which U.S. forces operate must be addressed, whether on U.S. or partner/allied territory. Even the U.S. homeland cannot be considered a sanctuary, and real-time prioritization may be required between homeland defense and overseas operations.

Fourth, *all domains will be contested by an adversary*—space, cyberspace, air, maritime, and land. Cyberspace and space-based capabilities are essential for U.S. operations and are vulnerable to adversary capabilities with a

low barrier to entry such as computer network attack and electronic jamming. Since the adversary may employ a multi-domain approach, ASB must defend and respond in each warfighting domain.

Lastly, *no domain can be completely ceded to the adversary*. Each domain can be used to impact and deny access to the others, so to cede one domain to an adversary invites the eventual loss of the other interdependent domains. While U.S. forces may contest freedom of action in each domain, they are not likely to be required to achieve control in each domain simultaneously or to the same degree. As such, U.S. forces must take advantage of freedom of action in one domain to create U.S. advantage or challenge an adversary in another. This will require tightly coordinated actions across domains using integrated forces able to operate in each domain.

3 | THE AIR-SEA BATTLE CONCEPT

ASB is a limited objective concept that describes what is necessary for the joint force to sufficiently shape A2/AD environments to enable concurrent or follow-on power projection operations. The ASB Concept seeks to ensure freedom of action in the global commons and is intended to assure allies and deter potential adversaries. ASB is a supporting concept to the Joint Operational Access Concept (JOAC), and provides a detailed view of specific technological and operational aspects of the overall A2/AD challenge in the global commons. The Concept is not an operational plan or strategy for a specific region or adversary. Instead, it is an analysis of the threat and a set of classified concepts of operations (CONOPS) describing how to counter and shape A2/AD environments, both symmetrically and asymmetrically, and develop an integrated force with the necessary characteristics and capabilities to succeed in those environments. ASB is about building conceptual alignment, programmatic collaboration and institutional commitment in an integrated way, across the military Services in order to develop forces and capabilities that can jointly address A2/AD challenges. The purpose of ASB is not to simply conduct operations more jointly. It is to increase operational advantage across all domains, enhance Service capabilities and mitigate vulnerabilities. In addition to other joint and service concepts, ASB will help ensure the U.S. ability to gain and maintain freedom of action in the global commons, and conduct concurrent or follow-on operations against a sophisticated adversary.

Central Idea. The ASB Concept's solution to the A2/AD challenge in the global commons is to develop networked, integrated forces capable of attack-in-depth to disrupt, destroy and defeat adversary forces (NIA/D3). ASB's vision of networked, integrated, and attack-in-depth (NIA) operations requires the application of cross-domain operations across all the interdependent warfighting domains (air, maritime, land, space, and cyberspace), to disrupt, destroy, and defeat (D3) A2/AD capabilities and provide maximum operational advantage to friendly joint and coalition forces.

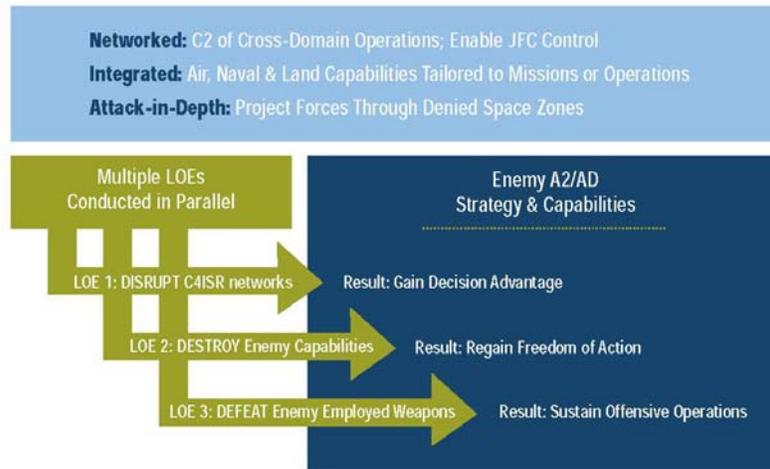


Figure 1. Components of ASB's Conceptual Design 'NIA/D3'

Cross-domain operations are conducted by integrating capabilities from multiple interdependent warfighting domains to support, shape, or achieve objectives in other domains. Cross-domain operations are those that can exploit asymmetric advantages in specific domains to create positive and potentially cascading effects in other domains. For cross-domain operations to be fully effective, commanders, whether defending or attacking, must have ready access to capabilities, no matter what domain they reside in or which commander owns them, to support or achieve operational objectives and create the effects required for advantage over an adversary. This interoperability may require multi-pathing, or the ability to use multiple, alternative paths from among all domain capabilities to achieve a desired end. While cross-domain operations are more complex than single domain or single Service options, their multi-pathing possibilities can provide distinct operational advantages over single domain or single Service solutions to operational problems.

The ability to integrate capabilities, equipment, platforms, and units across multiple domains and to communicate, interact, and operate together presents a joint force commander with more numerous and powerful options, which in turn, offer greater probability of operational success. For example, cyber or undersea operations can be used to defeat air defense systems, air forces can be used to eliminate submarine or mine maritime threats, or space assets can be used to disrupt adversary command and control. Put simply, traditional understandings of Service missions, functional responsibilities, or employment of capabilities from particular domains should not be barriers that hamper imaginative joint operations in an A2/AD environment. Each of the elements of ASB's construct offer joint force commanders increased flexibility and capability.

Networked. In the ASB Concept, networked actions are tightly coordinated in real time by mission-organized forces to conduct integrated operations across all domains without being locked into Service-specific procedures, tactics, or weapons systems. A networked force is people and equipment linked in time and purpose with interoperable

procedures; command control (C2) structures; and appropriate authorities capable of translating information into actions. These joint forces are able to attack the adversary A2/AD system-of-systems in depth and across all domains to create and exploit vulnerabilities.

Networked capabilities are both the physical means by which forces communicate and exchange information and the relationships, protocols, and procedures used by warfighters to complete their assigned missions. To be effective, networked forces need interoperable procedures, (C2) structures, and equipment. Authorities must also be provided at the appropriate C2 level in order for joint and coalition forces to gain and maintain decision advantage. In the ASB



Air-Sea Battle mitigates access challenges by moving beyond simply de-conflicting operations in each war fighting domain, toward creating the level of domain integration necessary to defeat increasingly varied and sophisticated threats.

*Secretary of Defense Leon Panetta
20 February 2012*

Concept, networked does not only mean having assured communications and access to data; it also means having a force trained to conduct operations using mission-type orders and being able to operate even in the absence of continuous connectivity. The joint force can achieve that ability in part by establishing habitual relationships across Service, component, and domain lines so that forces can be effectively trained to operate together in a contested and degraded environment.

