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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 limited but growing capability for conducting operations beyond China's near-seas region. Observers of Chinese and U.S. military forces view China's improving naval capabilities as posing a potential challenge in the Western Pacific to the U.S. Navy's ability to achieve and maintain control of blue-water ocean areas in wartime—the first such challenge the U.S. Navy has faced since the end of the Cold War. More broadly, these observers view China's naval capabilities as a key element of an emerging broader Chinese military challenge to the long-standing status of the United States as the leading military power in the Western Pacific. 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.

China's naval modernization effort encompasses a broad array of platform and 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 improvements in maintenance and logistics, 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); defending China's commercial sea lines of communication (SLOCs); 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. Additional missions for China's navy include conducting maritime security (including anti-piracy) operations, evacuating Chinese nationals from 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 enough and capable enough to adequately counter improved Chinese maritime A2/AD forces while also adequately performing other missions around the world;
- whether the Navy's plans for developing and procuring long-range carrier-based aircraft and long-range ship- and aircraft-launched weapons are appropriate;
- whether the Navy can effectively 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

This report provides background information and issues for Congress on China's naval modernization effort and its implications for U.S. Navy capabilities. 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 and budgeting. Many U.S. military programs for countering improving Chinese military forces (particularly its naval forces) fall within the U.S. Navy's budget.

The issue for Congress is how the U.S. Navy should respond to China's military modernization effort, particularly its naval modernization effort. Decisions that Congress reaches on this issue could affect U.S. Navy capabilities and funding requirements and the U.S. defense industrial base.

Scope, Sources, and Terminology

This report focuses on China's naval modernization effort and its implications for U.S. Navy capabilities. For an overview of China's military as a whole, see CRS Report R44196, *The Chinese Military: Overview and Issues for Congress*, by (name redacted) and David Gitter

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 2015 and 2009 reports on China's navy from the Office of Naval Intelligence (ONI),² published reference sources such as *IHS Jane's Fighting Ships*, and press reports.

For convenience, this report uses the term China's naval modernization effort 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.

China's military is formally called the People's Liberation Army (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 PLA Rocket Force.

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*

¹ Department of Defense, *Annual Report to Congress [on] Military and Security Developments Involving the People's Republic of China 2015*. Washington, undated but released in May 2015, 89 pp. Hereinafter *2015 DOD CMSD*. The 2010-2014 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 PLA Navy, New Capabilities and Missions for the 21st Century*, undated but released in April 2015, 47 pp., and *The People's Liberation Army Navy, A Modern Navy with Chinese Characteristics*, August 2009. 46 pp. Hereinafter *2015 ONI Report* and *2009 ONI Report*, respectively.

island chain encloses both these waters and the Philippine Sea that is situated between the Philippines and Guam.³

Background

Strategic and Budgetary Context

This section presents some brief comments on elements of the strategic and budgetary context in which China's naval modernization effort and its implications for U.S. Navy capabilities may be considered. There is also a broader context of U.S.-China relations and U.S. foreign policy toward the Asia-Pacific that is covered in other CRS reports.⁴

Shift in International Security Environment

World events have led some observers, starting in late 2013, to conclude that the international security environment has undergone a shift from the familiar post-Cold War era of the last 20 to 25 years, also sometimes known as the unipolar moment (with the United States as the unipolar power), to a new and different situation that features, among other things, renewed great power competition with China and Russia and challenges by these two countries and others to elements of the U.S.-led international order that has operated since World War II.⁵ China's improving naval capabilities can be viewed as one reflection of that shift.

U.S. Grand Strategy

Discussion of the above-mentioned shift in the international security environment has led to a renewed emphasis in discussions of U.S. security and foreign policy on grand strategy and geopolitics. From a U.S. perspective, grand strategy can be understood as strategy considered at a global or interregional level, as opposed to strategies for specific countries, regions, or issues. Geopolitics refers to the influence on international relations and strategy of basic world geographic features such as the size and location of continents, oceans, and individual countries.

From a U.S. perspective on grand strategy and geopolitics, it can be noted that most of the world's people, resources, and economic activity are located not in the Western Hemisphere, but in the other hemisphere, particularly Eurasia. In response to this basic feature of world geography, U.S. policymakers for the past several decades have chosen to pursue, as a key element of U.S. national strategy, a goal of preventing the emergence of a regional hegemon in one part of Eurasia or another, on the grounds that such a hegemon could represent a concentration of power strong enough to threaten core U.S. interests by, for example, denying the United States access to some of the other hemisphere's resources and economic activity. Although U.S. policymakers have not often stated this key national strategic goal explicitly in public, U.S. military (and diplomatic) operations in recent decades—both wartime operations and day-to-day operations—can be viewed as having been carried out in no small part in support of this key goal. Some observers

³ For a map showing the first and second island chains, see *2015 DOD CMSD*, p. 87.

⁴ See, for example, CRS Report R41108, *U.S.-China Relations: An Overview of Policy Issues*, by (name redacted), and CRS Report R42448, *Pivot to the Pacific? The Obama Administration's "Rebalancing" Toward Asia*, coordinated by (name redacted).

⁵ For additional discussion, see CRS Report R43838, *A Shift in the International Security Environment: Potential Implications for Defense—Issues for Congress*, by (name redacted).

view China's military (including naval) modernization effort as part of broader Chinese effort to become a regional hegemon in its part of Eurasia.

U.S. Strategic Rebalancing to Asia-Pacific Region

A 2012 Department of Defense (DOD) strategic guidance document⁶ and DOD's report on the 2014 Quadrennial Defense Review (QDR)⁷ state that U.S. military strategy will place an increased emphasis on the Asia-Pacific region. Although Administration officials state that this U.S. strategic rebalancing toward the Asia-Pacific region, as it is called, is not directed at any single country, many observers believe it is in no small part intended as a response to China's military (including naval) modernization effort and its assertive behavior regarding its maritime territorial claims.

Declining U.S. Technological and Qualitative Edge

DOD officials have expressed concern that the technological and qualitative edge that U.S. military forces have had relative to the military forces of other countries is being narrowed by improving military capabilities in other countries. China's improving naval capabilities contribute to that concern.

Challenge to U.S. Sea Control and U.S. Position in Western Pacific

Observers of Chinese and U.S. military forces view China's improving naval capabilities as posing a potential challenge in the Western Pacific to the U.S. Navy's ability to achieve and maintain control of blue-water ocean areas in wartime—the first such challenge the U.S. Navy has faced since the end of the Cold War.⁸ More broadly, these observers view China's naval capabilities as a key element of an emerging broader Chinese military challenge to the long-standing status of the United States as the leading military power in the Western Pacific.

Implications of Military Balance in Absence of a Conflict

Some observers consider a U.S.-Chinese military conflict in the Pacific over Taiwan or some other issue to be very unlikely 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, the U.S.-Chinese military balance in the Pacific could nevertheless influence day-to-day choices made by other Pacific countries 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 and consequently the ability of the United States to pursue various policy goals.

⁶ Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, January 2012, 8 pp. For additional discussion, see CRS Report R42146, *Assessing the January 2012 Defense Strategic Guidance (DSG): In Brief*, by (name redacted) and (name redacted)

⁷ Department of Defense, *Quadrennial Defense Review 2014*, 64 pp. For additional discussion, see CRS Report R43403, *The 2014 Quadrennial Defense Review (QDR) and Defense Strategy: Issues for Congress*, by (name redacted)

⁸ The term "blue-water ocean areas" is used here to mean waters that are away from shore, as opposed to near-shore (i.e., littoral) waters. Iran is viewed as posing a challenge to the U.S. Navy's ability to quickly achieve and maintain sea control in littoral waters in and near the Strait of Hormuz. For additional discussion, see CRS Report R42335, *Iran's Threat to the Strait of Hormuz*, coordinated by (name redacted)

China's "Salami-Slicing" Tactics in East and South China Seas

China's actions for asserting and defending its maritime territorial and exclusive economic zone (EEZ)⁹ claims in the East China (ECS) and South China Sea (SCS), particularly since late 2013, have heightened concerns among observers that ongoing disputes over these waters and some of the islands within them could lead to a crisis or conflict between China and a neighboring country, and that the United States could be drawn into such a crisis or conflict as a result of obligations the United States has under bilateral security treaties with Japan and the Philippines. More broadly, China's actions for asserting and defending its maritime territorial and EEZ claims, including recent land reclamation and construction activities at several sites in the SCS, have led to increasing concerns among some observers that China is seeking to dominate or gain control of its near-seas region. Some observers characterize China's approach for asserting and defending its territorial claims in the ECS and SCS as a "salami-slicing" strategy that employs a series of incremental actions, none of which by itself is a *casus belli*, to gradually change the status quo in China's favor.¹⁰

Regional U.S. Allies and Partners

The United States has certain security-related policies pertaining to Taiwan under the Taiwan Relations Act (H.R. 2479/P.L. 96-8 of April 10, 1979). The United States has bilateral security treaties with Japan, South Korea, the Philippines, and an additional security treaty with Australia and New Zealand.¹¹ In addition to U.S. treaty allies, certain other countries in the Western Pacific can be viewed as current or emerging U.S. security partners.

Limits on Defense Spending in Budget Control Act of 2011 as Amended

Limits on the "base" portion of the U.S. defense budget established by Budget Control Act of 2011, or BCA (S. 365/P.L. 112-25 of August 2, 2011), as amended, combined with some of the considerations above, have led to discussions among observers about how to balance competing demands for finite U.S. defense funds, and about whether programs for responding to China's military modernization effort can be adequately funded while also adequately funding other defense-spending priorities, such as initiatives for responding to Russia's actions in Ukraine and elsewhere in Europe and U.S. operations for countering the Islamic State organization in the Middle East. U.S. Navy officials have stated that if defense spending remains constrained to levels set forth in the BCA as amended, the Navy in coming years will not be able to fully execute all the missions assigned to it under the 2012 DOD strategic guidance document.¹²

⁹ A country's EEZ includes waters extending up to 200 nautical miles from its land territory. Coastal states have the right under the United Nations Convention on the Law of the Sea (UNCLOS) to regulate foreign economic activities in their own EEZs. EEZs were established as a feature of international law by UNCLOS.

¹⁰ For further discussion, see CRS Report R42784, *Maritime Territorial and Exclusive Economic Zone (EEZ) Disputes Involving China: Issues for Congress*, by (name redacted), CRS Report R42930, *Maritime Territorial Disputes in East Asia: Issues for Congress*, by (name redacted), (name redacted), and (name redacted), and CRS Report R44072, *Chinese Land Reclamation in the South China Sea: Implications and Policy Options*, by (name redacted).

¹¹ For a summary, see "U.S. Collective Defense Arrangements," accessed July 24, 2015, at <http://www.state.gov/s/l/treaty/collectivedefense/>.

¹² See, for example, Statement of Admiral Jonathan Greenert, U.S. navy, Chief of Naval Operations, Before the Senate Armed Services Committee on the Impact of Sequestration on National Defense, January 28, 2015, particularly page 4 and Table 1, entitled "Mission Impacts to a Sequestered Navy."

Overview of China's Naval Modernization Effort¹³

Date of Inception

China's military (including naval) modernization effort has been underway for about 25 years. Observers date the beginning of the effort, to various points in the 1990s.¹⁴ Design work on the first of China's newer ship classes appears to have begun in the later 1980s.¹⁵ 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 1991,¹⁶ 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.¹⁷

A Broad-Based Modernization Effort

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, 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 C4ISR¹⁸ systems. Some of these acquisition programs are discussed in further detail below. China's naval modernization effort also includes improvements in maintenance and logistics, doctrine, personnel quality, education and training, and exercises.

Quality vs. Quantity

In general, China's naval modernization effort to date appears focused less on increasing total platform (i.e., ship and aircraft) numbers than on increasing the modernity and capability of Chinese platforms. Changes in platform capability and the percentage of the force accounted for by modern platforms have generally been more dramatic than changes in total platform numbers.

¹³ Unless otherwise indicated, shipbuilding program information in this section is taken from *IHS Jane's Fighting Ships 2015-2016*, 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.

¹⁴ 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.

¹⁵ 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.

¹⁶ See, for example, Robert Farley, "What Scares China's Military: The 1991 Gulf War," *The National Interest* (<http://nationalinterest.org>), November 24, 2014.

¹⁷ 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.)

¹⁸ C4ISR stands for command and control, communications, computers, intelligence, surveillance, and reconnaissance.

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 “China’s force modernization has concentrated on improving the quality of its force, rather than its size. Quantities of major combatants have stayed relatively constant, but their combat capability has greatly increased as older combatants are replaced by larger, multi-mission ships.”¹⁹

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 certain areas, including joint operations with other parts of China’s military,²⁰ antisubmarine warfare (ASW),²¹ a dependence on foreign suppliers for some ship components,²² and long-range targeting.²³ China is working to overcome such limitations and weaknesses.²⁴ ONI states that “Although the PLA(N) faces some capability gaps in key areas, it is emerging as a well equipped and competent force.”²⁵

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.

¹⁹ 2015 ONI Report, p. 5. See also p. 13.

²⁰ See, for example, 2015 ONI Report, p. 31. See also Minnie Chan, “PLA Navy in Future Will Have World-Class Ships, But Not The Expertise to Operate Them, Military Observers Say,” *South China Morning Post*, July 27, 2015.

²¹ DOD states that “China is making gradual progress in the undersea domain as well, but continues to lack either a robust coastal or deep water anti-submarine warfare capability.” (2015 DOD CMSD, p. 35.)

²² DOD states that “China continues to invest in foreign suppliers for some propulsion units, but is becoming increasingly self-reliant.” (2015 DOD CMSD, p. 51.) For a discussion of China’s weaknesses and limitations in general, see Andrew S. Erickson, “Clear Strengths, Fuzzy Weaknesses In CHina’s Massive Military Buildup,” *China Real Time (Wall Street Journal)*, May 9, 2015.

²³ DOD states that

It is also unclear whether China has the capability to collect accurate targeting information and pass it to launch platforms in time for successful strikes in sea areas beyond the first island chain.

(2015 DOD CMSD, p. 35.)

See also Dennis J. Blasko, “Ten Reasons Why China Will Have Trouble Fighting A Modern War,” *War on the Rocks*, February 18, 2015; Paul Dibb, “Why the PLA Is A Paper Tiger,” *Real Clear Defense*, October 15, 2015. (For a rebuttal to Dibb’s article, see Malcolm David, “The PLA is No Paper Tiger,” *Real Clear Defense*, October 19, 2015; and Malcolm Davis, “Why the PLA is No Paper Tiger (Part 2),” *Real Clear Defense*, October 22, 2015. See also Roger Cliff, “China’s Military: Mighty Dragon or Paper Tiger?” *National Interest*, September 22, 2015.) See also Richard A. Bitzinger, “China’s Not-So-Wonderful Weapons,” *Asia Times*, February 23, 2016.