Integrated. Integration is the arrangement of military forces and their actions to create a force that operates networked across domains as a whole. An integrated joint force is better able to combine capabilities across multiple domains to conduct specific missions. The basic concept of integration has further evolved into seeking the development of pre-integrated joint forces. In order to maintain an advantage over potential adversaries, air, naval, and land forces must fully integrate their operations. Integration, traditionally viewed as strictly the combatant commander's job, needs to begin across Service lines as part of force development.

Forces should be integrated prior to entering a theater. Effective integration requires enhanced joint and combined training against A2/AD capabilities, including training and exercise for cross-domain operations before deployment. In some cases, pre-integration will also require Services' collaboration in materiel programming to ensure interoperability to avoid overly redundant or incompatible systems.

Attack-in-depth to Disrupt, Destroy and Defeat. The attack-in-depth methodology is based on adversary effects chains, or an adversary's process of finding, fixing, tracking, targeting, engaging and assessing an attack on U.S. forces. Attack-in-depth is offensive and defensive fires, maneuver, and command and control with the objective of disrupting, destroying, or defeating an adversary's A2/AD capabilities, conducted across domains in time, space, purpose, and resources. Attack-in-depth seeks to apply both kinetic and non-kinetic means to address

adversary critical vulnerabilities without requiring systematic destruction of the enemy's defenses (e.g., a rollback of an adversary's integrated air defense system).

D3 represents the 3 lines of effort of the ASB Concept:

- **Disrupt** Adversary Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR or C4I);
- **Destroy** adversary A2/AD platforms and weapons systems; and,
- **Defeat** adversary employed weapons and formations.

Disrupting these effects chains includes impacting an adversary's C4ISR or C4I capabilities, ideally precluding attack on friendly forces. **Destroying** or neutralizing adversary weapons platforms enhances friendly survivability and provides freedom of action. **Defeating** employed weapons post-launch defends friendly forces from an adversary's attacks and allows sustained operations.

Due to the nature of A2/AD threats and potentially short indications and warning timelines posed by adversaries, joint forces must be capable of effective offensive operations as soon as conflict begins, while simultaneously defending or re-positioning deployed forces, protecting land and sea bases, and bringing forces forward from garrison with acceptable levels of risk. The ability to attack and defend through the entire depth of the desired battlespace, in all the interdependent warfighting domains, is critical to establishing joint freedom of action.

4 | ROLE IN JOINT FORCE DEVELOPMENT

The ASB Concept is focused on joint force development. As a service concept, it falls under the Services' Title 10 responsibilities to man, train, and equip forces for employment by the combatant commands. Accordingly, the objective of the ASB Concept is to inform force development to ultimately provide combatant commanders' joint forces with the aforementioned NIA-D3 capabilities that will help ensure freedom of access in the global commons. The ASB Concept is intended to foster future capabilities that directly support several of the U.S. Armed Forces primary missions described in the DoD's Strategic Guidance (DSG): *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*. These include missions to Deter and Defeat Aggression, Project Power Despite Anti-Access/Area Denial Challenges, and to Operate Effectively in Cyberspace and Space.

PRIMARY MISSIONS OF THE U.S. ARMED FORCES

- Counter Terrorism & Irregular Warfare
- **Deter & Defeat Aggression**
- **Project Power Despite Anti-Access/Area Denial Challenges**
- Counter Weapons of Mass Destruction
- **Operate Effectively in Cyberspace and Space**
- Maintain a Safe, Secure, & Effective Nuclear Deterrent
- Defend Homeland & Provide Support to Civil Authorities
- **Provide A Stabilizing Presence**
- Conduct Stability & Counterinsurgency Operations
- Conduct Humanitarian, Disaster Relief & Other Operations

The ASB Concept is also a supporting concept to and thus complements the overarching Chairman of the Joint Chiefs of Staff's force development vision detailed in the *Capstone Concept for Joint Operations: Joint Force 2020 (CCJO)*, JOAC, and the emerging Joint Concept for Entry Operations (JCEO). As a capstone document, the CCJO describes the future operating environment and the high-order vision for how the future force will need to conduct *Globally Integrated Operations* across the Range of Military Operations (ROMO). ASB is aligned with this operating environment and several of the key elements required to achieve the Chairman's vision – specifically concerning the need for developing cross-domain synergy in the future force.

JOAC is a component under the CCJO that broadly describes how U.S. joint forces will overcome opposed access challenges. It establishes guiding precepts and capabilities necessary to assure access and for the joint forces to overcome A2/AD threats. At the next level, ASB supports JOAC by identifying more specific means and requirements by which the joint force may defeat those adversary threats in order to maintain freedom of action in the global commons.

JCEO, at the same level as ASB, will focus on guiding force development to enable joint force entry operations in an A2/AD environment. ASB can be seen to support JCEO by covering that freedom of action and access requirements in the global commons that ultimately support the joint force's ability to conduct concurrent or follow-on entry operations.

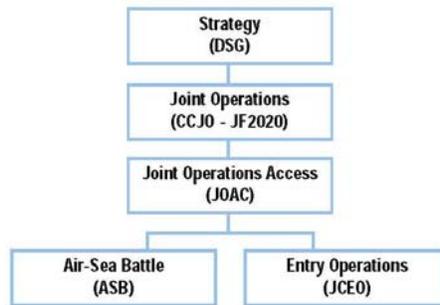


Figure 2. Relationship between Strategy, CCJO, JOAC, JCEO & ASB

Like other joint concepts, ASB does not seek to create a new force, as in one with wholly new equipment or capabilities, but instead endeavors to unify Service Title 10 efforts to develop forces that fight together more effectively. The Concept is a natural evolution of joint coalition warfighting toward more networked and integrated operational employment. It is an example of how the separate Services can formally collaborate, yet still protect, develop, and maintain unique Service capabilities, equities, and culture.

The ASB Concept views the joint force in a holistic way to include doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) within the Services' purview to organize, train, and equip. The ASB Concept specifically addresses a range of threats, such as ballistic and cruise missiles, sophisticated integrated

air defense systems, anti-ship capabilities from high-tech missiles and submarines to low-tech swarming boats, electronic warfare, and counter-C4ISR capabilities. Yet, the ASB Concept differs from other concepts because, while it contains the operational details needed in a limited objective concept, it is about fostering institutional change, conceptual alignment, and materiel change in and among the Services.