²⁴ See, for example, Christopher P. Cavas, “China’s Navy Makes Strides, Work Remains To Be Done,” *Defense News*, May 24, 2015. Regarding China’s efforts to overcome its limitations in ASW in particular, see, for example, Greg Torode, “China’s Island Airstrips To Heighten South China Sea Underwater Rivalry,” *Reuters*, September 17, 2015; Lyle J. Goldstein, “A Frightening Thought: China Erodes America’s Submarine Advantage,” *The National Interest*, August 17, 2015; “China: Closing the Gap in Anti-Submarine Warfare,” *Stratfor*, July 20, 2015; Ankit Panda, “China’s Navy Just Got Better at Detecting and Taking out Submarines,” *The Diplomat*, July 9, 2015; Franz-Stefan Gady, “Meet China’s New Submarine Hunter Plane,” *The Diplomat*, June 30, 2015; Gareth Jennings, “China Fields New Maritime Patrol and Anti-Submarine Y-8/Y-9 Variant [Aircraft],” *IHS Jane’s 360*, June 28, 2015.

²⁵ 2015 ONI Report, p. 13.

Roles and Missions for China's Navy

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), and more generally, achieving a greater degree of control or domination over the SCS;²⁶
- 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);²⁷
- defending China's commercial sea lines of communication (SLOCs), such as those linking China to the Persian Gulf;
- displacing U.S. influence in the Western Pacific; and
- asserting China's status as a leading regional power and major world power.²⁸

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 arrival or reduce the effectiveness of intervening U.S. forces.²⁹ (A2/AD is a term used by U.S. and other Western writers. During the Cold War, U.S. writers used the term sea-denial force to refer to a maritime A2/AD force.) ASBMs, ASCMs, attack submarines, and supporting C4ISR systems are viewed as key elements of China's emerging maritime A2/AD force, though other force elements are also of significance in that regard.

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 with the aim of denying U.S. use of the sea and countering U.S. naval forces participating in a NATO-Warsaw Pact conflict. One 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.

Additional missions for China's navy include conducting maritime security (including anti-piracy) operations, evacuating Chinese nationals in foreign countries when necessary, and conducting humanitarian assistance/disaster response (HA/DR) operations.

DOD states that

Preparing for potential conflict in the Taiwan Strait remains the focus and primary driver of China's military investment; however, the PRC is increasing its emphasis on preparations for contingencies other than Taiwan, such as contingencies in the East China Sea and South China Sea. Additionally, as China's global footprint and international

²⁶ 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 (name redacted), and CRS Report R42930, *Maritime Territorial Disputes in East Asia: Issues for Congress*, by (name redacted), (name redacted), and (name redacted). See also CRS Report R44072, *Chinese Land Reclamation in the South China Sea: Implications and Policy Options*, by (name redacted) et al.

²⁷ 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 (name redacted).

²⁸ For a discussion of roles and missions of China's navy, see *2015 ONI Report*, pp. 8-11.

²⁹ See, for example, *2015 DOD CMSD*, pp. 33-37.

interests grow, its military modernization program has become progressively more focused on investments for a range of missions beyond China's periphery, including power projection, sea lane security, counter-piracy, peacekeeping, and humanitarian assistance/disaster relief (HA/DR)....

Whereas "near seas" defense remains the PLA Navy's primary focus, China's gradual shift to the "far seas" has necessitated that its Navy support operational tasks outside the first island chain with multi-mission, long-range, sustainable naval platforms with robust self-defense capabilities.³⁰

China's 2015 Military Strategy, released in May 2015, is viewed as placing an increased emphasis on maritime operations, among other things.³¹ The document states that

With the growth of China's national interests, its national security is more vulnerable to international and regional turmoil, terrorism, piracy, serious natural disasters and epidemics, and the security of overseas interests concerning energy and resources, strategic sea lines of communication (SLOCs), as well as institutions, personnel and assets abroad, has become an imminent issue....

To implement the military strategic guideline of active defense in the new situation, China's armed forces will adjust the basic point for PMS [preparation for military struggle]. In line with the evolving form of war and national security situation, the basic point for PMS will be placed on winning informationized local wars, highlighting maritime military struggle and maritime PMS....

In line with the strategic requirement of offshore waters defense and open seas protection, the PLA Navy (PLAN) will gradually shift its focus from "offshore waters defense" to the combination of "offshore waters defense" with "open seas protection," and build a combined, multi-functional and efficient marine combat force structure. The PLAN will enhance its capabilities for strategic deterrence and counterattack, maritime maneuvers, joint operations at sea, comprehensive defense and comprehensive support....

The seas and oceans bear on the enduring peace, lasting stability and sustainable development of China. The traditional mentality that land outweighs sea must be abandoned, and great importance has to be attached to managing the seas and oceans and protecting maritime rights and interests. It is necessary for China to develop a modern maritime military force structure commensurate with its national security and development interests, safeguard its national sovereignty and maritime rights and interests, protect the security of strategic SLOCs and overseas interests, and participate in international maritime cooperation, so as to provide strategic support for building itself into a maritime power.³²

³⁰ 2015 DOD CMSD, p. i, 8. See also page 43, and 2015 ONI Report, pp. 8-11.

³¹ See, for example, Andrew Jacobs, "China, Updating Military Strategy, Puts Focus on Projecting Naval Power," *New York Times*, May 26, 2015; "Kaiser Xi's Navy," *Wall Street Journal*, May 29, 2015; Greg Austin, "China's Military Dream," *The Diplomat*, June 2, 2015. For a somewhat contrary perspective, see Gordon Lubold, "U.S., Experts See No Major Change in China Defense Strategy; Beijing's Shift in Military Focus to Maritime Warfare Is No Surprise, According to Senior U.S. Defense Official," *Wall Street Journal*, May 27, 2015; 2015 Report to Congress of the U.S. China Economic and Security Review Commission, November 2015, pp. 231-232.

³² China's Military Strategy, The State Council Information Office of the People's Republic of China, May 2015, Beijing, released May 26, 2015, accessed July 27, 2015, at http://eng.mod.gov.cn/DefenseNews/2015-05/26/content_4586748.htm. "Informationized" is the English translation of a Chinese term that refers to modern warfare with precision-guided weapons and networks of platforms (i.e., ships, aircraft, etc.) that share targeting and other information.

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) and Anti-Ship Cruise Missiles (ASCMs)

Anti-Ship Ballistic Missiles (ASBMs)

China is fielding 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 aircraft carriers in the western Pacific. The CSS-5 Mod 5 has a range exceeding 1,500 km [about 810 nm] and is armed with a maneuverable warhead.³³

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].”³⁴

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.³⁵

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

³³ 2015 DOD CMSD, p. 39. A similar statement appears on page 8. On page 35, the report states that DF-21D missiles are “specifically designed to hold adversary aircraft carriers at risk once they approach within 900 nm [1,667 km] of the Chinese coastline.” See also 2009 ONI Report, pp. 26-27.

³⁴ 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.

³⁵ For further discussion of China's ASBM and its potential implications for U.S. naval forces, see Andrew S. Erickson, “Raining Down: Assessing the Emergent ASBM Threat,” *Jane's Navy International*, March 16, 2016.

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.³⁶

DOD has been reporting on the DF-21D in its annual reports to Congress since 2008.³⁷ On September 3, 2015, at a Chinese military parade in Beijing that displayed numerous types of Chinese weapons, an announcer stated that a second type of Chinese ballistic missile, the DF-26, may have an anti-ship capability.³⁸ The DF-26 has a reported range of 1,800 miles to 2,500 miles, or more than twice the reported range of the DF-21D.³⁹

China reportedly is developing a hypersonic glide vehicle that, if incorporated into Chinese ASBMs, could make Chinese ASBMs more difficult to intercept.⁴⁰

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, including some highly capable models. DOD states that

The PLA Navy is deploying a wide range of advanced ASCMs. The most capable include the domestically produced ship-launched YJ-62 ASCM and the Russian SS-N-22/SUNBURN supersonic ASCM, which is fitted on China’s SOVREMENNY-class DDGs acquired from Russia. China’s submarine force is also increasing its ASCM capability, with the long-range YJ-18 ASCM replacing the older YJ-82 on the SONG, YUAN, and SHANG classes. The YJ-18 is similar to the Russian SS-N-27B/SIZZLER ASCM, which is capable of supersonic terminal sprint and is fielded on eight of China’s twelve Russian-built KILO SS. In addition, PLA Navy Aviation employs the 200 km range 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

³⁶ “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>.

³⁷ 2008 DOD CMP, pp. 2 and 23.

³⁸ See, for example, Richard D Fisher Jr., “DF-26 IRBM May Have ASM Variant, China Reveals at 3 September Parade,” *IHS Jane’s 360*, September 2, 2015; Wendell Minnick, “China’s Parade Puts US Navy on Notice,” *Defense News*, September 3, 2015; Andrew S. Erickson, “Showtime: China Reveals Two ‘Carrier-Killer’ Missiles,” *The National Interest*, September 3, 2015.

³⁹ Thomas Gibbons-Neff, “China Showcases Advanced Ballistic Missiles at Military Parade,” *Washington Post*, September 3, 2015. Another press report states that the missile’s range is 3,000 km to 4,000 km, which equates to about 1,860 miles to about 2,480 miles, or to about 1,620 nautical miles to 2,160 nautical miles. (Richard D Fisher Jr., “DF-26 IRBM May Have ASM Variant, China Reveals at 3 September Parade,” *IHS Jane’s 360*, September 2, 2015.) See also Bill Gertz, “Access vs. Anti-Access: China, US Posture in Anti-Ship Missile Face Off,” *Asia Times*, December 14, 2015.

⁴⁰ See, for example, Bill Gertz, “China Conducts Fifth Test of Hypersonic Glide Vehicle,” *Washington Free Beacon*, August 21, 2015; Philip Ewing, “Arms Race Goes Hypersonic,” *Politico*, August 11, 2015; Li Bao and Christopher Jones-Cruise, “China Testing ‘Hypersonic’ Weapons,” *VOA News*, August 3, 2015; Bill Gertz, “China Again Tests Nuclear Hypersonic Missile,” *Washington Free Beacon*, November 25, 2015; Yousaf Butt, “The Hypersonic Arms Race Is Going Nuclear—Take Note,” *Huffington Post*, December 3, 2015; Richard D. Fisher Jr., “US Confirms Sixth Chinese Hypersonic Manoeuvring Strike Vehicle Test,” *IHS Jane’s Defence Weekly*, December 2, 2016: 14; Bill Gertz, “Stratcom: China Moving Rapidly to Deploy New Hypersonic Glider,” *Washington Free Beacon*, January 22, 2016; Bill Gertz, “Hypersonic Arms Race Heats Up as U.S. Builds High-Speed Missiles,” *Washington Free Beacon*, March 8, 2016.

its long-range and supersonic speeds. It is capable of being launched from H-6 bombers.⁴¹

Submarines and Mines

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...."⁴² 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.⁴³

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**);

⁴¹ 2015 DOD CMSD, p. 46. On page 10, the report states:

The PLA Navy continues to emphasize anti-surface warfare (ASUW) as its primary focus, including modernizing its advanced ASCMs and associated over-the-horizon targeting (OTH-T) systems. Older Chinese surface combatants carry variants of the YJ-8A ASCM (65nm), while newer surface combatants such as the LUYANG II DDG [destroyer] are fitted with the YJ-62 (120nm). The LUYANG III DDG and Type 055 CG [cruiser] will be fitted with a variant of China's newest ASCM, the YJ-18 (290nm), which is a significant step forward in China's surface ASUW capability. Eight of China's twelve KILO SS [attack submarines] are equipped with the SS-N-27 ASCM (120nm), a system China acquired from Russia. China's newest indigenous submarine-launched ASCM, the YJ-18 and its variants, represents a dramatic improvement over the SS-N-27, and will be fielded on SONG, YUAN, and SHANG [class] submarines. China's previously produced sub-launched ASCM, the YJ-82, is a version of the C-801, which has a much shorter range.

See also Michael Pilger, "China's New YJ-18 Antiship Cruise Missile: Capabilities and Implications for U.S. Forces in the Western Pacific," U.S. China Economic and Security Review Commission Staff Research Report, October 28, 2015, 7 pp.; Lyle J. Goldstein, "YJ-18 Supersonic Anti-Ship Cruise Missile: America's Nightmare," *National Interest*, June 1, 2015; "CCTV Military Commentator Responds to US Report on YJ-18," *Want China Times*, April 18, 2015; 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*, 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.

⁴² 2015 DOD CMSD, p. 8.

⁴³ [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. See also Lyle J. Goldstein, "Old-School Killers: Fear China's Sea Mines," *National Interest*, October 14, 2015.

- a new nuclear-powered attack submarine (SSN) design called the Shang class or Type 093;
- a new SS design called the Yuan class or Type 039A (**Figure 2**);⁴⁴ 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.

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.⁴⁵

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, "Over the next decade, China may construct a new Type 095 nuclear powered, guided-missile attack submarine (SSBN), which not only would improve the PLA Navy's anti-surface warfare capability, but might also provide it with a more clandestine, land-attack option."⁴⁶ ONI states that

The SHANG-class SSN's initial production run stopped after only two hulls that were launched in 2002 and 2003. After nearly 10 years, China is continuing production with four additional hulls of an improved variant, the first of which was launched in 2012.⁴⁷ These six total submarines will replace the aging HAN class SSN on nearly a one-for-one basis in the next several years. Following the completion of the improved SHANG SSN, the PLA(N) will progress to the Type 095 SSN, which may provide a generational improvement in many areas such as quieting and weapon capacity.⁴⁸

⁴⁴ Some sources refer to the Yuan class as the Type 041.

⁴⁵ The August 2009 ONI report, for example, states that the Yuan class may incorporate quieting technology from the Kilo class. (2009 ONI Report, p. 23.)

⁴⁶ 2015 DOD CMSD, p. 9.

⁴⁷ For additional discussion of these improved Type 093boats, see Franz-Stefan Gady, "China's 'New' Carrier Killer Subs," *The Diplomat*, April 6, 2015; Kris Osborn, "China Unveils Three New Nuclear-Powered Attack Submarines," *DefenseTech*, April 3, 2015; Zhao Lei, "Navy To Get 3 New Nuclear Subs," *China Daily*, April 3, 2015.

⁴⁸ 2015 ONI Report, p. 19. See also Lyle Goldstein, "Emerging From The Shadows," *U.S. Naval Institute Proceedings*, April 2015: 30-34.

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



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

A November 2015 report, based on information from Chinese media reports, states that China launched three new Type 093-class submarines in May 2015.⁴⁹ (Launched generally means that construction of the ships has progressed to the point where the ships could be put into the water for the final phase of their construction.)

China in 2012 commissioned into a service a new type of non-nuclear-powered submarine, called the Type 032 or Qing class according to *IHS Jane's Fighting Ships 2015-2016*, that is about one-third larger than the Yuan-class design. Observers believe the boat may be a one-of-kind test platform; *IHS Jane's Fighting Ships 2015-2016* refers to it as an auxiliary submarine (SSA).⁵⁰ DOD states that China is pursuing “a new joint-design and production program [with Russia] for diesel-electric submarines based on the Russian PETERSBURG/LADA-class.”⁵¹ A June 29, 2015, press report showed a 2014 satellite photograph of an apparent Chinese mini- or midget-submarine submarine that “has not been seen nor heard of since.”⁵²

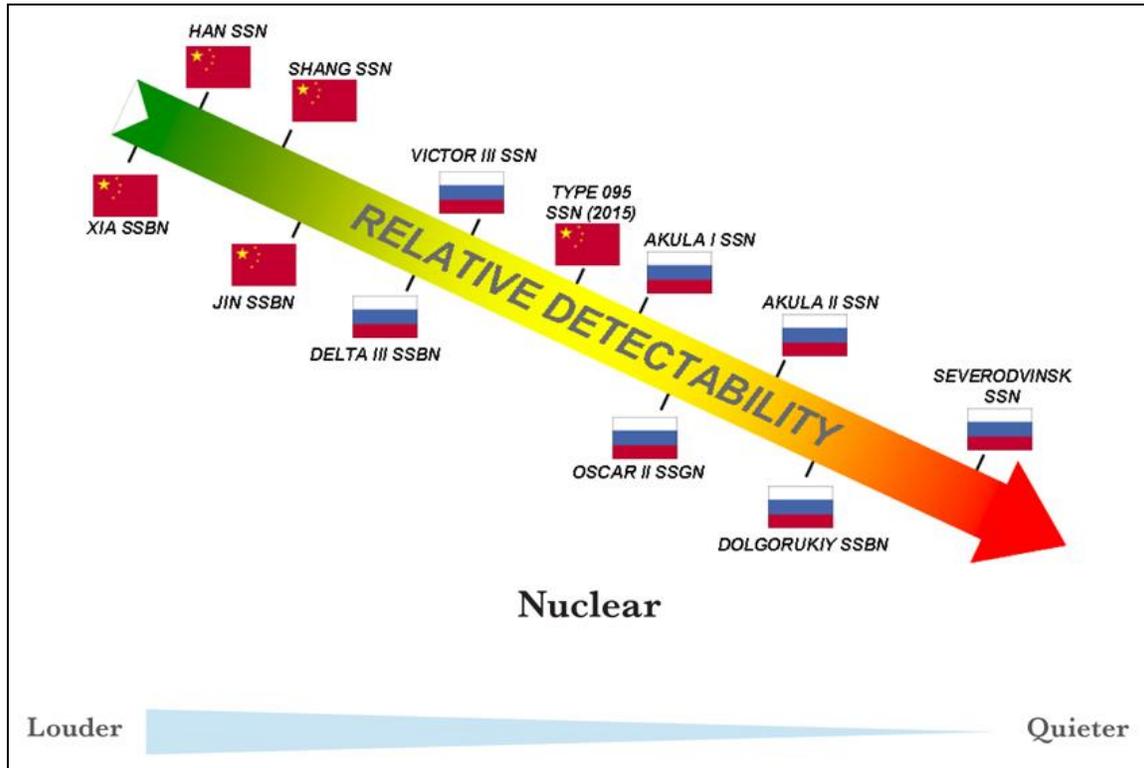
Figure 3 and **Figure 4**, which are taken from the August 2009 ONI report, show the acoustic quietness of Chinese nuclear- and non-nuclear-powered submarines, respectively, relative to that of Russian nuclear- and non-nuclear-powered submarines.

⁴⁹ 2015 Report to Congress of the U.S. China Economic and Security Review Commission, November 2015, p. 242.

⁵⁰ *IHS Jane's Fighting Ships 2015-2016*, p. 134.

⁵¹ 2015 DOD CMSD, p. 52.

⁵² Jamie Seidel, “Mini Submarine Captured on Satellite Photo of Chinese Dockyard,” *News.com.au*, June 29, 2015.

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

Source: 2009 ONI Report, p. 22.

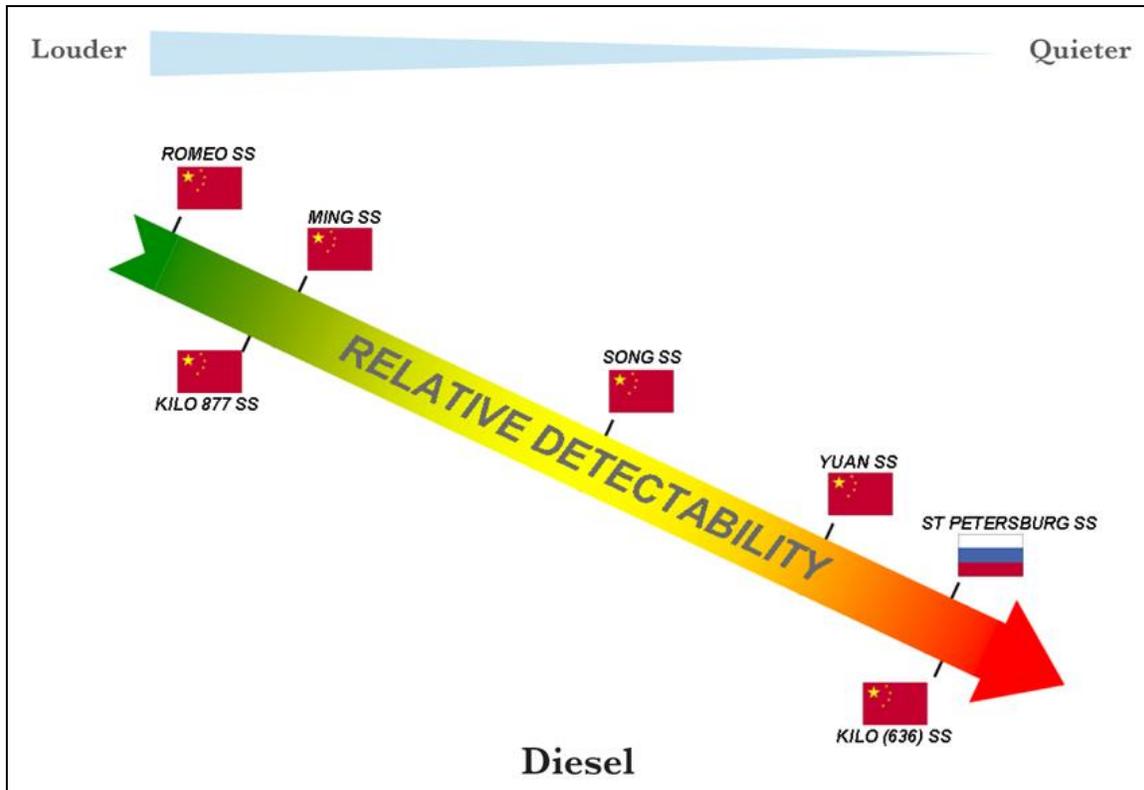
In **Figure 3** and **Figure 4**, the downward slope of the arrow indicates the increasingly lower noise levels (i.e., increasing acoustic quietness) of the submarine designs shown. In general, quieter submarines are more difficult for opposing forces to detect and counter. The green-yellow-red color 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.

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.

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.

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 2015 is expected to have a total of 41 relatively modern attack submarines—meaning Shang-, Kilo-, Yuan-, and Song-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 and 8 Song-class boats) were added, and in 2011-2012, when 8 Yuan-class attack submarines were added.

The figures in **Table 1** show that between 1995 and 2015, China placed or was expected to place into service a total of 56 submarines of all kinds, or an average of about 2.7 submarines per year. This average commissioning rate, if sustained indefinitely, would eventually result in a steady-state submarine force of about 54 to 81 boats of all kinds, assuming an average submarine life of 20 to 30 years.

Table I. PLA Navy Submarine Commissionings

Actual (1995-2014) and Projected (2015-2017)

	Jin (Type 094) SSBN	Shang (Type 093/ 093A) 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			1	2				3	7	3
1998			1	2				3	10	4
1999					1			1	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			6		3			9	31	22
2006		1	1		2	1		5	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		3	45	34
2012	1					5	1 ^e	7	52	39
2013								0	52	39
2014								0	52	39
2015	1	1				2 ^f		4	56	41
2016		1 ^h				n/a		n/a	n/a	n/a
2017	1 ^g	n/a				n/a		n/a	n/a	n/a

Source: *IHS Jane's Fighting Ships 2015-2016*, and (for Ming class) 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 sources refer to the Yuan class as the Type 041.
- This total excludes the Jin-class SSBNs (because they are not attack boats), the Ming-class SSs (because they are generally considered to not be of a modern design), and the Qing-class boat (because IHS Jane's considers it to be an auxiliary submarine).
- IHS Jane's Fighting Ships 2015-2016* lists the commissioning date of one of the two Kilos as November 15, 1994.
- Observers believe this boat may be a one-of-kind test platform; *IHS Jane's Fighting Ships 2015-2016* refers to it as an auxiliary submarine (SSA).
- IHS Jane's Fighting Ships 2015-2016* states that a class of up to 20 boats is expected. DOD states that a total of 20 are planned for production. (2015 DOD CMSD, p. 9) ONI states that as many as 20 may be produced. (2015 ONI Report, p. 19)
- IHS Jane's Fighting Ships 2015-2016* states that a total of five boats is expected.
- IHS Jane's Fighting Ships 2015-2016* states that a total of six boats are expected, with the final four boats built to a modified (Type 093A) design.

Excluding the 12 Kilos purchased from Russia, the total number of domestically produced submarines placed into service between 1995 and 2015 is 44, or an average of about 2.1 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 42 to 63 boats of all kinds, again assuming an average submarine life of 20 to 30 years.

DOD states that “by 2020, [China’s submarine] force will likely grow to between 69 and 78 submarines.”⁵³ ONI states that “by 2020, the [PLA(N)] submarine force will likely grow to more than 70 submarines.”⁵⁴ In an accompanying table, ONI provides a more precise projection of 74 submarines in 2020, including 11 nuclear-powered boats and 63 non-nuclear-powered boats.⁵⁵ A May 16, 2013, press report quotes Admiral Samuel Locklear, then-Commander of U.S. Pacific Command, as stating that China plans to acquire a total of 80 submarines.⁵⁶

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

China continues to produce the JIN SSBN (Type 094) with associated CSS-NX-14 (JL-2) submarine-launched ballistic missile (SLBM) that has an estimated range of 7,400 km [3,996 nautical miles]. This capability represents China’s first credible, sea-based nuclear deterrent. China will likely conduct its first SSBN nuclear deterrence patrol sometime in 2015. Four JIN-class SSBNs are currently operational, and up to five may enter service before China begins developing and fielding its next-generation SSBN, the Type 096, over the coming decade.⁵⁷

A December 9, 2015, press report stated that China had sent a Jin-class SSBN out on its first deterrent patrol.⁵⁸

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.

Mines

China has modernized its substantial inventory of naval mines.⁵⁹ ONI states that

⁵³ 2015 DOD CMSD, p. 9.

⁵⁴ 2015 ONI Report, p. 19.

⁵⁵ 2015 ONI Report, p. 18.

⁵⁶ 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>.

⁵⁷ 2015 DOD CMSD, p. 9. See also p. 32, and 2015 ONI Report, pp. 19-20.

⁵⁸ Bill Gertz, “Pentagon Confirms Patrols of Chinese Nuclear Missile Submarines,” *Washington Times*, December 9, 2015. See also Richard D Fisher Jr., “China Advances Sea- and Land-Based Nuclear Deterrent Capabilities,” *IHS Jane’s Defence Weekly*, December 15, 2015.

⁵⁹ See, for example, Scott C. Truver, “Taking Mines Seriously, Mine Warfare in China’s Near Seas,” *Naval War College Review*, Spring 2012: 30-66.

China has a robust mining capability and currently maintains a varied inventory estimated at more than 50,000 [naval] mines. China 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 vast mine inventory consisting of a large variety of mine types such as moored, bottom, drifting, rocket-propelled, and intelligent mines. The mines can be laid by submarines (primarily for covert mining of enemy ports), surface ships, aircraft, and by fishing and merchant vessels. China will continue to develop more advanced mines in the future such as extended-range propelled-warhead mines, antihelicopter mines, and bottom influence mines more able to counter minesweeping efforts.⁶⁰

Aircraft Carriers and Carrier-Based Aircraft⁶¹

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.

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 1998.⁶²

The *Liaoning* is conventionally powered, has an estimated full load displacement of almost 60,000 tons,⁶³ 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.⁶⁴ The *Liaoning* lacks aircraft catapults and instead launches fixed-wing airplanes off the ship's bow using an inclined "ski ramp."

⁶⁰ 2015 ONI Report, pp. 23-24.

⁶¹ 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.) See also Andrew Scobell, Michael McMahon, and Cortez A. Cooper III, "China's Aircraft Carrier Program," *Naval War College Review*, Autumn 2015, pp. 65-79.

⁶² 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," *Wanted China Times*, January 22, 2015.

⁶³ *IHS Jane's Fighting Ships 2015-2016* lists a full load displacement of 59,439 tons for the ship.

⁶⁴ Wendell Minnick, "Chinese Carrier's Purported Air Wing Deemed Plausible But Limited," *Defense News* (www.defensenews.com), September 7, 2014.

Figure 5. Aircraft Carrier Liaoning



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.

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 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.⁶⁵ DOD states that

Even when fully operational, the Liaoning will not enable long-range power projection similar to U.S. NIMITZ-class carriers. The LIAONING’s smaller size limits the number of aircraft it can embark, while the ski-jump configuration limits restricts fuel and ordnance load. The LIAONING is therefore best suited to fleet air defense missions, extending air cover over a fleet operating far from land-based coverage.⁶⁶

ONI states that

LIAONING is quite different from the U.S. Navy’s NIMITZ-class carriers. First, since LIAONING is smaller, it will carry far fewer aircraft in comparison to a U.S.-style carrier air wing. Additionally, the LIAONING’s ski-jump configuration significantly restricts aircraft fuel and ordnance loads. Consequently, the aircraft it launches have more a

⁶⁵ See, for example, *2015 ONI Report*, p. 23, and “China Plans New Generation of Carriers as Sea Disputes Grow,” *Bloomberg News*, April 24, 2013.

⁶⁶ *2015 DOD CMSD*, p. 11.

limited flight radius and combat power. Finally, China does not yet possess specialized supporting aircraft such as the E-2C Hawkeye.

Unlike a U.S. carrier, LIAONING is not well equipped to conduct long-range power projection. It is better suited to fleet air defense missions, where it could extend a protective envelope over a fleet operating in blue water. Although it possesses a full suite of weapons and combat systems, LIAONING will likely offer its greatest value as a long-term training investment.⁶⁷

A July 8, 2015, press report states:

China's first aircraft carrier battle group is expected to be formed next year to make up for the shortcoming of the limited combat radius of the country's existing fleets, according to China's official news agency Xinhua....