- Institutional Service and joint cooperation is enhanced through enduring organizational collaboration relevant to A2/AD environments as they evolve over time. Over the long term, the Concept envisions closer collaboration and integration of the Services' organize, train, and equip activities across the DOTMLPF spectrum. This will be done by expanding integration efforts through collaborative planning and increased liaison to emphasize more joint training at the operational and tactical levels.
- Conceptual alignment, perpetuated through the ASB conceptual design, which describes how capabilities and forces are integrated to accomplish combatant commander-directed operational objectives in A2/AD environments. Conceptual alignment actions fall into three broad categories: concept development, wargaming, and experimentation.
- Materiel solutions and innovations are collaboratively developed and vetted to ensure they are complementary where appropriate, redundant when mandated by capacity requirements, fully interoperable, and fielded with integrated acquisition strategies. ASB advocates for a process with expected products with a specific timeline to better facilitate Services' programmatic collaboration. The process is not intended to supplant existing Service activities, but to benefit from those activities and act as a focal point for improving inter-Service collaboration.

These key objectives guide the Services' efforts to develop the networked, integrated forces able to attack and defend where and when required—throughout any contested domain. Through these objectives, the Concept strives to develop a pre-integrated joint force ready to meet the A2/AD challenges. Such a pre-integrated joint force is built from the aforementioned habitual relationships, interoperable and complementary cross-domain capabilities. It benefits from realistic, shared training, enhancing the flexibility to develop new tactics, techniques, and procedures (TTPs) on the fly as operational conditions dictate. Such forces will provide the strategic deterrence assurance and stabilizing effects of a force in being and be ready at the outset of a contingency to avoid delays for buildups or extensive mission rehearsal.

5 | IMPLEMENTATION

SPECIFIC EXAMPLES OF ACTIONS BEING TAKEN BY THE SERVICES TO IMPLEMENT AIR-SEA BATTLE:

- Incorporating contested & denied environments into Service training & education
- Incorporating characteristics of contested environments into Service and Joint exercises
- Continuing subordinate concept development in support of CCJO, JOAC, and Air-Sea Battle
- Conducting engagement activities to ensure conceptual alignment with partners, build necessary partner capacity, and to strengthen relationships to assure access
- Conducting various studies and experiments to determine the validity of specific counter-A2/AD capabilities and concepts
- Conducting war games to explore future structures and policies for cross-domain operations command and control (XDO C2) and experiments to integrate and enable XDO C2 at the tactical level in A2/AD environments
- Developing multi-service tactics, techniques & procedures (TTPs) that address the A2/AD environment
- Conducting Service wargames focused on the Air-Sea Battle Concept's application in realistic operational scenarios
- Collaborating on Service resource planning and programming
- Incorporating Air-Sea Battle's and counter-A2/AD ideas into Joint and Service doctrine
- Establish & strengthen habitual relationships among Service organizations with complementary or similar operational purposes

In late 2011, the Secretary of Defense endorsed the ASB Concept as a necessary first step to address the anti-access, area denial challenge and directed the Services to work further to develop the Concept. To this end, the Services established a multi-service, flag-level ASB Executive Committee (EXCOM), Senior Steering Group (SSG), and supporting staff charged with implementing the Concept. Composed of representatives from each of the four Services, the role of the ASB Office is to foster the development and adoption of the related conceptual, institutional and material solutions through coherent implementation of the Concept's NIA/D3 construct. The ASB Office advocates for ASB initiatives, monitors their progress, and coordinates with various stakeholders within each Service.

The ASB office has established subject matter expert working groups and held implementation workshops to further validate, refine, and expand the original ASB Concept work as well as to lay out a plan for multi-Service implementation. This plan describes the recommended processes and actions to develop forces and enhance military capabilities necessary to counter current and future A2/AD challenges, using 2020 as the objective year. Accordingly, ASB is expected to be a multi-year process, as advanced capabilities come on line and the Services strengthen and enhance their habitual relationships and closely integrate their organize, train, and equip actions.

Following are examples of the actions being taken by the Services to implement the ASB Concept.

Incorporating contested & denied environments into Service training & education. In order to produce forces that can operate in, and counter an A2/AD environment, the Services must train to an increasingly challenging A2/AD environment and more fully integrate tactics, techniques, and procedures across service, functional, and domain lines. The Services will incorporate contested, degraded operations into their training and education programs, from the individual and unit level through integrated training in the deployed environment. Required training focus will

include both active measures, such as integrating capabilities to neutralize advanced adversary air defenses, and passive measures, such as comprehensive emissions control training. Education will include teaching the ASB Concept and JOAC precepts and ideas in Service professional military education courses and war colleges.

Incorporating characteristics of contested environments into Service and Joint exercises. The nature of heavily defended A2/AD capabilities makes attacking them, either kinetically or non-kinetically, far more challenging. Cross-domain solutions are required in order for manned or unmanned weapons systems to be able to penetrate and survive in contested environments. Cross-domain and multi-service training will be the focus in both defensive and offensive operations.

Continuing subordinate concept development in support of CCJO, JOAC, and ASB. CCJO, JOAC, and ASB have attempted to outline the current and future threat, however the nature of warfare dictates the threat will evolve in unpredictable ways. Continued development of the ASB Concept's ideas, in more detail, will be needed as the threat and operational scenarios change. Subordinate or complementary concepts will be developed, both to support the operationalization of the ASB Concept and to support the JOAC and the CCJO.

Conducting engagement activities to build conceptual alignment and partner capacity and to strengthen relationships to assure access. Shaping and engagement activities during implementation ensures conceptual alignment with our partners and allies, builds necessary partner capacity and strengthens our relationships which facilitate and assure access to multiple domains in the event conflict occurs.

Conducting various studies and experiments to determine the validity of specific counter-A2/AD capabilities and concepts. Studies and experimentation are critical for the evolution of concepts in to doctrine. Continued study and assessment of ASB's operational solutions will be conducted, as will experimentation into innovative capabilities and processes to defeat A2/AD threats and enhance joint integration and interdependence.

Conducting experiments with integrated command and control of cross-domain operations. Command and control is the heart and soul of joint operations; fighting in a multi-domain environment against a capable adversary will require innovative methods to ensure decision advantage and operational success. The Services will review and better integrate the existing C2 structures to allow for ease of cross-domain operations.



...future Joint Forces will leverage better integration to improve cross-domain synergy—the complementary vice merely additive employment of capabilities across domains in time and space. While the U.S. military maintains unique advantages in every domain, it is our ability to project force across domains that so often generates our decisive advantage.