Beijing is considering different approaches for forming its aircraft carrier battle groups, including the one used by the United States Navy, the report said.⁶⁸

The PLA Navy is currently learning to operate aircraft from the ship. DOD states, "The [ship's] air wing is not expected to embark the carrier until 2015 or later."⁶⁹ ONI states that "full integration of a carrier air regiment remains several years in the future, but remarkable progress has been made already,"⁷⁰ and that "it will take several years before Chinese carrier-based air regiments are operational."⁷¹ A September 2, 2015, press report states that "China's aircraft carrier *Liaoning* can carry at least 20 fixed-wing carrier-based J-15 fighter jets and the ratio between the pilots and planes is about 1.5:1. So China needs to train more pilots for the future aircraft carrier, said a military expert recently."⁷²

Indigenous Aircraft Carriers

DOD states that "China also continues to pursue an indigenous aircraft carrier program and could build multiple aircraft carriers over the next 15 years."⁷³ ONI states that "Chinese officials acknowledge plans to build additional carriers but they have not publicly indicated whether the next carrier will incorporate catapults or which aircraft they plan to embark."⁷⁴ On July 25, 2014, Admiral Jonathan Greenert, then 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."⁷⁵ In December 2015, China officially confirmed the

⁶⁷ 2015 ONI Report, p. 23.

⁶⁸ "Liaoning Carrier's First Battle Group To Be Formed Next Year," *Want China Times*, July 8, 2015.

⁶⁹ 2015 DOD CMSD, p. 11.

⁷⁰ 2015 ONI Report, p. 13.

⁷¹ 2015 ONI Report, p. 23.

⁷² "Over 20 J-15 Fighters Can Land on the Liaoning Aircraft Carrier," *People's Daily Online*, September 7, 2015.

⁷³ 2015 DOD CMSD, p. 11.

⁷⁴ 2015 ONI Report, p. 13.

⁷⁵ 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.

construction of its first indigenous aircraft carrier.⁷⁶ **Figure 6** shows the construction of a ship that some observers believe to be China's first indigenously built carrier.

Figure 6. Potential Indigenous Aircraft Carrier Under Construction



Source: Jeffrey Lin and P.W. Singer, "China's First Homemade Carrier Moves Forward," *Popular Science*, October 27, 2015. The caption to the photo from the press report states: "By late October 2015, with the installation of the 7.5 meter tall hangar below the soon to be flight deck, it's pretty certain that this hull is going to be China's first domestically built aircraft carrier."

A March 7, 2016, press report states:

China's second aircraft carrier will be larger and will be equipped with J-15 fighter jets, a rear admiral and a member of the National Committee of the Chinese People's Political Consultative Conference said.

The new aircraft carrier will be larger than aircraft carrier Liaoning, though it will still carry the J-15, China's first-generation multipurpose carrier-borne fighter jet, Yin Zhuo - also a senior researcher with the People's Liberation Army Navy Equipment Research Center - was quoted by news site cnr.cn as saying Sunday.

⁷⁶ Sam LaGrone, "Officials Confirm Construction of First Domestic Chinese Aircraft Carrier," *USNI News*, January 4, 2016; Zhang Tao, "2nd Aircraft Carrier To Have Military Focus," *China Daily*, January 4, 2016; Chris Buckley, "China Says It is Building Its Second Aircraft Carrier," *New York Times*, December 31, 2015. See also Sean O'Connor and James Hardy, "Latest Imagery Suggests Chinese Aircraft Carrier Is Under Construction," *IHS Jane's Defence Weekly*, November 18, 2015: 8; Jeffrey Lin and P.W. Singer, "China's First Homemade Carrier Moves Forward," *Popular Science*, October 27, 2015; Nanae Kurashige, "China Building First of Two Domestic Aircraft Carriers," *Asahi Shimbun*, October 21, 2015; Brendan McGarry, "Satellite Images May Show China's First Domestic Aircraft Carrier," *Defense Tech*, October 1, 2015; Ankit Panda, "Is This China's First Homemade Aircraft Carrier?" *The Diplomat*, October 2, 2015; Sam LaGrone, "China's Domestic Aircraft Carrier Almost Certainly Under Construction," *USNI News*, September 30, 2015; J.R. Wu, "China Building Two Aircraft Carriers: Taiwan Defense Ministry Report," *Reuters*, September 3, 2015; Bradley Perrett, "China Building Third Carrier, Taiwanese Report Says," *Aerospace Daily & Defense Report*, September 16, 2015: 4.

The Liaoning has a full displacement of more than 50,000 tons, the Xinhua News Agency reported.

Yin said the new aircraft carrier will also feature a new design that will allow the vessel to carry more ammunition, aircraft and fuel, greatly improving its self-sufficiency and combat effectiveness at sea.

Yin also revealed that the aircraft on the new carrier will be similar to the Liaoning and will include early warning aircraft, anti-submarine aircraft and health evacuation helicopters, in addition to the J-15 fighters.⁷⁷

Carrier-Based Aircraft

China has developed a carrier-capable fighter, called the J-15 or Flying Shark, that can operate from the *Liaoning* (**Figure 7**). DOD states that the J-15 is “modeled after the Russian Su-33 [Flanker],” and that “although the J-15 has a land-based combat radius of 1,200 km, 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.”⁷⁸

Figure 7. 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.

⁷⁷ Zhang Tao, “China’s Second Aircraft Carrier To Get J-15 Jets,” *Global Times*, March 7, 2016. See also Yuan Can, “China’s First Homegrown Aircraft Carrier To Be Superior Than [sic] Liaoning, Military Experts Say,” *People’s Daily Online*, March 23, 2016.

⁷⁸ 2014 DOD CMSD, p. 68. See also 2015 ONI Report, p. 23.

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*.”⁷⁹

A May 13, 2015, press report states that China has begun development of a short takeoff, vertical landing (STOVL) aircraft that could operate from a ship.⁸⁰

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 for power-projection operations, particularly in scenarios that do not involve opposing U.S. forces, and to impress or intimidate foreign observers.⁸¹ 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.⁸²

DOD states that “although it possesses a full suite of weapons and combat systems, LIAONING will likely continue to play a significant role in training China’s carrier pilots, deck crews, and developing tactics that will be used with later, more capable carriers.”⁸³ DOD also states that

Although 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 carriers would be capable of improved endurance and of carrying and launching more varied types of aircraft, including electronic warfare, early warning, and anti-submarine, thus increasing the potential striking power of a PLA Navy “carrier battle group” in safeguarding China’s interests in

⁷⁹ 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 Mock-Up Appears on Carrier Deck,” *Real Clear Defense* (www.realcleardefense.com), October 1, 2014.

⁸⁰ “Nation Starts Research on Naval Jet,” *Chinamil.com*, May 13, 2015.

⁸¹ 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.

⁸² 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.

⁸³ 2015 DOD CMSD, p. 11. See also 2015 ONI Report, p. 23.

areas outside its immediate periphery. The carriers would most likely perform such missions as patrolling economically important sea lanes, and conducting naval diplomacy, regional deterrence, and HA/DR.⁸⁴

A March 3, 2016, press report states:

China is building aircraft carrier battlegroups and plans to deploy them not only in the disputed East and South China seas, but also to protect the country's overseas -interests.

Rear Admiral Yin Zhuo, who served as a national political adviser and sits on the navy's advisory board on cybersecurity, told the state-run Xinhua News Agency that building aircraft carriers served to "defend China's sovereignty of the islands and reefs, maritime rights and overseas -interests".

The defence ministry confirmed this year that China was building its second aircraft carrier, its first wholly home-made one.

Xinhua mentioned China's growing interests overseas, including the increasing numbers of nationals travelling abroad and its direct investments. It also noted a need to protect overseas ethnic Chinese.

"Protecting the economic, political status and occupational safety of overseas Chinese is paramount to safeguarding China's domestic economic development and its reform and opening-up," Yin said, adding that such protection required strong naval power like aircraft carrier battlegroups.⁸⁵

A January 4, 2016, press report states:

China's second aircraft carrier, which is now under construction, will focus on military operations rather than training and technological experiments, according to a senior military researcher.

"This carrier will have different missions than those for the Liaoning (the country's first aircraft carrier)," Senior Captain Zhang Junshe with the People's Liberation Army Naval Military Studies Research Institute told the official PLA Daily on Friday.

"We use the Liaoning to test the reliability and compatibility of systems on carriers, and to train personnel. The second carrier will mainly do what a genuine aircraft carrier is supposed to do: running combat patrols and delivering humanitarian aid."

Zhang said China urgently needs a second carrier, as the country is seeking to improve its defense systems and better safeguard national interests.

"The PLA needs at least three aircraft carriers. When it does, one can be on duty, one can train personnel, and the third can receive maintenance," he said.⁸⁶

⁸⁴ 2015 DOD CMSD, p. 40. See also Bryan McGrath, "Why China Wants Aircraft Carriers," *National Interest*, June 9, 2015. 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.

⁸⁵ Zhen Liu, "China Plans Aircraft Carrier Battlegroups To Protect Offshore Interests," *South China Morning Post*, March 3, 2016.

⁸⁶ Zhang Tao, "2nd Aircraft Carrier To Have Military Focus," *China Daily*, January 4, 2016.

Navy Surface Combatants and Coast Guard Cutters

Overview

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."⁸⁷ ONI states that

In recent years, shipboard air defense is arguably the most notable area of improvement on PLA(N) surface ships. China has retired several legacy destroyers and frigates that had at most a point air defense capability, with a range of just several miles. Newer ships entering the force are equipped with medium-to-long range area air defense missiles.⁸⁸

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 also appears to be planning to build a new cruiser. ONI states, "The JIANGKAI-class (Type 054A) frigate series, LUYANG-class (Type 052B/C/D) destroyer series, and the upcoming new cruiser (Type 055) class are considered to be modern and capable designs that are comparable in many respects to the most modern Western warships."⁸⁹

China is also building substantial numbers of new cutters for the China Coast Guard (CCG), a paramilitary service that China often uses for asserting and defending its maritime territorial claims in the East and South China Seas. In terms of numbers of ships being built and put into service, production of corvettes for China's navy and cutters for the CCG are currently two of China's most active areas of non-commercial shipbuilding.

Russia reportedly has assisted China's development of new surface warfare capabilities.⁹⁰

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

Photographs showing a land-based mockup of what appears to be the topside (i.e., the main deck and superstructure) of a large surface combatant have led some observers to conclude that China is planning to build a new cruiser (or destroyer), called the Type 055, that might displace roughly 10,000 tons.⁹¹ China is the only country known to be planning to build a ship referred to (by some sources at least) as a cruiser.⁹² (The U.S. Navy's current 30-year shipbuilding plan includes

⁸⁷ 2015 DOD CMSD, p. 9.

⁸⁸ 2015 ONI Report, p. 15.

⁸⁹ 2015 ONI Report, p. 13.

⁹⁰ Paul Schwartz, *Russia's Contribution to China's Surface Warfare Capabilities, Feeding the Dragon*, Washington, Center for Strategic and International Studies, August 2015, 42 pp. For a press report based on this document, see Franz-Stefan Gady, "How Russia Is Helping China Develop Its Naval Power," *The Diplomat*, September 4, 2015.

⁹¹ 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.popsoci.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.

⁹² The U.S. Navy's most recent cruiser was procured in FY1988 and entered service in 1994, and the Navy's 30-year (continued...)

destroyers but no cruisers.) DOD states that China will “likely begin construction of a larger Type 055 ‘destroyer’ in 2015, a vessel better characterized as a guided-missile cruiser (CG) than a DDG.”⁹³ ONI states that “a new cruiser to be built in China in the latter half of the decade will carry a variety of antisurface weapons, some of which will be newly developed.”⁹⁴

A March 19, 2016, blog post states:

Some further hints about the mysterious behemoth, suggested as 11,500 tons fully loaded, were revealed in the Chinese magazine *Shipborne Weaponry*.... According to this description, which includes several rather detailed line drawings, the ship is projected to be 175 meters in length and twenty-one meters wide, with a draft of 6.5 meters and a top speed of thirty-two knots. The ship will wield four types of “new-type”... missiles (discussed below), but that arsenal does not even account for the “long-range land attack cruise missile”... and “sea-based missile interceptor”.... In addition to electric drive propulsion, this analysis boasts that the all-important phased array radars have been upgraded to include both X-band and S-band arrays—and thus may be on par [sic: par] with America’s top air-defense ships. This analysis holds that [the Type] 055’s larger displacement will enable “larger weapons magazines and enhanced combat potential, so that its distant seas comprehensive fighting power will be much stronger” than its predecessors....

Like the Aegis-equipped destroyers that formed the model for its predecessors, Type 055’s main mission is still certain to be fleet air defense, including for Beijing’s nascent carrier battle groups. The phased array radars on the Type 052D are said to be 15 percent larger and less rounded than 052C, delivering detection ranges not less than four hundred kilometers. Dual band radar technology, the article explains, was pioneered in the United States during the 1990s and originally planned for installation aboard the Ford-class aircraft carrier, as well as the recently unveiled DDG-1000. However, DDG-1000 did not get the system because of cost constraints, according to the Chinese analysis. Visible in the given diagrams of Type 055 are both the S-band radar (under the bridge and facing forward) and also the X-band arrays that are somewhat smaller and located in the middle of the large mast, but this may not constitute a genuine “dual-band” capability as the radars are not combined. Notably, the same drawings show a very prominent “fixed long-range warning radar”... mounted above the helicopter hangar near the stern. The article claims that any further deficiencies with respect to radar are related to cost savings, and that China “will not confront a gap in radar capabilities or function.”

As to weaponry, the Type 055’s large cruiser dimensions are said to allow for ninety-six VLS [vertical launch system] launchers, up from sixty-four on the 052D destroyer now in production. Its large size allows not only for more weapons, but also for larger-dimension missiles, as this analysis states explicitly that a drawback of the current 052D VLS is that it cannot accommodate missiles longer than seven meters. In addition to the “long-range land attack cruise missile” and “missile interceptor” mentioned at the outset of this article, the other weapons that will likely be loaded into these VLS tubes, include a “new-type medium-range air defense missile”..., a “new-type medium-range antisubmarine missile”..., a “new-type long-range air defense missile”... and “a new-type supersonic

(...continued)

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.

⁹³ 2015 DOD CMSD, p. 9.

⁹⁴ 2015 ONI Report, p. 16. See also “PLA’s Type 055 destroyer to be bigger than US Arleigh Burke-class,” *Want China Times*, July 1, 2015; Manny Salvacion, “China Building Type 055 Destroyer More Powerful Than U.S. Arleigh Burke-Class,” *Yibada*, July 3, 2015.

long-range antiship missile”.... Interestingly, among the mission areas mentioned for Type 055 beyond air defense is not only missile defense, but also “antisatellite”... operations. For close-in air defense, the ship is said to be upgraded with a new close-in weapons system (CIWS) that fires 9,600 rounds per minute—twice the rate of the former Chinese CIWS. Another interesting feature of the large design, of course, is the relatively expansive helicopter hangar. However, the helicopters illustrated in the design drawings feature the Ka-28 (an import from Russia) as well as the new Z-20 (a Chinese copy of the SH-60 now in development that I have written about in another Dragon Eye column), but not the larger Z-18AF that some had expected to see. However, one weapon that the Chinese analysis cautions will all but certainly not appear on Type 055 is an “electromagnetic gun”.⁹⁵

A December 15, 2015, press report states: “According to Yin Zhou, director of the PLA Navy’s Expert Consultation Committee, China is also developing the Type 055 destroyer, which has a full displacement of around 10,000 tons and can carry more than 100 missiles.”⁹⁶

An April 6, 2015, press report states:

China could be developing two types of the Type 055 guided-missile destroyer—an anti-submarine and an air-defense model—according to the Kanwa Defense Review, a Chinese-language military magazine based in Canada.