Capstone Concept for Joint Operations

Developing multi-service TTPs that address the A2/AD environment. Current Joint and Service TTPs still largely reflect an operational environment where U.S. and coalition operational access is unchallenged. During the multi-year implementation process of ASB and JOAC, Service-level and combatant commander-level organizations must review, revise, and (in some cases) develop the necessary TTPs based on the results of wargaming, experimentation, tactics development, and exercises/cross-domain training events. Joint TTPs are already developed collaboratively by the Services; ASB will seek closer, earlier, and more ubiquitous collaboration on how best to operate, share information, and train the force to proficiency.

Conducting Service wargames focused on the ASB Concept's application in realistic operational scenarios. Service Title 10 wargames are key shaping events for force development. All four Services will address various aspects of the evolving A2/AD environment. They will be informed by and build on each other's work. This will include collaborative support of sister Service wargames with subject matter experts.

Collaborating on Service resource planning and programming. The joint force ultimately ends up with the capabilities it invests in; ASB will seek closer integration of resource planning and programming. This will begin with mutually developed capability gaps and integrated solution sets; these are followed by collaborated, integrated priorities provided to Service resource sponsors and programmers.

Incorporating ASB and counter-A2/AD ideas into Joint and Service doctrine. Once best practices and TTPs are validated, the Services will reflect these in their doctrine. This includes reviewing existing doctrine and, where applicable, advocating the use of suitable doctrine for emerging and future environments.

Establishing & strengthening habitual relationships among Service organizations with complementary or similar operational purposes. The ASB Concept will largely be implemented by the Fleet and Field; encouraging and facilitating the establishment of habitual relationships between operational level and tactical level units is critical to the long-term success of the ASB Concept's ideas. This includes Echelon 2 and 3 organizations such as the USAF's Air Combat Command (ACC), the Navy's Fleet Forces Command (FFC), the Army's Training and Doctrine Command (TRADOC), and the Marine Corps' Combat Development Command (MCCDC).

6 | CONCLUSION

Successful implementation of the ASB Concept will require unprecedented levels of joint and combined integration founded on comprehensive and habitual relationships that span from the fleets and forces in the field to the headquarters' staffs in the Pentagon. Substantial aspects of joint force development, operations, training, acquisition, and modernization will be involved in order to meet the challenge and be ready. Given the proliferation of advanced A2/AD technologies, NIA/D3 solutions will be a necessary component for the U.S. military's ability to continue to confidently operate forward and project power throughout the world. The ASB Concept is a natural evolution of the joint force and relations with allies toward more networked and integrated operational solutions. In a changing world that demands continued U.S. leadership, concepts such as ASB are essential to sustaining America's military freedom of action and ability to project power.



The reality of force development is that about 80% of Joint Force 2020 is programmed or exists today. We do however; have an opportunity to be innovative in two ways. We can significantly change the other 20% of the force, and we can change the way we use the entire force. While new capabilities will be essential, many of our most important advancements will come through innovations in training, education, personnel management, and leadership development.

Capstone Concept for Joint Operations

Press Reports

An August 20, 2012, press report stated that the ASB concept has prompted Navy officials to make significant shifts in the service's FY2014-FY2018 budget plan, including new investments in ASW, electronic attack and electronic warfare, cyber warfare, the F-35 Joint Strike Fighter (JSF), the P-8A maritime patrol aircraft, and the Broad Area Maritime Surveillance (BAMS) UAV (a maritime version of the Global Hawk UAV). The report quoted Chief of Naval Operations Jonathan Greenert as saying that the total value of the budget shifts was certainly in the hundreds of millions of dollars, and perhaps in the "low billions" of dollars.¹⁶⁸

An August 2, 2012, press report on the ASB concept states:

When President Obama called on the U.S. military to shift its focus to Asia earlier this year, Andrew Marshall, a 91-year-old futurist, had a vision of what to do.

Marshall's small office in the Pentagon has spent the past two decades planning for a war against an angry, aggressive and heavily armed China.

No one had any idea how the war would start. But the American response, laid out in a concept that one of Marshall's longtime proteges dubbed "Air-Sea Battle," was clear.

Stealthy American bombers and submarines would knock out China's long-range surveillance radar and precision missile systems located deep inside the country. The initial "blinding campaign" would be followed by a larger air and naval assault.

The concept, the details of which are classified, has angered the Chinese military and has been pilloried by some Army and Marine Corps officers as excessively expensive. Some Asia analysts worry that conventional strikes aimed at China could spark a nuclear war.

Air-Sea Battle drew little attention when U.S. troops were fighting and dying in large numbers in Iraq and Afghanistan. Now the military's decade of battling insurgencies is ending, defense budgets are being cut, and top military officials, ordered to pivot toward Asia, are looking to Marshall's office for ideas.

In recent months, the Air Force and Navy have come up with more than 200 initiatives they say they need to realize Air-Sea Battle. The list emerged, in part, from war games conducted by Marshall's office and includes new weaponry and proposals to deepen cooperation between the Navy and the Air Force....

Even as it has embraced Air-Sea Battle, the Pentagon has struggled to explain it without inflaming already tense relations with China. The result has been an information vacuum that has sown confusion and controversy.

Senior Chinese military officials warn that the Pentagon's new effort could spark an arms race....

¹⁶⁸ Christopher J. Castelli, "CNO: Air-Sea Battle Driving Acceleration Of Key Programs In POM-14," *Inside the Navy*, August 20, 2012. POM-14 is the Program Objective Memorandum (an internal DOD budget-planning document) for the FY2014 DOD budget.

Privately, senior Pentagon officials concede that Air-Sea Battle's goal is to help U.S. forces weather an initial Chinese assault and counterattack to destroy sophisticated radar and missile systems built to keep U.S. ships away from China's coastline.

Their concern is fueled by the steady growth in China's defense spending, which has increased to as much as \$180 billion a year, or about one-third of the Pentagon's budget, and China's increasingly aggressive behavior in the South China Sea.

"We want to put enough uncertainty in the minds of Chinese military planners that they would not want to take us on," said a senior Navy official overseeing the service's modernization efforts. "Air-Sea Battle is all about convincing the Chinese that we will win this competition."

Inside the Pentagon, the Army and Marine Corps have mounted offensives against the concept, which could lead to less spending on ground combat.

An internal assessment, prepared for the Marine Corps commandant and obtained by The Washington Post, warns that "an Air-Sea Battle-focused Navy and Air Force would be preposterously expensive to build in peace time" and would result in "incalculable human and economic destruction" if ever used in a major war with China.

The concept, however, aligns with Obama's broader effort to shift the U.S. military's focus toward Asia and provides a framework for preserving some of the Pentagon's most sophisticated weapons programs, many of which have strong backing in Congress.¹⁶⁹

An April 2012 press report that provides a historical account of the ASB concept states: "In truth, the Air Sea Battle Concept is the culmination of a strategy fight that began nearly two decades ago inside the Pentagon and U.S. government at large over how to deal with a single actor: the People's Republic of China."¹⁷⁰ A November 10, 2011, press report states:

Military officials from the three services told reporters during a [November 9, 2011, DOD] background briefing that the concept is not directed at a single country. But they did not answer when asked what country other than China has developed advanced anti-access arms.

A senior Obama administration official was more blunt, saying the new concept is a significant milestone signaling a new Cold War-style approach to China.

"Air Sea Battle is to China what the [U.S. Navy's mid-1980s] maritime strategy was to the Soviet Union," the official said.

During the Cold War, U.S. naval forces around the world used a strategy of global presence and shows of force to deter Moscow's advances.

"It is a very forward-deployed, assertive strategy that says we will not sit back and be punished," the senior official said. "We will initiate."

¹⁶⁹ Greg Jaffe, "Real Tensions Over A Theoretical War," *Washington Post*, August 2, 2012: 1.

¹⁷⁰ Bill Gertz, "China's High-Tech Military Threat and What We're Doing About It," *Commentary*, April 2012: 15-21. The quoted passage is from page 16. See also Yoichi Kato, "Japan's Response to New U.S. Defense Strategy: 'Welcome, But ...'" *Asahi Shimbun*, March 9, 2012, accessed online at http://ajw.asahi.com/article/behind_news/politics/AJ201203090025.

The concept, according to defense officials, grew out of concerns that China's new precision-strike weapons threaten freedom of navigation in strategic waterways and other global commons.

Defense officials familiar with the concept said among the ideas under consideration are:

- Building a new long-range bomber.
- Conducting joint submarine and stealth aircraft operations.
- New jointly operated, long-range unmanned strike aircraft with up to 1,000-mile ranges.
- Using Air Force forces to protect naval bases and deployed naval forces.
- Conducting joint Navy, Marine Corps and Air Force strikes inside China.
- Using Air Force aircraft to deploy sea mines.
- Joint Air Force and Navy attacks against Chinese anti-satellite missiles inside China.
- Increasing the mobility of satellites to make attacks more difficult.
- Launching joint Navy and Air Force cyber-attacks on Chinese anti-access forces.¹⁷¹

An October 12, 2011, press report states that

The Pentagon is engaged in a behind-the-scenes political fight over efforts to soften, or entirely block, a new military-approved program to bolster U.S. forces in Asia.

The program is called the Air Sea Battle concept and was developed in response to more than 100 war games since the 1990s that showed U.S. forces, mainly air and naval power, are not aligned to win a future war with China.

A senior defense official said Defense Secretary Leon E. Panetta is reviewing the new strategy.

“We want to do this right,” the official said. “The concept is on track and is being refined to ensure that we are able to implement it wherever we need to—including in the Asia-Pacific region, where American force projection is essential to our alliances and interests.”

The official noted that the program is “the product of unprecedented collaboration by the services.”

Pro-defense Members of Congress aware of the political fight are ready to investigate. One aide said Congress knows very little about the concept and is awaiting details.

Officially, the Pentagon has said the new strategy is not directed at China.

But officials familiar with the classified details said it is designed to directly address the growing threat to the United States and allies in Asia posed by what the Pentagon calls

¹⁷¹ Bill Gertz, “Battle Concept Signals Cold War Posture On China,” *Washington Times*, November 10, 2011: 13.

China's "anti-access" and "area denial" weapons—high-technology arms that China has been building in secret for the past several decades....

The U.S. response in the Air Sea Battle concept is said to be a comprehensive program to protect the "global commons" used by the United States and allies in Asia from Chinese military encroachment in places such as the South China Sea, western Pacific and areas of Northeast Asia.

The highly classified program, if approved in its current form, will call for new weapons and bases, along with non-military means. Plans for new weapons include a long-range bomber.

Other systems and elements of the program are not known....

However, defense officials said China's government was alerted to some aspects of the concept earlier this year when the Center for Strategic and Budgetary Assessments think tank presented its own concept for a new warfighting strategy against China.

Andrew Krepinevich, the center's director who recently left the Pentagon's Defense Policy Board, could not be reached for comment.

As a result of the disclosure, China launched a major propaganda and influence campaign to derail it. The concept was raised in several meetings between Chinese and U.S. officials, with the Chinese asserting that the concept is a sign the Pentagon does not favor military relations and views China as an enemy.

Officials in the Obama administration who fear upsetting China also are thought to have intervened, and their opposition led Mr. Panetta to hold up final approval.

The final directive in its current form would order the Air Force and the Navy to develop and implement specific programs as part of the concept. It also would include proposals for defense contractors to support the concept.¹⁷²

An October 2011 magazine article stated:

AirSea Battle emerged from a memorandum between the air and sea services in 2009. The Air Force and Navy realized sophisticated threats involving high technology, networked air defenses, modern ballistic missile, and sea and air capabilities, and anti-space weapons required the services to marry up many of their respective strengths. The plan, which has received a great amount of attention since the 2010 Quadrennial Defense Review, mandated the creation of an operations concept to protect US and allied access to certain areas in the world while also protecting forward-based assets and bases....

Both services are said to be fully on board with the plan, and to weed out duplication, officers from each branch have been cleared to see "all the black programs," or classified projects, of the other service as the ASB plan has matured....

The plan had been vetted by both services by June [2011], and is awaiting blessing from the Office of the Secretary of Defense.... Service officials have been predicting a formal release of more information on the doctrine for months as well.

¹⁷² Bill Gertz, "Inside the Ring," *Washington Times*, October 12, 2011 (item entitled "Air Sea Battle Fight").

As early as Feb. 17 [2011], Lt. Gen. Herbert J. Carlisle, the Air Force's deputy chief of staff for operations, plans, and requirements, had said a public document explaining the outlines of ASB in detail would occur "possibly within two weeks." The now-retired Chief of Naval Operations Adm. Gary Roughead told reporters in Washington in March he expected to release details on ASB in "a few weeks," as the service Chiefs of the Marines Corps, USAF, and Navy were "basically done" with their work on the concept. The majority of the plan will remain classified, he added, "as it should be."¹⁷³

A sidebar to this magazine article stated:

The AirSea Battle rollout was repeatedly delayed over the course of 2011. According to Office of the Secretary of Defense and Air Force officials, new Secretary of Defense Leon E. Panetta is reviewing the ASB plan—a sort of executive summary of the overall operations concept (which, as of early September, remains classified).

However, then-Vice Chief of Naval Operations Adm. Jonathan W. Greenert, now the CNO, told the House Armed Services Committee in late July he expected a release of unclassified portions of the plan soon.