The April edition of the magazine made the suggestion after analyzing the latest leaked satellite images of a ground model of the Type 055, which experts believe may have been designed as the successor to the PLA Navy’s highly successful Type 52D destroyer.⁹⁷

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 Luhai (Type 052A), Luhai (Type 051B), Louzhou (Type 051C), Luyang I (Type 052B), Luyang II (Type 052C), and Luyang III (Type 052D) 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 8**) 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.

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

⁹⁵ Lyle J. Goldstein, “Can China’s ‘Dreadnought’ Tip the Naval Balance?” *National Interest*, March 19, 2016.

⁹⁶ “Advanced Destroyers Boost Combat Capability of PLA,” *China Military Online*, December 15, 2015.

⁹⁷ “PLA Could Be Developing Two Versions of Type 055 Destroyer,” *Want China Times*, April 6, 2015.

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.

Figure 8. Luyang II (Type 052C) Class Destroyer



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

As also shown in **Table 2**, after commissioning no new destroyers in 2008-2012—a hiatus that may have been caused in part by the relocation of a shipyard⁹⁸—commissionings of new Luyang II- and Luyang III-class destroyers have resumed. DOD states that “during 2014, the final two LUYANG II-class DDG (Type 052C) entered service, bringing the total number of ships of this class to six. Additionally, the first LUYANG III-class DDG (Type 052D) entered service in 2014.”⁹⁹ A December 14, 2015, press report states that the first three Luyang III-class DDGs entered service on March 21, 2014; August 12, 2015; and December 12, 2014.¹⁰⁰ A July 21, 2015, press report states:

People's Liberation Army Navy (PLAN) watchers report that the second of the Type 052D 'Luyang III' class destroyers, Yangsha (pennant number 173), was commissioned in mid-July and joined China's South Sea Fleet....

⁹⁸ 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.” (Blog entry entitled “2012 in Review,” December 28, 2012, accessed March 21, 2013, at <http://www.informationdissemination.net/2012/12/2012-in-review.html>.)

⁹⁹ 2015 DOD CMSD, p. 9. See also 2015 ONI Report, p. 15.

¹⁰⁰ “New Missile Destroyer Joins South China Sea Fleet,” *China Military Online*, December 14, 2015.

Earlier in July, the seventh Type 052D emerged from the building shed at the Jiangnan Changxingdao shipyard in Shanghai and after launch joined the sixth of class currently fitting out. Photographs showing visible progress on the eighth and ninth hulls have also appeared.¹⁰¹

Table 2. PLA Navy Destroyer Commissionings

Actual (1994-2014) and Projected (2015-2017)

	Sovremenny (Russian-made)	Luhu (Type 052A)	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	1							1	5
2001								0	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					1		1	2	17
2015					1		2	3	20
2016							2	2	22
2017							5	5	27
2018							2 ^a	2	29

Source: IHS Jane's Fighting Ships 2015-2016, and previous editions.

a. IHS Jane's Fighting Ships 2015-2016 states that a total of 12 Luyang III-class ships is expected.

A July 27, 2015, press report states that “all in all, the PLAN plans to build a fleet of 12 Type 052D [Luyang III-class] destroyers—nicknamed ‘Chinese Aegis’ [ships]—before shifting

¹⁰¹ Andrew Tate, “China Commissions Second Type 052D DDG, Pushes Ahead With Frigate, Corvette Launches,” *IHS Jane's 360*, July 21, 2015. See also Sam LaGrone, “China Commissions Second Advanced Destroyer,” *USNI News*, July 23, 2015, and “Seven Type 052D Destroyers Being Built in Shanghai Port,” *Want China Times*, May 2, 2015.

production to the newer Type 055D multi-role cruiser.”¹⁰² A November 2015 report states that a total of 10 Type 052D ships are expected.¹⁰³

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. **Figure 9** shows a Jiangkai II-class ship.

Figure 9. Jiangkai II (Type 054A) Class Frigate



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

Compared with 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. DOD states that “China has continued to produce the JIANGKAI II FFG (Type 054A), with 17 ships currently in the fleet and 5 in various stages of construction.”¹⁰⁴ A July 27, 2015, press report states that

Type 054A ‘Jiangkai II’ class frigates Yangzhou (578) and Handan (579) appear to have been handed over to the PLAN and are believed to have been commissioned, or they will be shortly. They are the 19th and 20th ships of the class. Two more are in build at the Hudong shipyard in Shanghai and a further two at the Huangpu yard in Guangzhou.¹⁰⁵

¹⁰² Franz-Stefan Gady, “China Commissions Second ‘Carrier Killer Destroyer,’” *The Diplomat*, July 27, 2015.

¹⁰³ *2015 Report to Congress of the U.S. China Economic and Security Review Commission*, November 2015, p. 241.

¹⁰⁴ *2015 DOD CMSD*, p. 9.

¹⁰⁵ Andrew Tate, “China Commissions Second Type 052D DDG, Pushes Ahead With Frigate, Corvette Launches,” *IHS Jane’s 360*, July 21, 2015. See also Morgan Clemens, Gabe Collins, and Kristen Gunness, “The Type 054/054A Frigate Series: China’s Most Produced and Deployed Large Modern Surface Combatant,” *China Signpost*, August 2, 2015.

Table 3 shows commissionings of new frigates since 1991.

Table 3. PLA Navy Frigate Commissionings

Actual (1991-2014) and Projected (2015-2016)

	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				0	0	32
2015				3	3	35
2016				3 ^a	3	38

Source: IHS Jane's Fighting Ships 2015-2016, and previous editions.

a. IHS Jane's Fighting Ships 2015-2016 states that a total of 24 Jiangkai II-class ships is expected.

Type 056 Corvette

China is building a new type of corvette (i.e., a light frigate, or FFL) called the Jiangdao class or Type 056/056A (Figure 10). These ships are being built at a high annual rate; IHS Jane's Fighting Ships 2015-2016 states that the first 8 ships were commissioned into service in 2013, followed by 10 more in 2014 and 5 more projected for 2015. A November 2015 report states that the 27th ship in the class entered service in May 2015.¹⁰⁶ DOD states that

More than 20 JIANGDAO-class corvettes (FFL) (Type 056) are in service and an additional 11 were launched in 2014. China may build more than 60 of this class,

¹⁰⁶ 2015 Report to Congress of the U.S. China Economic and Security Review Commission, November 2015, p. 241.

ultimately replacing older PLA Navy patrol vessels, including the 60 HOUBEI-class wave-piercing catamaran missile patrol boats (PTG) (Type 022) [see next section] built for operations in China's "near seas."¹⁰⁷

Figure 10. 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>.

ONI states that

In 2012, China began producing the new JIANGDAO-class (Type 056) corvette (FFL), which offers precisely the flexibility that the HOUBEI lacks. The JIANGDAO is equipped to patrol China's claimed EEZ and assert Beijing's interests in the South China and East China Seas. The 1500-ton JIANGDAO is equipped with 76mm, 30mm, and 12.7mm guns, four YJ-83 family ASCMs, torpedo tubes, and a helicopter landing area. The JIANGDAO is ideally-suited for general medium-endurance patrols, counterpiracy missions, and other littoral duties in regional waters, but is not sufficiently armed or equipped for major combat operations in blue-water areas. At least 20 JIANGDAOs are already operational and 30 to 60 total units may be built, replacing both older small patrol craft as well as some of the PLA(N)'s aging JIANGHU I-class (Type 053H) frigates (FF).¹⁰⁸

A March 21, 2015, press report states that

As China launched its 25th Type 056 corvette on Ma. 19, the Sina Military Network based in Beijing said the PLA Navy will be able to control the disputed South China Sea with

¹⁰⁷ 2015 DOD CMSD, p. 9.

¹⁰⁸ 2015 ONI Report, p. 17.

between 10 and 20 such vessels. China is estimated to be building at least 40 Type 056 corvettes....¹⁰⁹

A July 27, 2015, press report states that

On 17 July the latest Type 056 ‘Jianguo’ class corvette was launched at the Huangpu shipyard. This is the 27th of the class and the eighth to be equipped with variable depth and towed array sonars. Reports suggest that two days later, the 22nd of class, Suqian (504), also an ASW variant, was commissioned. Earlier in the month the sixth Type 056 to be built at the Lushun Liaonan shipyard was launched.¹¹⁰

Houbei (Type 022) Fast Attack Craft

As a 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 11**), that uses a stealthy, wave-piercing, catamaran hull.¹¹¹ Each boat can carry eight C-802 ASCMs.

Figure 11. 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.

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. ONI states:

During the past two decades, China phased out hundreds of Cold War-era OSA and HOUKU-class missile patrol boats and gun-armed SHANGHAI and HAINAN-class patrol craft (among others) as the PLA(N) transitioned from coastal defense missions towards offshore and far seas operations. However, China retains a modern coastal-

¹⁰⁹ “056 Corvette Suitable for PLA Navy Defense in South China Sea,” *Want China Times*, March 21, 2015.

¹¹⁰ Andrew Tate, “China Commissions Second Type 052D DDG, Pushes Ahead With Frigate, Corvette Launches,” *IHS Jane’s 360*, July 21, 2015.

¹¹¹ 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.

defense and area-denial capability with 60 HOUBEI (Type 022) class missile patrol craft (PTG) built in the mid-2000s to supplement 25 1990s-vintage HOUJIAN and HOUXIN-class missile patrol combatants. The HOUBEI design integrates a high-speed wave-piercing catamaran hull, waterjet propulsion, signature-reduction features, and the YJ-83 family ASCM. Although poorly equipped for offshore patrol duties, the HOUBEI is valuable for reacting to specific threats in China's exclusive economic zone (EEZ) and slightly beyond.¹¹²

As noted in the previous section, these ships eventually may be replaced by Type 056 corvettes.

Coast Guard Cutters

China in 2013 consolidated four of its five maritime law enforcement (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. 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. **Figure 12** shows a picture of a CCG ship.

Figure 12. 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.

China is rapidly modernizing its inventory of CCG ships, and some of China's newest CCG ships are relatively large.¹¹³ DOD states that

¹¹² 2015 *ONI Report*, p. 17.

¹¹³ 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.

In the next decade, a new force of civilian law enforcement ships will afford China the capability to patrol more robustly its claims in the East China Sea and the South China Sea. China is continuing with the second half of a modernization and construction program for the CCG. The first half of this program, from 2004-2008, resulted in the addition of almost 20 ocean-going patrol ships. The second half of this program, from 2011-2015, includes at least 30 new ships for the CCG. Several less capable patrol ships will be decommissioned during this period. In addition, the CCG will likely build more than 100 new patrol craft and smaller units, both to increase capability and to replace old units. Overall, The CCG's total force level is expected to increase by 25 percent. Some of these ships will have the capability to embark helicopters, a capability that only a few CCG ships currently have. The enlargement and modernization of China's CCG forces will improve China's ability to enforce its maritime and sovereignty claims.¹¹⁴

ONI states that

During the last decade, China's MLE force has undergone a major modernization, which increased both the sizes of its ships and their overall capability. These civilian maritime forces have added approximately 100 new large patrol ships (WPS), patrol combatants/craft (WPG/WPC), and auxiliary/support ships, not including small harbor and riverine patrol boats.

The current phase of the construction program, which began in 2012, will add over 30 large patrol ships and over 20 patrol combatants to the force by 2015. This will increase by 25 percent the overall CCG force level in a fleet that is also improving rapidly in quality. Most MLE ships are either unarmed or armed only with light deck weapons (12.7mm, 14.5mm, and 30mm guns) and generally use commercial radars and communications equipment. Several of the largest ships are equipped with helicopter landing and hangar facilities as well.¹¹⁵

Amphibious Ships and Potential Floating Sea Bases

DOD states that "China's amphibious ship force has remained relatively constant in recent years following what was a robust modernization program in the early 2000s."¹¹⁶

Yuzhao (Type 071) Amphibious Ship

China has put into service a new class of amphibious ships called the *Yuzhao* or *Type 071 class* (**Figure 13**). *IHS Jane's Fighting Ships 2015-2016* states that the first three ships in the class were commissioned into service in 2007, 2011, and 2012, and that two more projected to be commissioned in 2016 and 2017.¹¹⁷ The Type 071 design has an estimated displacement of more than 18,500 tons,¹¹⁸ compared with about 15,900 tons to 16,700 tons for the U.S. Navy's

¹¹⁴ 2015 DOD CMSD, p. 44.

¹¹⁵ 2015 ONI Report, p. 46. See also Jane Perlez, "China Is Rapidly Adding Coast Guard Ships, U.S. Navy Says," *New York Times*, April 10, 2015; Ryan D. Martinson, "China's Second Navy," *U.S. Naval Institute Proceedings*, April 2015: 24-29; Ryan D. Martinson, "East Asian Security in the Age of the Chinese Mega-Cutter," Center for International Maritime Security (CIMSEC), July 3, 2015.

¹¹⁶ 2015 DOD CMSD, p. 10. A similar statement appears in 2015 ONI Report, p. 18. See also 2015 Report to Congress of the U.S. China Economic and Security Review Commission, November 2015, pp. 243-244.

¹¹⁷ *IHS Jane's Fighting Ships 2015-2016*, p. 153.

¹¹⁸ Unless otherwise indicated, displacement figures cited in this report are full load displacements. *IHS Jane's Fighting Ships 2015-2016*, 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.

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. DOD states that

China has built four large YUZHAO (Type 071) class amphibious transport docks (LPD), which provide a considerably greater and more flexible capability than the older landing ships, signaling China's development of an expeditionary warfare and OTH amphibious assault capability, as well as inherent humanitarian assistance/disaster relief (HA/DR) and counterpiracy capabilities. 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 YUZHAO construction is expected in the near-term....¹¹⁹

Figure 13. 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 construction of an “amphibious assault ship that is not only larger [than the Type 071 design], but incorporates a full flight deck for helicopters,” is “expected in the near term.”¹²⁰ *IHS Jane's Fighting Ships 2015-2016* states that “There are reports that construction of a Type 081 LHD [amphibious assault ship] is under consideration. The ship is believed to be of the order of 20,000 tonnes and may be based on the Type 071 hull.”¹²¹ A July 30, 2015, press report states

¹¹⁹ 2015 ONI Report, p. 18. A similar statement appears in 2015 DOD CMSD, p. 10.