The AirSea Battle concept was signed by the USAF, Navy, and Marine Corps service Chiefs, and the Air Force and Navy Secretaries on June 2 and "forwarded to the [Secretary of Defense] for approval," the Air Force said in a brief official statement Aug. 2.

Previous Defense Secretary Robert M. Gates, who departed July 1, had the document in his possession and had told senior Air Force officials he would sign it before his departure. In late July, however, Air Force and DOD officials privately indicated the concept was held up in OSD's policy shop, and Gates did not sign the document before leaving the Pentagon.

Air Force and defense officials have indicated both publicly and privately that there are strong international political considerations at play. Spin "concern" has likely contributed to the delay in officially rolling out the AirSea Battle concept. In late July, USAF officials privately indicated that there is a great deal of concern within OSD about how China will perceive and react to the concept.¹⁷⁴

A September 29, 2011, press report on a reported new DOD Defense Planning Guidance (DPG) document quoted "a senior defense official" as stating: "It seems clear that there will be increased emphasis on [the] AirSea Battle approach going forward."¹⁷⁵

A July 26, 2011, press report, stated:

U.S. Defense Secretary Leon Panetta is reviewing an Air Force-Navy battle concept that was ordered by the Pentagon last year in response to China's military buildup and Iran's advanced weapons, Vice Chief of Naval Operations Admiral Jonathan Greenert said today.

The Navy and Air Force have submitted to Panetta the equivalent of an executive summary of the battle concept with the intent to release unclassified portions within weeks, depending

¹⁷³ Marc V. Schanz, "AirSea Battle's Turbulent Year," *Air Force Magazine*, October 2011: 32-33.

¹⁷⁴ "An ASB Summer," *Air Force Magazine*, October 2011: 33.

¹⁷⁵ Christopher J. Castelli, "DOD Aims To Boost Investment In Capabilities For Major-Power War," *Inside the Pentagon*, September 29, 2011.

on Panetta's reaction, Greener told a House Armed Services readiness panel and a Bloomberg News reporter after the hearing.

The plan aims to combine the strengths of the Navy and Air Force to enable long-range strikes. It may employ a new generation of bombers, a new cruise missile and drones launched from aircraft carriers. The Navy also is increasing funding to develop new unmanned submarines.¹⁷⁶

A June 10, 2011, press report stated that “while defense officials publicly insist that the military’s new AirSea Battle concept, a study meant to reshape the way the U.S. military fights future wars, is not focused on China, one Navy team is quietly contradicting their claims. The group, called the China Integration Team, is hard at work applying the lessons of the study to a potential conflict with China, say sources familiar with the effort.” The report also stated that “though sources familiar with the study have said that the first draft of the concept has been completed, those same sources highlighted that the project is ongoing—something that official spokesmen have stressed as well.”¹⁷⁷ A January 10, 2011, press report stated that “the AirSea Battle concept study, meant to outline the future of Navy and Air Force operations in anti-access environments, is near completion and is being briefed to Navy Secretary Ray Mabus and Air Force Secretary Michael Donley this month, according to sources familiar with the study.”¹⁷⁸

¹⁷⁶ Tony Capaccio, “Panetta Reviewing Air-Sea Battle Plan Summary, Greener Says,” *Bloomberg News*, July 26, 2011.

¹⁷⁷ Andrew Burt and Christopher J. Castelli, “Despite Improved Ties, China Weighs Heavily In Pentagon’s War Planning,” *Inside the Navy*, June 13, 2011.

¹⁷⁸ Andrew Burt, “Final AirSea Study Being Briefed To Mabus And Donley This Month,” *Inside the Navy*, January 10, 2011. See also David Fulghum, “Money Walks? Service Leaders Fight to Explain, Justify AirSea Battle Strategy,” *Aviation Week & Space Technology*, June 4/11, 2012: 71; Philip DuPree and Jordan Thomas, “Air-Sea Battle: Clearing the Fog,” *Armed Forces Journal*, June 2012; John Callaway, “The Operational Art of Air-Sea Battle,” *Center for International Maritime Security* (<http://cimsec.org>), July 18, 2014.

Appendix C. Article by CNO Greenert on Navy's Rebalancing Toward Asia-Pacific

This appendix presents the text of a November 14, 2012, article by Admiral Jonathan Greenert that provides an overview of Navy activities associated with the U.S. strategic rebalancing toward the Asia-Pacific. The article states:

Our nation's security priorities, and our military, are in transition. In the Middle East, we ended the war in Iraq and are reducing ground troops in Afghanistan with the shift of security responsibilities to Kabul. At home we are reassessing our military's size and composition as we seek to align our spending with our resources. And around the world we face a range of new security challenges, from continued upheaval in the Arab world to the imperative of sustaining our leadership in the Asia-Pacific. These challenges place a premium on the flexibility and small ground footprint of naval forces, which are being deployed longer and more often to advance our nation's interests.

The Department of Defense's January 2012 strategic guidance, *Sustaining U.S. Global Leadership - Priorities for 21st Century Defense*, addressed this new environment and our security priorities in it. Overall, the strategy focuses on important regions and current readiness and agility, while accepting reduced capacity and level of effort in less critical missions. In particular, the strategy directed that our military rebalance toward the Asia-Pacific while continuing to support our partners in the Middle East. Naval forces will be at the heart of both efforts.

After two decades of ground conflict in the Middle East, our security concerns and ability to project power in the region both center on the sea. U.S. ground forces continue to draw down in Afghanistan and around the region, so our commanders increasingly rely on naval aircraft to support and protect troops. Meanwhile, Iranian leaders speak provocatively about impacting maritime traffic throughout the Arabian Gulf. In response, we turned to maritime forces, doubling our minesweeping forces in the Gulf and deploying an additional carrier strike group to the region.

The focus of our rebalance, the Asia-Pacific, is fundamentally a maritime region. Our friends there depend on the sea for their food and energy, while more than 90 percent of trade by volume makes its way through the region over the water. Maritime security for Pacific nations is a matter of economic survival. Militarily, the vast maritime distances in the region make access via the sea essential to deterring and defeating aggression. Our fleet deployed in the Asia-Pacific will exploit the mobility of being at sea to project power against aggressors and avoid attacks, while their reinforcements and supplies will arrive via the ocean from the United States or regional bases.

The importance of the Asia-Pacific, and the Navy's attention to it, is not new. Five of our seven treaty allies are in the region, as well as six of the world's top 20 economies. We have maintained an active and robust presence in the Asia-Pacific for more than 70 years and built deep and enduring relationships with allies and partners there. While we remain present and engaged in the Middle East to address today's challenges, the Navy will build on its longstanding Asia-Pacific focus by rebalancing in four main ways: deploying more forces to the Asia-Pacific; basing more ships and aircraft in the region; fielding new capabilities focused on Asia-Pacific challenges; and developing partnerships and intellectual capital across the region.