¹²⁰ 2015 DOD CMSD, p. 10. A similar statement appears in 2015 ONI Report, p. 18.

¹²¹ *IHS Jane's Fighting Ships 2015-2016*, p. 153.

that a design for the ship displaces 40,000 tons;¹²² an August 3, 2015, press report puts the figure at 36,000 tons.¹²³ By comparison, U.S. Navy LHD/LHA-type amphibious assault ships displace 41,000 to 45,000 tons. **Figure 14** shows an unconfirmed conceptual rendering of a possible design for the Type 081 LHD.

Figure 14. 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>.

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 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.

¹²² "China To Build 40,000-Ton Amphibious Assault Ship: Kanwa," *Want China Times*, July 30, 2015.

¹²³ Jamie Seidel, "Pictures Circulate of New Chinese Helicopter Assault Ship," *www.news.com.au*, August 3, 2015.

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.¹²⁴

Potential Roles for Type 071 and Type 081 Ships

Although larger amphibious ships such as the Type 071 and the potential 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. Such an invasion would demonstrate military capability and political resolve while achieving tangible territorial gain and simultaneously showing some measure of restraint. However, this kind of operation includes significant, if not prohibitive, political risk because it could galvanize pro-independence sentiment on Taiwan and generate international opposition.

Large-scale amphibious invasion is one of the most complicated and difficult military operations. Success depends upon air and sea superiority, rapid buildup and sustainment of supplies on shore, and uninterrupted support. An attempt to invade Taiwan would strain China's armed forces and invite international intervention. These stresses, combined with China's combat force attrition and the complexity of urban warfare and counterinsurgency (assuming a successful landing and breakout), make amphibious invasion of Taiwan a significant political and military risk. Taiwan's investments to harden infrastructure and strengthen defensive capabilities could also decrease China's ability to achieve its objectives. Moreover, China does not appear to be building the conventional amphibious lift required to support such a campaign.¹²⁵

Zubr-Class Air Cushioned Landing Craft

In June 2013, it was reported that China in May 2013 had taken delivery of four large, Ukrainian-made Zubr-class 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. China in July 2014 used at least one of the craft in an amphibious assault exercise in the South China Sea.¹²⁶

¹²⁴ "PLA To Build Amphibious Assault Ships: Report," *Focus Taiwan News Channel*, January 25, 2015.

¹²⁵ 2015 DOD CMSD, p. 59.

¹²⁶ Franz-Stefan Gady, "Beijing Practices Invasion of South China Sea islands," *The Diplomat*, July 24, 2014. See also (continued...)

Ship Similar to U.S. Navy's Mobile Landing Platform (MLP) Ship

In July 2015, it was reported that China's navy had commissioned into service a ship similar to the U.S. military's Mobile Landing Platform (MLP) ship. China's ship, like the U.S. MLP, is a semi-submersible ship that can support ship-to-shore movement of equipment by serving as a "pier at sea" for ships that lack a well deck for accommodating landing craft. China's MLP-like ship, with an estimated displacement of about 20,000 tons, is smaller than the U.S. MLP.¹²⁷

Potential Use of Civilian Ships

Some observers have commented over the years on the possibility that China could use civilian ships to assist in an amphibious operation. In June 2015, it was reported that China had approved a plan to ensure that civilian ships can support maritime military operations in the event of a crisis.¹²⁸

Potential Floating Sea Bases

China reportedly is building or preparing to build one or more large floating sea bases. The bases (see **Figure 15**) are referred to in press reports as very large floating structures (VLFSs). They are broadly similar in appearance to a concept known as the Mobile Offshore Base (MOB) that U.S. defense planners considered at one point years ago. VLFSs could be used for supporting operations by aircraft and surface ships and craft.

An August 10, 2015, press report states:

China's military wants the ability to create large modular artificial islands that can be repositioned around the world as necessary. And it's not as outlandish a goal as it might seem.

According to Navy Recognition, China's Jidong Development Group unveiled its first design for a Chinese-built Very Large Floating Structure (VLFSs) at its National Defense Science and Technology Achievement exhibition in Beijing at the end of July. The structures are comprised of numerous smaller floating modules that can be assembled together at sea in order to create a larger floating platform.

VLFSs have a number of uses. The artificial islands can be used as fake islands for touristic purposes, or can also be constructed to function as piers, military bases, or even floating airports, Navy Recognition notes.¹²⁹

(...continued)

Jeffrey Lin and P.W. Singer, "China Practices Pacific D-Days With Tanks And Hovercraft," *Popular Science*, July 27, 2015.

¹²⁷ Mike Yeo, "China Commissions First MLP-Like Logistics Ship, Headed For South Sea Fleet," *USNI News*, July 14, 2015; "China Gains Semi-Submersible Ship for South China Sea Fleet," *Reuters*, July 10, 2015; Megha Rajagopalan, "This Submersible Cargo Ship Strengthens Beijing's Hand in the South China Sea," *Business Insider*, July 10, 2015.

¹²⁸ Franz-Stefan Gady, "China Prepares Its 172,000 Civilian Ships for War," *The Diplomat*, June 23, 2015.

¹²⁹ Jeremy Bender, "China Wants To Build Giant Floating Islands in the South China Sea," *Business Insider*, August 10, 2015. The Navy Recognition article referred to is: "China Unveiled its First VLFS Project Similar to the US Military Mobile Offshore Base Concept," *Navy Recognition*, August 9, 2015. See also Jeffrey Lin and P.W. Singer, "Chinese Shipyard Looks to Build Giant Floating Islands," *Popular Science*, April 20, 2015.

Figure 15. Very Large Floating Structure (VLFS)
Notional Artist's Rendering



Source: Liang Jun, “China Displays Its First Large Floating Structure,” *People’s Daily Online*, July 30, 2015.

An August 19, 2015, press report states:

Two Chinese companies are to build 3.2-kilometer [2-mile] long platforms that could host airstrips, docks, helipads, barracks, or even “comprehensive security bases”, the *Financial Times* quoted Feng Jun, chairman of Hainan Offshore Industry as saying on August 18.

[The] *Financial Times* says Jidong Development Group have confirmed its contribution to most of the 3.7 billion yuan in research funding of the project. Hainan Offshore Industry will also play a part in the project.

Although the “Floating Fortresses” so far “are only in the design and research phase”, western media are already paying close attention on the project, which also drew criticism from military observers.

“Planting one of these in the middle of the South China Sea would be a terribly provocative act,” said Richard Bitzinger, a U.S. authority on maritime security.

However, experts incline to the view that these platforms are more likely to serve large oil drilling rigs. The two companies also emphasize on the peaceful application of the giant platforms, mentioning duty-free shopping malls and exotic tourist destinations.

The first VLFS (very large floating structure) of the project is currently under construction at dry dock in Caofeidian near Beijing.¹³⁰

Land-Based Aircraft and Unmanned Aerial Vehicles (UAVs)

Land-Based Aircraft

ONI states that

¹³⁰ Luxioa Zou, “Two Chinese Companies to Build ‘Floating Fortresses,’” *People’s Daily Online*, August 19, 2015. See also Liang Jun, “China Displays Its First Large Floating Structure,” *People’s Daily Online*, July 30, 2015.

During the past two decades, the PLANAF has made great strides in moving beyond its humble origins. Antiquated fixed-wing aircraft such as the Nanchang Q-5 Fantan and the Harbin H-5 Beagle have given way to an array of relatively high-quality aircraft. This force is equipped for 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. Just a decade ago, this air modernization relied very heavily on Russian imports. Following in the footsteps of the People's Liberation Army Air Force (PLAAF), the PLA(N) has recently begun benefitting from domestic combat aircraft production.

Historically, the PLA(N) relied on older Chengdu J-7 variants and Shenyang J-8B/D Finback fighters for offshore air defense. These aircraft offered limited 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. The PLA(N)'s first major air capability upgrade came with the Su-30MK2 FLANKER. While the PLAAF had received numerous FLANKER variants from Russia between 1992 and 2002, the PLA(N) did not acquire its initial aircraft until very late in that process.

In 2002, China purchased 24 Su-30MK2, making it the first 4th-generation fighter aircraft fielded with the PLA(N). These aircraft feature both an extended range and maritime radar systems. This allows the Su-30MK2 to strike enemy ships at long distances, while maintaining a robust air-to-air capability. Several years later, the PLA(N) began replacing its older J-8B/D 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 Firebird 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 are among the most modern aircraft in China's inventory.

For maritime strike, the PLA(N) has relied on the H-6 BADGER bomber for decades. The H-6 is a licensed copy of the ex-Soviet Tu-16 BADGER medium jet bomber, maritime versions of which can employ advanced ASCMs against surface targets. Despite the age of the design, the Chinese H-6 continues to receive electronics and payload upgrades, which keep the aircraft viable. We think as many as 30 of these aircraft remain in service....

With at least five regiments fielded across the three fleets, the JH-7 FLOUNDER augments the H-6 for maritime strike. 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....

In addition to combat aircraft, the PLA(N) is expanding its inventory of fixed-wing maritime patrol aircraft (MPA), airborne early warning (AEW), and surveillance aircraft. China has achieved significant new capabilities by modifying several existing airframes. 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. All of these aircraft play a key role in providing a clear picture of surface and air contacts in the maritime environment. As the PLA(N) pushes farther from the coast, long-range aircraft capable of extended on-station times to act as the eyes and ears of the fleet become increasingly important.

Internet photos from 2012 indicated the development of a Y-9 naval variant that is equipped with a MAD (magnetic anomaly detector) boom, typical of ASW aircraft. This

Y-9 ASW variant features a large surface search radar mounted under the nose as well as multiple blade antennae on the fuselage for probable electronic surveillance.¹³¹

UAVs

China reportedly is developing and fielding a range of UAV designs. DOD states that

the acquisition and development of longer-range UAVs will increase China's ability to conduct long-range reconnaissance and strike operations. China is advancing its development and employment of UAVs. Some estimates indicate China plans to produce upwards of 41,800 land- and sea-based unmanned systems, worth about \$10.5 billion, between 2014 and 2023. During 2013, China began incorporating its UAVs into military exercises and conducted ISR over the East China Sea with the BZK-005 UAV. In 2013, China unveiled details of four UAVs under development—the Xianglong, Yilong, Sky Saber, and Lijian—the last three of which are designed to carry precision-strike capable weapons. The Lijian, which first flew on November 21, 2013, is China's first stealthy flying wing UAV.¹³²

ONI states that

The PLA(N) will probably emerge as one of China's most prolific UAV users, employing UAVs to supplement manned ISR aircraft as well as to aid targeting for land-, ship-, and other air-launched weapons systems.... In addition to land-based systems, the PLA(N) is also pursuing ship-based UAVs as a supplement to manned helicopters.¹³³

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.’”¹³⁴

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, ASCMs, 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.¹³⁵ DOD states that

¹³¹ 2015 ONI Report, pp. 21-22.

¹³² 2015 DOD CMSD, p. 37.

¹³³ 2015 ONI Report, pp. 22-23.

¹³⁴ Bill Gertz, “Beijing Develops Pulse Weapons,” *Washington Times*, July 22, 2011: 1. Except for “[July 21],” materials in brackets as in original.

¹³⁵ 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 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.

The PLA Navy recognizes that long-range ASCMs require a robust, over-the-horizon targeting capability to realize their full potential, and China has, therefore, invested heavily in reconnaissance, surveillance, command, control, and communications systems at the strategic, campaign, and tactical levels to provide high-fidelity targeting information to surface and subsurface launch platforms....

The PLA Navy also is 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 anti-ship ballistic missiles).¹³⁶

ONI states that

China is developing a wide array of sensors to sort through this complex environment and contribute to its maritime picture. The most direct method is reporting from the ships and aircraft that China operates at sea. These provide the most detailed and reliable information, but can only cover a fraction of the needed space. A number of ground-based coastal radars provide overlapping coverage of the area immediately off the coast, but their range is similarly limited.

To gain a broader view of the activity in its near and far seas, China has turned to more sophisticated sensors. The skywave OTH radar provides awareness of a much larger area than conventional radars by bouncing signals off the ionosphere. At the same time, China operates a growing array of reconnaissance satellites, which allow it to observe maritime activity anywhere on the earth. Two civilian systems also contribute to China's maritime awareness. The first is a coastal monitoring network for the Automatic Identification System (AIS)—an automated system required on most commercial vessels by the International Maritime Organization. China's Beidou system, installed on several thousand of its fishing boats, provides GPS-like navigation to the boats as well as automatic position reporting back to a ground station in China, allowing the location of the fishing fleet to be constantly monitored by fishing enforcement authorities.

Naval Cyber Warfare Capabilities

ONI states that

Strategic Chinese military writings do not specifically deal with how China would employ cyber operations in a maritime environment, although they do make clear the importance of cyber operations. The PLA highlights network warfare as one of the “basic modes of sea battle” alongside air, surface, and underwater long-range precision strikes.” As the PLA's larger military investment in emerging domains such as cyber matures, the application of cyber operations in the maritime realm will consequently bolster the PLA(N)'s capability.¹³⁷

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

¹³⁶ 2015 DOD CMSD, pp. 10 and 46. See also Shane Bilborough, “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.

¹³⁷ 2014 ONI Report, p. 24.

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 the military's efforts to extend its operational reach beyond East Asia 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 HA/DR; 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 contingency or conflict in the East or South China Sea. 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 high-intensity operations over a period of several months. However, logistics and intelligence support remain key obstacles, particularly in the Indian Ocean.

In the last several years, the PLA Navy's "far seas" experience has been derived primarily from its ongoing counter-piracy mission in the GOA 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 GOA to protect Chinese merchant shipping from maritime piracy. This operation is China's first enduring naval operation beyond the Asia region.¹³⁸

The 2015 ONI report states that

Although the PLA(N)'s primary focus remains in the East Asia region, where China faces multiple disputes over the sovereignty of various maritime features and associated maritime rights, in recent years, the PLA(N) has increased its focus on developing blue-water naval capabilities. Over the long term, Beijing aspires to sustain naval missions far from China's shores.

When we wrote the 2009 publication [i.e., the 2009 ONI report], China had just embarked on its first counterpiracy missions in the Gulf of Aden, but most PLA(N) operations remained close to home. Nearly six years later, these missions have continued without pause, and China's greater fleet has begun to stretch its legs. The PLA(N) has begun regular combat training in the Philippine Sea, participated in multinational exercises including Rim of the Pacific (RIMPAC) 2014, operated in the Mediterranean, increased intelligence collection deployments in the western Pacific, and for the first time deployed a submarine to the Indian Ocean....

With a greater percentage of the force consisting of these modern combatants capable of blue water operations, the PLA(N) will have an increasing capability to undertake missions far from China.¹³⁹

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.¹⁴⁰ In

¹³⁸ 2015 DOD CMSD, pp. 40-41.