Deploying more forces to the Asia-Pacific

The most visible element of our rebalance toward the Asia-Pacific region will be an increase in day-to-day military presence. Although it is not the only way we are rebalancing, forces operating in the region show our commitment to the Asia-Pacific and provide a full-time capability to support our allies and partners. About half of the deployed fleet is in the Pacific—50 ships on any given day. These ships and their embarked Marines and aircraft train with our allies and partners, reinforce freedom of navigation, and deter conflict. They are also the “first responders” to large-scale crises such as the Great East Asian Earthquake and Tsunami in 2011.

The long distance between the continental United States and Asia makes it inefficient to rotate ships and aircraft overseas for six to nine months at a time. To avoid this transit time and build greater ties with our partners and allies, more than 90 percent of our forces in the Asia-Pacific are there permanently or semi-permanently. For example, about half of our 50 deployed ships are permanently home-ported in Japan and Guam along with their crews and families. Our logistics and support ships use rotating civilian or military crews to obtain more presence for the same number of ships.

Although we plan to reduce our future budgets, the Navy will continue to increase its presence in the Asia-Pacific region. The benchmark year of the Defense Strategic Guidance is 2020, and by then the Navy Fleet will grow to approximately 295 ships. This, combined with the impacts of our plans for operations and basing, will increase the day-to-day naval presence in the Asia-Pacific by about 20 percent, to 60 ships by 2020. In addition to growing the fleet, three factors will allow us to increase the number of ships in the Asia-Pacific by 2020:

First, we will permanently base four destroyers in Rota, Spain over the next several years to help defend our European allies from ballistic missiles. Today we do this mission with 10 destroyers that travel in rotation to the Mediterranean from the United States. The six destroyers freed up in the process will then be able to rotationally deploy to the Asia-Pacific.

Second, new Joint High Speed Vessels (JHSV) and Littoral Combat Ships (LCS) under construction today will enter the fleet and take on security cooperation and humanitarian assistance missions in South America and Africa, allowing the destroyers and amphibious ships we use today for those missions to deploy to the Asia-Pacific. These amphibious ships will begin deploying instead to the Asia-Pacific in the next few years to support Marine operations, including those from Darwin, Australia. Additionally, the new JHSV and LCS are also better suited to the needs of our partners in Africa and South America.

Third, we will field more ships that spend the majority of their time forward by using rotating civilian or military crews. These include the JHSV, LCS, and our new Mobile Landing Platforms and Afloat Forward Staging Bases (AFSB).

In addition to more ship presence in the Asia-Pacific, we will increase our deployments of aircraft there and expand cooperative air surveillance operations with regional partners. Today we fly cooperative missions from Australia, the Philippines, and Thailand, where we build our shared awareness of activities on the sea by either bringing partner personnel on board or sharing the surveillance information with them. We may expand these operations in the future to new partners concerned about threats from piracy, trafficking, and fisheries violations. To expand our surveillance capacity, the Navy version of the MQ-4 Global Hawk unmanned air vehicle will operate from Guam when it enters the fleet in the middle of this decade.

Basing more ships and aircraft in the region

To support our increased presence in the Asia-Pacific, we will grow the fraction of ships and aircraft based on the U.S. West Coast and in the Pacific from today's 55 percent to 60 percent by 2020. This distribution will allow us to continue to meet the needs of Europe, South America, and West Africa while more efficiently providing additional presence and capacity in the Asia-Pacific.

Each ship that operates from an overseas port provides full-time presence and engagement in the region and delivers more options for Combatant Commanders and political leaders. It also frees up ships that would otherwise be needed to support a rotational deployment. Today, we have about two dozen ships home-ported in Guam and Japan. In 2013, with the USS Freedom, we will begin operating Littoral Combat Ships from Singapore, eventually growing to four ships by 2017. The LCS will conduct maritime security operations with partner navies throughout Southeast Asia and instead of rotationally deploying to the region, the ships will stay overseas and their crews will rotate in from the United States, increasing the presence delivered by each ship.

Fielding new capabilities focused on Asia-Pacific challenges

We will also bolster the capabilities we send to the Asia-Pacific. Using the approach described in the Air-Sea Battle concept and in concert with the U.S. Air Force, we will sustain our ability to project power in the face of access challenges such as cruise and ballistic missiles, submarines, and sophisticated anti-air weapons. Air-Sea Battle's operations to disrupt, destroy, and defeat anti-access threats will be essential to maintain the credibility of our security commitments and ability to deter aggression around the world. Our improved capabilities will span the undersea, surface, and air environments.

Undersea

The Navy's dominance in the undersea domain provides the United States a significant advantage over potential adversaries. Our undersea capabilities enable strike and anti-surface warfare in otherwise denied areas and exploit the relative lack of capability of our potential adversaries at anti-submarine warfare. We will sustain our undersea advantage in part through continued improvements in our own anti-submarine warfare capability, such as replacing the 1960s-era P-3 Orion maritime patrol aircraft with the longer range and greatly improved sensors of the P-8A Poseidon.

We will also field improved platforms and systems that exploit the undersea domain for power projection and surveillance. In the coming years, newer, multi-mission Virginia-class submarines with dramatically improved sensors and combat systems will continue to replace aging Los Angeles-class submarines. With their conversion from Cold War-era ballistic missile submarines, our four Ohio-class guided missile submarines (SSGN) are now our most significant power projection platforms. During Operation Unified Protector, USS Florida launched over 100 Tomahawk missiles at Libyan air defenses to help establish a "no-fly" zone. When she and her counterparts retire in the mid 2020s, the Virginia-class submarine "payload module" will replace their striking capacity with the ability to carry up to 40 precision-strike cruise missiles, unmanned vehicles, or a mix of other payloads.

Improved sensors and new unmanned systems allow us to augment the reach and persistence of manned submarines, and are essential to our continued domination of the undersea environment. These unmanned vehicles will enhance the persistence of undersea sensing, and expand its reach into confined and shallow waters that are currently inaccessible to other systems. This will enable detection of threats, for example, to undersea infrastructure.

Surface

But undersea forces have limited effectiveness at visible, day-to-day missions such as security cooperation, humanitarian assistance, missile defense, and freedom of navigation. Surface ships will continue to conduct these operations and show our presence in the Asia-Pacific. Our surface fleet and embarked personnel will continue to be the most versatile element of the naval force, building partner capacity and improving security in peacetime and transitioning to sea control and power projection in conflict. Their credibility and their ability to execute these missions depends on their ability to defeat improving threats, especially anti-ship cruise missiles (ASCM) and anti-ship ballistic missiles (ASBM).