¹³⁹ 2015 ONI Report, p. 5. See also pp. 8, 13, 27, 28-29. See also Andrew Erickson and Christopher Carlson, "Sustained Support: The PLAN Evolves Its Expeditionary Logistics Strategy," *Jane's Navy International*, March 9, 2016.

¹⁴⁰ 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, 1010: 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, (continued...)

late November 2015, China confirmed that it was in talks with Djibouti to establish a military base there; the facility will reportedly be China's first overseas military base.¹⁴¹ In March 2016, remarks from China's Foreign Minister were interpreted by some observers as hinting that China might establish additional overseas bases in the future.¹⁴² In November and December 2015, it was reported that a Chinese commercial firm had purchased a port near Darwin, Australia—leading to a discussion among Australian and U.S. observers as to whether this development posed a security threat to U.S. naval forces that might operate out of Darwin.¹⁴³

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. The services provided likely will fall short of permitting the full spectrum of support from repair to re-armament.¹⁴⁴

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

Numbers Provided by ONI

Numbers Provided by ONI in 2015

The 2015 ONI report states that

(...continued)

"Pearls for the Orient," *Sydney Morning Herald*, July 9, 2010.

¹⁴¹ See "China, Djibouti Negotiate Over Military Base," *CCTV*, November 27, 2015; Kristina Wing, "China's Military Makes Move Into Africa," *The Hill*, November 24, 2015; Sam LaGrone, "U.S. AFRICOM Commander Confirms Chinese Logistics Base in Djibouti," *USNI News*, November 25, 2015; Jane Perlez and Chris Buckley, "China Retools Its Military With a First Overseas Outpost in Djibouti," *New York Times*, November 26, 2015; Jeremy Page and Gordon Lubold, "China to Build Naval Hub in Djibouti," *Wall Street Journal*, November 27, 2015; "China To Set Up First Overseas Naval Facility in Djibouti Next to US Airbase," *Asia Times*, November 27, 2015; David Brewster, "China's First Overseas Military Base in Djibouti Likely To Be A Taste of Things To Come," *Lowy Interpreter*, December 2, 2015; Jill Craig and Shannon Van Sant, "China Base in Djibouti Reflects Economic, Africa Strategy," *VOA*, December 7, 2015; Bill Chappell, "China Reaches Deal To Build Military Outpost in Djibouti," *National Public Radio*, January 21, 2016; Edmund Blair, "China To Start Work Soon on Naval Base in Djibouti: Guelleh," *Reuters*, February 3, 2016.

¹⁴² Ben Blanchard, "China Hints More Bases On Way After Djibouti," *Reuters*, March 8, 2016.

¹⁴³ See, for example, Jane Perlez, "U.S. Casts Wary Eye on Australian Port Leased by Chinese," *New York Times*, March 20, 2016; Patrick Cronin and Phoebe Benich, "The Port of Darwin As a 'Gray Zone' Situation," *ASPI Strategist*, November 27, 2015; Lauren Dickey, "What Are the Chinese up to in Australia?" *War on the Rocks*, December 3, 2015; Jason Scott, "China Spy Fears Over Aussie Port Deal Are Absurd, [Australian] Defense Says," *Bloomberg News*, December 14, 2015.

¹⁴⁴ 2015 DOD CMSD, p. 41. 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. See also Peter A. Dutton and Ryan D. Martinson, editors, *Beyond the Wall, Chinese Far Seas Operations*, Newport, RI (Center for Naval Warfare Studies, Naval War College, China Maritime Study No. 13), May 2015, 120 pp.; Christopher H. Sharman, *China Moves Out: Stepping Stones Toward a New Maritime Strategy*, Washington, National Defense University Press (Center for the Study of Chinese Military Affairs, Institute for National Strategic Studies, National Defense University), 45 pp.

- “the PLA(N) currently possesses more than 300 surface combatants, submarines, amphibious ships, and missile-armed patrol craft”,¹⁴⁵ that
- “the PLA(N) [surface force] consists of approximately 26 destroyers (21 of which are considered modern), 52 frigates (35 modern), 20 new corvettes, 85 modern missile-armed patrol craft, 56 amphibious ships, 42 mine warfare ships (30 modern), more than 50 major auxiliary ships, and more than 400 minor auxiliary ships and service/support craft”,¹⁴⁶ and that
- “currently, the [PLA(N)] submarine force consists of five nuclear attack submarines, four nuclear ballistic missile submarines, and 57 diesel attack submarines.”¹⁴⁷

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

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

¹⁴⁵ 2015 ONI Report, p. 13.

¹⁴⁶ 2015 ONI Report. p. 15.

¹⁴⁷ 2015 ONI Report, p. 18.

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
<i>Ships</i>							
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
<i>Aircraft</i>							
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 that “the PLA Navy now possesses the largest number of vessels in Asia, with more than 300 surface ships, submarines, amphibious ships, and patrol craft,”¹⁴⁸ and that “The PLA Navy has the largest force of principal combatants, submarines, and amphibious warfare ships in Asia.”¹⁴⁹ **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 2009.¹⁵⁰

¹⁴⁸ 2015 DOD CMSD, p. 8.

¹⁴⁹ 2015 DOD CMSD, p. 79.

¹⁵⁰ 2011 DOD CMSD, p. 43 (figure).

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	2015
Nuclear-powered attack submarines	5	5	~60	n/a	6	5	5	5	6	6	5	5	5	5	5
Diesel attack submarines	~60	~ 50		n/a	51	50	53	54	54	54	49	48	49	51	53
Aircraft carriers	0	0	0	0	0	0	0	0	0	0	0	0	1 ^b	1	1
Destroyers	~20	~ 60	> 60	n/a	21	25	25	29	27	25	26	26	23	24	21
Frigates	~40			n/a	43	45	47	45	48	49	53	53	52	49	52
Corvettes	0	0	0	0	0	0	0	0	0	0	0	0	0	8 ^b	15
Missile-armed coastal patrol craft	n/a	~ 50	~ 50	n/a	51	45	41	45	70	85	86	86	85	85	86
Amphibious ships: LSTs and LPDs	almost 50	~ 40	> 40	n/a	20	25	25	26	27	27	27	28	29	29	29
Amphibious ships: LSMs				n/a	23	25	25	28	28	28	28	23	26	28	28

Source: Table prepared by CRS based on data in 2000-2015 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.

a. The DOD report generally covers events of the prior calendar year. Thus, the 2014 edition of the report covers events during 2013.

b. 2014 was the 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,¹⁵¹ 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.**¹⁵² 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.¹⁵³ 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 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 1990, but has greater aggregate capability than it did in 1990, because larger numbers of older, obsolescent boats have been replaced by

¹⁵¹ 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.

¹⁵² 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).

¹⁵³ 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.

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. In a U.S.-China conflict inside the first island chain, U.S. naval and other forces would be operating at the end of generally long supply lines, while Chinese naval and other forces would be operating at the end of generally short supply lines.
- **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.

A 2015 RAND report attempts to take factors like those discussed above more fully into account with the aim of producing a more comprehensive assessment of relative U.S. and Chinese military capabilities for potential conflict scenarios involving Taiwan and the Spratly Islands in the South China Sea. The report states:

Over the past two decades, China's People's Liberation Army (PLA) has transformed itself from a large but antiquated force into a capable, modern military. In most areas, its technology and skill levels lag behind those of the United States, but it has narrowed the gap. Moreover, it enjoys the advantage of proximity in most plausible scenarios and has developed capabilities that capitalize on that advantage....

... four broad trends emerge:

- Since 1996, the PLA has made tremendous strides, and, despite improvements to the U.S. military, the net change in capabilities is moving in favor of China. Some aspects of Chinese military modernization, such as improvements to PLA ballistic missiles, fighter aircraft, and attack submarines, have come extraordinarily quickly by any reasonable historical standard.
- The trends vary by mission area, and relative Chinese gains have not been uniform across all areas. In some areas, U.S. improvements have given the United States new options, or at least mitigated the speed at which Chinese military modernization has shifted the relative balance.
- Distances, even relatively short distances, have a major impact on the two sides' ability to achieve critical objectives. Chinese power projection capabilities are improving, but present limitations mean that the PLA's ability to influence events and win battles diminishes rapidly beyond the unrefueled range of jet fighters and diesel submarines. This is likely to change in the years beyond those considered in this report, though operating at greater distances from China will always work, on balance, against China.
- The PLA is not close to catching up to the U.S. military in terms of aggregate capabilities, but it does not need to catch up to the United States to dominate its immediate periphery. The advantages conferred by proximity severely complicate U.S. military tasks while providing major advantages to the PLA. This is the central finding of this study and highlights the value of campaign analysis, rather than more abstract assessments of capabilities.

Over the next five to 15 years, if U.S. and PLA forces remain on roughly current trajectories, Asia will witness a progressively receding frontier of U.S. dominance. The United States would probably still prevail in a protracted war centered in virtually any area, and Beijing should not infer from the above generalization that it stands to gain from conflict. U.S. and Chinese forces would likely face losses on a scale that neither has suffered in recent decades. But PLA forces will become more capable of establishing temporary local air and naval superiority at the outset of a conflict. In certain regional contingencies, this temporal or local superiority might enable the PLA to achieve limited objectives without “defeating” U.S. forces. Perhaps even more worrisome from a military-political perspective, the ability to contest dominance might lead Chinese leaders to believe that they could deter U.S. intervention in a conflict between it and one or more of its neighbors. This, in turn, would undermine U.S. deterrence and could, in a crisis, tip the balance of debate in Beijing as to the advisability of using force....

Although trends in the military balance are running against the United States, there are many actions that the United States could take to reinforce deterrence and continue to serve as the ultimate force for stability in the Western Pacific.¹⁵⁴

DOD Response to China Naval Modernization

Efforts to Preserve U.S. Military Superiority

DOD has taken a number of actions in recent years that are intended to help maintain U.S. military superiority over improving military capabilities of other countries, such as China, including the following:

¹⁵⁴ Eric Heginbotham, *The U.S.-China Military Scorecard, Forces, Geography, and the Evolving Balance of Power, 1996-2017*, Santa Monica (CA), RAND Corporation, 2015 (RAND report RR-392), pp. xix, xxx-xxxii.

- **Defense Innovation Initiative.** To help arrest and reverse an assessed decline in the U.S. military's technological and qualitative edge over the opposing military forces, DOD in November 2014 announced a new Defense Innovation Initiative.¹⁵⁵
- **Strategic Capabilities Office (SCO).** DOD in 2012 created the Strategic Capabilities Office (SCO), an organization that Secretary of Defense Ashton Carter described on February 2, 2016, as one that “re-imagine[s] existing DOD and intelligence community and commercial systems by giving them new roles and game-changing capabilities to confound potential enemies,” with an emphasis on fielding capabilities within a few years, rather than in 10 or 15 years.¹⁵⁶
- **Third Offset Strategy.** DOD has also announced that it is seeking a new general U.S. approach—a so-called “third offset strategy”—for maintaining U.S. superiority over opposing military forces that are both numerically large and armed with precision-guided weapons.¹⁵⁷

¹⁵⁵ See, for example, Cheryl Pellerin, “Hagel Announces New Defense Innovation, Reform Efforts,” *DOD News*, November 15, 2014; Jake Richmond, “Work Explains Strategy Behind Innovation Initiative,” *DOD News*, November 24, 2014; and memorandum dated November 15, 2015, from Secretary of Defense Chuck Hagel to the Deputy Secretary of Defense and other DOD recipients on The Defense Innovation Initiative, accessed online on July 21, 2015, at <http://www.defense.gov/pubs/OSD013411-14.pdf>.

¹⁵⁶ Remarks by Secretary Carter on the Budget at the Economic Club of Washington, DC, February 2, 2016, accessed March 30, 2016, at <http://www.defense.gov/News/News-Transcripts/Transcript-View/Article/648901/remarks-by-secretary-carter-on-the-budget-at-the-economic-club-of-washington-dc>. See also Sam LaGrone, “Little Known Pentagon Office Key to U.S. Military Competition with China, Russia,” *USNI News*, February 2, 2016; Jason Sherman, “Carter Lifts the Veil on Classified Work of Secretive Strategic Capabilities Office,” *Inside the Pentagon*, February 4, 2016; Colin Clark and Sydney J. Freedberg Jr., Robot Boats, Smart Guns & Super B-52s: Carter’s Strategic Capabilities Office,” *Breaking Defense*, February 5, 2016; Dan Lamothe, “Veil of Secrecy Lifted on Pentagon Office Planning ‘Avatar’ Fighters and Drone Swarms,” *Washington Post*, March 8, 2016; Anthony Capaccio, “Once-Secret Pentagon Agency Asks Industry to Help Find New Ideas,” *Bloomberg*, March 29, 2016; Reuters, “New ‘Take Risk’ Office Rebuilds Navy’s Arsenal,” *Maritime Executive*, March 29, 2016.

¹⁵⁷ See Deputy Secretary of Defense Speech, Reagan Defense Forum: The Third Offset Strategy, As Delivered by Deputy Secretary of Defense Bob Work, Reagan Presidential Library, Simi Valley, CA, November 7, 2015, accessed December 21, 2015, at <http://www.defense.gov/News/Speeches/Speech-View/Article/628246/reagan-defense-forum-the-third-offset-strategy>, and Deputy Secretary of Defense Speech, CNAS Defense Forum, As Delivered by Deputy Secretary of Defense Bob Work, JW Marriott, Washington, DC, December 14, 2015, accessed December 21, 2015, at <http://www.defense.gov/News/Speeches/Speech-View/Article/634214/cnas-defense-forum>. See also Jason Sherman, “DOD Unveils Technology Areas That Will Drive ‘Third Offset’ Investments, Experimentation,” *InsideDefense.com Daily News*, December 9, 2014; Aaron Mehta, “Work Outlines Key Steps in Third Offset Tech Development,” *Defense News*, December 14, 2015; Jon Harper, “2017 Budget Proposal to Include Billions for Next-Generation Weapons Research,” *National Defense*, December 14, 2015; Tony Bertuca, “Work Pegs FY-17 ‘Third Offset’ Investment at \$12B-\$15B,” *InsideDefense.com Daily News*, December 14, 2015; Jason Sherman, “DOD ‘Red Teams’ Aim to Anticipate Russia, Chinese Reaction to ‘Third Offset Strategy,’” *Inside the Pentagon*, December 22, 2016; Kyle Mizokami, “America’s Military is Getting Deadly Serious About China, Russia, and North Korea,” *The Week*, February 10, 2016; Mackenzie Eaglen, “What is the Third Offset Strategy?” *Real Clear Defense*, February 16, 2016; Tony Bertuca, “DOD Breaks Down ‘Third Offset’ FYDP Investments,” *Inside the Pentagon*, February 17, 2016; David Ignatius, “The Exotic New Weapons the Pentagon Wants to Deter Russia and China,” *Washington Post*, February 23, 2016; Amaani Lyle, “Pentagon: New Technology Deters Russia, China,” *Scout*, March 13, 2016; Shawn Brimley and Loren DeJonge Schulman, “Sustaining the Third Offset Strategy in the Next Administration,” *War on the Rocks*, March 15, 2016.