We will defeat ASCMs at long range using an integrated fire control system that combines the proven Aegis weapon system and upgraded airborne early warning aircraft with new long-range anti-air missiles on cruisers and destroyers. To defeat ASCMs at short range, the Navy is upgrading point-defense missiles and electronic warfare systems to destroy incoming missiles or cause them to miss by deceiving and jamming their seekers.

Navy forces will defeat ASBMs by countering each link in the operational chain of events required for an adversary to find, target, launch, and complete an attack on a ship with a ballistic missile. The Navy is fielding new systems that jam, decoy, or confuse the wide-area surveillance systems needed to find and target ships at long range. To shoot down an ASBM once launched, the fleet will employ the Aegis ballistic missile defense system and SM-3 missile. And, to prevent an ASBM from completing an attack, the Navy is fielding new missiles and electronic warfare systems over the next several years that will destroy, jam, or decoy the ASBM warhead as it approaches the ship.

To improve the ability of surface forces to project power, we will field new long-range surface-to-surface missiles aboard cruisers and destroyers in the next decade and improve our ability to send troops ashore as new San Antonio-class amphibious ships replace their smaller and less-capable 30-year-old predecessors over the next two years.

Air

The Navy and Air Force will improve their integrated ability to defeat air threats and project power in the face of improving surveillance and air defense systems. This evolution involves the blending of new and existing technology and the complementary use of electronic warfare, stealth, and improved, longer-range munitions. The carrier air wing in Japan recently finished upgrading to F/A-18 E/F Super Hornet strike fighters with improved jamming and sensor systems and the new E/A-18G Growler electronic attack aircraft. This air wing will also be the first to incorporate the F-35C Lightning II, which will enable new operational concepts that combine the F-35C's stealth and sensor capability with the payload capacity of the F/A-18 E/F to project power against the most capable air defense systems.

Developing partnerships and intellectual capital

Perhaps most importantly, rebalancing the Navy's emphasis toward the Asia-Pacific region includes efforts to expand and mature our partnerships and establish greater intellectual focus on Asia-Pacific security challenges.

First, we are increasing the depth and breadth of our alliances and partnerships in the Asia-Pacific. Our relationships in the region are the reason for our engagement there and are the foundation of our rebalanced national security efforts. Our connection with Asia-Pacific allies starts at the top. Our naval headquarters and command facilities are integrated with those of Japan and South Korea and we are increasing the integration of our operating forces by regularly conducting combined missions in areas including anti-submarine warfare and

ballistic missile defense. We are also establishing over the next year a headquarters in Singapore for our ships that will operate there.

We build our relationships with operational experience. The Navy conducts more than 170 exercises and 600 training events there every year with more than 20 allies and partners—and the number of events and partners continues to grow. Our 2012 Rim of the Pacific Exercise, or “RIMPAC,” was the world’s largest international maritime exercise, involving more than 40 ships and submarines, 200 aircraft, and more than 25,000 sailors from two dozen Asia-Pacific countries. This year RIMPAC included several new partners, such as Russia and India. It also incorporated naval officers from Canada, Australia, and Chile as leaders of exercise task forces. Like our other exercises, RIMPAC practices a range of operations, building partner capacity in missions such as maritime security and humanitarian assistance while enhancing interoperability with allies in sophisticated missions such as anti-submarine and surface warfare and missile defense.

Second, we are refocusing attention on the Asia-Pacific in developing and deploying our intellectual talent. The Naval War College is the nation’s premier academic center on the region and continues to grow its programs on Asian security, while the Naval Postgraduate School expanded its programs devoted to developing political and technical expertise relevant to the Asia-Pacific. We continue to carefully screen and send our most talented people to operate and command ships and squadrons in the Asia-Pacific.

Third, as described above, the Navy is sharpening its focus on military capabilities needed in the Asia-Pacific. Most important is the ability to assure access, given the distances involved in the region and our treaty alliances there. Having a credible ability to maintain operational access is critical to our security commitments in the region and the diplomatic and economic relationships those commitments underpin. We are developing the doctrine, training and know-how to defeat access threats such as submarines and cruise and ballistic missiles through our Air-Sea Battle concept. With Air-Sea Battle, we are pulling together the intellectual effort in needed areas, including intelligence and surveillance, cyber operations, anti-submarine warfare, ballistic missile defense, air defense, and electronic warfare. The Air-Sea Battle Office leads this effort with more than a dozen personnel representing each military service.

Our credibility in these missions rests on the proficiency our forces deployed every day in the Asia-Pacific. We increased our live-fire training in air defense and in surface and anti-submarine warfare by more than 50 percent, and expanded the number and sophistication of training events we conduct in theater with our partners and allies. For example, in RIMPAC 2012, U.S. allies and partners shot 26 torpedoes and more than 50 missiles from aircraft and ships against a range of targets and decommissioned ships.

A Global Fleet

Even as we rebalance to the Asia-Pacific, the Navy will remain engaged around the world. We will maintain our presence to deter and respond to aggression in support of our partners in the Middle East. In Europe we will build our alliance relationships. Our basing of ballistic missile defense destroyers to Spain is part of this effort, as an element of the overall European Phased Adaptive Approach. The home-porting of U.S. ships in Europe will yield greater opportunities for integration with European forces as well.

In South America and Africa we will shift, as the Defense Strategic Guidance directs, to “innovative, low-cost approaches,” including JHSV, AFSB, and LCS. In contrast to our approach today, which is to send the destroyers and amphibious ships we have when available, these new ships will be better suited to operations in these regions and will be available full-time thanks to their rotational crews.

The Asia-Pacific will become increasingly important to our national prosperity and security. It is home to the world's largest and most dynamic economies, growing reserves of natural resources, and emerging security concerns. Naval forces, with their mobility and relevance in peacetime and conflict, are uniquely poised to address these challenges and opportunities and sustain our leadership in the region. With our focus on partnerships and innovative approaches, including new ships, forward homeporting, and rotational crewing, the Navy can rebalance toward the Asia-Pacific while being judicious with the nation's resources. We will grow our fleet in the Asia-Pacific, rebalance our basing, improve our capabilities, and focus intellectually on the region. This will sustain our credibility to deter aggression, preserve freedom of maritime access, and protect the economic livelihood of America and our friends.¹⁷⁹

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¹⁷⁹ Jonathan Greenert, "Sea Change, The Navy Pivots to Asia," *Foreign Policy* (www.foreignpolicy.com), November 14, 2012.