U.S. Strategic Rebalancing to Asia-Pacific Region

As mentioned earlier, a 2012 DOD strategic guidance document¹⁵⁸ and DOD's report on the 2014 Quadrennial Defense Review (QDR)¹⁵⁹ state that U.S. military strategy will place an increased emphasis on the Asia-Pacific region. Although Administration officials state that this U.S. strategic rebalancing toward the Asia-Pacific region, as it is called, is not directed at any single country, many observers believe it is in no small part intended as a response to China's military (including naval) modernization effort and its assertive behavior regarding its maritime territorial claims.

Asia-Pacific Maritime Security Strategy

As one reflection of the U.S. strategic rebalancing to the Asia-Pacific region, a DOD report on Asia-Pacific maritime security strategy submitted to Congress in August 2015 states, in discussing "DoD lines of effort," that

First, we are strengthening our military capacity to ensure the United States can successfully deter conflict and coercion and respond decisively when needed. The Department is investing in new cutting-edge capabilities, deploying our finest maritime capabilities forward, and distributing these capabilities more widely across the region. The effort also involves enhancing our force posture and persistent presence in the region, which will allow us to maintain a higher pace of training, transits, and operations. The United States will continue to fly, sail, and operate in accordance with international law, as U.S. forces do all around the world.

Second, we are working together with our allies and partners from Northeast Asia to the Indian Ocean to build their maritime capacity. We are building greater interoperability, updating our combined exercises, developing more integrated operations, and cooperatively developing partner maritime domain awareness and maritime security capabilities, which will ensure a strong collective capacity to employ our maritime capabilities most effectively.

Third, we are leveraging military diplomacy to build greater transparency, reduce the risk of miscalculation or conflict, and promote shared maritime rules of the road. This includes our bilateral efforts with China as well as multilateral initiatives to develop stronger regional crisis management mechanisms. Beyond our engagements with regional counterparts, we also continue to encourage countries to develop confidence-building measures with each other and to pursue diplomatic efforts to resolve disputed claims.

Finally, we are working to strengthen regional security institutions and encourage the development of an open and effective regional security architecture. Many of the most prevalent maritime challenges we face require a coordinated multilateral response. As such, the Department is enhancing our engagement in ASEAN-based institutions such as the ASEAN Defense Ministers Meeting Plus (ADMM-Plus), ASEAN Regional Forum (ARF), and the Expanded ASEAN Maritime Forum (EAMF), as well as through wider forums like the Western Pacific Naval Symposium (WPNS) and Indian Ocean Naval

¹⁵⁸ Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense*, January 2012, 8 pp. For additional discussion, see CRS Report R42146, *Assessing the January 2012 Defense Strategic Guidance (DSG): In Brief*, by (name redacted) and (name redacted)

¹⁵⁹ Department of Defense, *Quadrennial Defense Review 2014*, 64 pp. For additional discussion, see CRS Report R43403, *The 2014 Quadrennial Defense Review (QDR) and Defense Strategy: Issues for Congress*, by (name redacted)

Symposium (IONS), which provide platforms for candid and transparent discussion of maritime concerns.¹⁶⁰

Administration officials have stated that notwithstanding constraints on U.S. defense spending under the Budget Control Act of 2011 (S. 365/P.L. 112-25 of August 2, 2011) as amended, DOD will seek to protect initiatives for strengthening U.S. military presence and capabilities in the Asia-Pacific region. Some observers, viewing both the BCA's constraints on defense spending and events in Europe (i.e., Russia's actions in Ukraine) and in the Middle East (U.S. efforts to counter the Islamic State organization) that have drawn U.S. policymaking attention back to those two regions, have questioned whether DOD should, or will be able to, fully implement its initiatives for the Asia-Pacific region.¹⁶¹

Joint Concept for Access and Maneuver in Global Commons (JAM-GC)

DOD has been developing a concept, originally called Air-Sea Battle (ASB) and now called Joint Concept for Access and Maneuver in the Global Commons (JAM-GC),¹⁶² for increasing the joint operating effectiveness of U.S. naval and Air Force units, particularly in operations for countering adversary anti-access/area-denial (A2/AD) forces. DOD announced the concept in the 2010 Quadrennial Defense Review. Although DOD officials state that the 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 concept; the document builds on earlier statements from DOD officials on the topic. DOD's unclassified summary of the document is reprinted in **Appendix B**. A January 6, 2016, press report states:

The Defense Department's Joint Concept for Access and Maneuver in the Global Commons is nearing completion, as the military services and combatant commands are currently reviewing the draft document, according to an official involved in the concept's development.

The concept, termed JAM-GC, is in the second round of coordination with the services and the COCOMs, according to Capt. Michael Hutchens, director of the Air-Sea Battle office within the Office of the Chief of Naval Operations (N3/N5). Following their review, the document will then go through "tank sessions" for the operational deputies and the Joint Chiefs of Staff sometime in 2016....¹⁶³

¹⁶⁰ Department of Defense, *Asia-Pacific Maritime Security Strategy*, undated but released August 2015, pp. 19-20. Italics as in original. The report was submitted in response to Section 1259 of the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015 (H.R. 3979/P.L. 113-291 of December 19, 2014).

¹⁶¹ See, for example, Connor O'Brien, "U.S. Should Reconsider Asia-Pacific 'Pivot,' Former NATO Commander Says," *Politico*, February 10, 2016.

¹⁶² In February 2015, it was reported that the name of the concept was being changed from Air-Sea Battle to Joint Concept for Access and Maneuver in the Global Commons (JAM-GC). See 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 Mends Air, Sea and Land," *Defense News*, January 24, 2015; James Holmes, "Redefining AirSea Battle: JAM-GC, China and the Quest for Clarity," *National Interest*, November 22, 2015; Harry J. Kazianis, "Air-Sea Battle's Next Step: JAM-GC on Deck," *National Interest*, November 25, 2015.

¹⁶³ Justin Doubleday, "Draft DOD Joint Concept Nearing Completion, Getting Input From Services, COCOMs," *Inside the Pentagon*, January 6, 2016.

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, for improving the U.S. Navy's ability to counter Chinese maritime A2/AD capabilities, including but not limited to those discussed below.

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.”¹⁶⁴
- 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 2020.¹⁶⁵
- 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.¹⁶⁶
- The Navy has announced an intention to station up to four Littoral Combat Ships (LCSs) at Singapore by 2017,¹⁶⁷ and an additional seven LCSs in Japan by 2022.¹⁶⁸
- In April 2014, the United States and the Philippines signed an agreement that will provide U.S. forces with increased access to Philippine bases.¹⁶⁹
- In September 2015, the U.S. Pacific Fleet Commander raised the idea of having the U.S. Third Fleet (the fleet for the Eastern Pacific—the part of the Pacific

¹⁶⁴ U.S. Department of Defense, *Quadrennial Defense Review Report*. Washington, 2006. (February 6, 2006) p. 47.

¹⁶⁵ 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.

¹⁶⁶ “Fourth Attack Sub to be Homeported in Guam,” *Navy News Service*, February 10, 2014.

¹⁶⁷ 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.

¹⁶⁸ Zachary Keck, “U.S. Chief of Naval Operations: 11 Littoral Combat Ships to Asia by 2012,” *The Diplomat* (<http://thediplomat.com>), May 17, 2013.

¹⁶⁹ 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.

closer to the United States) operate some of its forces in the area of the U.S. Seventh Fleet (the fleet for the Western Pacific), which could increase the number of U.S. Navy ships operating in the Western Pacific.¹⁷⁰

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 2016.¹⁷¹

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). 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, and unmanned underwater vehicles (UUVs).

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 A2/AD capabilities. Examples of highly capable ships now being acquired include Ford (CVN-78) class aircraft carriers,¹⁷² Virginia (SSN-774) class attack submarines,¹⁷³ and Arleigh Burke (DDG-51) class Aegis destroyers.¹⁷⁴ Examples of highly capable aircraft now being acquired by the Navy include F-35C carrier-based Joint Strike Fighters (JSFs),¹⁷⁵ F/A-18E/F Super Hornet strike fighters and EA-18G Growler electronic attack aircraft,¹⁷⁶ E-2D Hawkeye early warning and command and control aircraft, and the P-8A Multi-mission Maritime Aircraft (MMA).¹⁷⁷ Examples of new weapon technologies that might be of value in countering Chinese maritime A2/AD capabilities include new and more capable versions of the Aegis ballistic missile defense (BMD) system,¹⁷⁸ as well as the electromagnetic rail gun (EMRG), solid state lasers (SSLs), and a hypervelocity projectile (HPV) for the 5-inch guns on Navy cruisers and destroyers.¹⁷⁹

¹⁷⁰ Tim Kelly, “U.S. Admiral Signals Wider Role for Powerful Third Fleet in Western Pacific,” *Reuters*, September 26, 2015.

¹⁷¹ Seth Robson, “US Increasing Number of Marines On Rotation To Australia,” *Stars and Stripes (Stripes.com)*, June 15, 2013.

¹⁷² 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 (name redacted) .

¹⁷³ 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 (name redacted) .

¹⁷⁴ 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 (name redacted) .

¹⁷⁵ For more on the F-35 program, see CRS Report RL30563, *F-35 Joint Strike Fighter (JSF) Program*, by (name redacted) .

¹⁷⁶ For more on the F/A-18E/F and EA-18G programs, see CRS Report RL30624, *Navy F/A-18E/F and EA-18G Aircraft Program*, by (name redacted) .

¹⁷⁷ 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.

¹⁷⁸ For more on the Aegis BMD program, see CRS Report RL33745, *Navy Aegis Ballistic Missile Defense (BMD) Program: Background and Issues for Congress*, by (name redacted) .

¹⁷⁹ For more on these new weapon technologies, see CRS Report R44175, *Navy Lasers, Railgun, and Hypervelocity Projectile: Background and Issues for Congress*, by (name redacted)

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 that appear to have been aimed at monitoring Chinese military operations.¹⁸⁰ 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.¹⁸¹

Increased Naval Cooperation with Allies and Other Countries

U.S. Navy forces in recent years have taken steps to increase cooperation with naval forces from allies and other countries, such as Japan, Australia, and India. Some of these efforts appear to involve expanding existing bilateral forms of naval cooperation (e.g., U.S.-Japan, U.S.-Australia, U.S.-India) into nascent trilateral forms (e.g., U.S.-Japan-Australia, U.S.-Australia-India). A March 2, 2016, press report takes the idea further, stating:

The chief of the United States Pacific Command, Adm. Harry B. Harris Jr., on Wednesday proposed reviving an informal strategic coalition made up of the navies of Japan, Australia, India and the United States, an experiment that collapsed a decade ago because of diplomatic protests from China.

The proposal was the latest in a series of United States overtures to India, a country wary of forming strategic alliances, to become part of a network of naval powers that would balance China's maritime expansion.

The American ambassador to India, Richard R. Verma, expressed hope in a speech that "in the not-too-distant future," joint patrols by navy vessels from India and the United States "will become a common and welcome sight throughout Indo-Pacific waters."

And officials have said that the United States is close, after 10 years of demurral from the Indian side, to concluding a logistics agreement that would allow the two countries' militaries to easily use each other's resources for refueling and repairs....

Though he did not specifically mention China on Wednesday, Admiral Harris said powerful countries were seeking to "bully smaller nations through intimidation and coercion," and made the case that a broad naval collaboration was the best way to avert it.

"Exercising together will lead to operating together," he said, before meetings with his Indian counterpart. "By being ambitious, India, Japan, Australia and the United States and so many like-minded nations can aspire to operate anywhere in the high seas and the airspace above it."¹⁸²

¹⁸⁰ 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.

¹⁸¹ Kris Osborn, "Navy Pivots Training to Match Pacific Transition," *DOD Buzz* (www.dodbuzz.com), July 2, 2013.

¹⁸² Ellen Barry, "U.S. Proposes Reviving Naval Coalition to Balance China's Expansion," *New York Times*, March 2, 2016.

Issues for Congress

Future Size and Capability of U.S. Navy

One potential oversight issue for Congress, particularly in the context of the constraints on U.S. defense spending established by the Budget Control Act of 2011 as amended, is whether the U.S. Navy in coming years will be large enough and capable enough to adequately counter improved Chinese maritime A2/AD 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 and capability 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.¹⁸³

Current Navy plans call for achieving and maintaining a fleet of 308 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 308 ships.¹⁸⁴ Navy officials stated in early 2016 that the Navy has begun a new Force Structure Assessment (or FSA, meaning an analysis to determine the Navy's force-level goals) that the Navy hopes to complete by summer 2016. Some observers speculate that this FSA will result in a revised force-level goal for a fleet of more than 308 ships.¹⁸⁵ The issue of whether the U.S. Navy in coming years will be large enough and capable 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.

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

Another potential oversight issue for Congress is whether the Navy's plans for developing and procuring long-range carrier-based aircraft and long-range ship- and aircraft-launched weapons are appropriate. 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.¹⁸⁶

CBARS Aircraft (Previously 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. Some of these observers view the

¹⁸³ See, for example, Audrey McAvoy, "US Pacific Fleet Shrinks Even as China Grows More Aggressive," *ABC News (Associated Press)*, January 5, 2016; Seth Cropsey, "S.O.S. for a Declining American Navy," *Wall Street Journal*, January 6, 2016.

¹⁸⁴ For further discussion, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by (name redacted) .

¹⁸⁵ For further discussion, see CRS Report RL32665, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, by (name redacted) .

¹⁸⁶ 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. See also Anthony Capaccio, "U.S. Must Deploy Anti-Ship Missile in Asia, Admiral Says," *Bloomberg*, February 23, 2016; Megan Eckstein, "Harris: PACOM Needs More Subs, Long-Range Missiles To Counter Chinese Threats," *USNI News*, February 25, 2016.

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.

Navy plans for doing this had centered on a program called the Unmanned Carrier Launched Airborne Surveillance and Strike (UCLASS) aircraft. The operational requirements for the UCLASS aircraft were a matter of some debate, with a key issue being whether the UCLASS should be optimized for penetrating heavily defended air space and conducting strike operations at long ranges, or for long-endurance intelligence, surveillance, and reconnaissance (ISR) operations (with a limited secondary capacity for conducting strike operations).¹⁸⁷ The issue was the topic of a July 16, 2014, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee.

As part of its proposed FY2017 budget, the Navy is proposing to replace UCLASS effort with a restructured program to develop and field rapidly a new carrier-based refueling UAV called the carrier based aerial refueling system (CBARS). CBARS could extend the operational range of the manned aircraft in Navy carrier air wings.

Long-Range Anti-Ship and Land Attack Missiles

Some observers have stressed a need for the Navy to develop and field longer-ranged anti-ship and land-attack missiles, so that U.S. Navy ships would not be out-ranged by Chinese navy ships armed with long-range ASCMs, and so that U.S. Navy ships would be able to achieve military effects while operating outside the ranges of other Chinese A2/AD weapons. The U.S. Navy now has a number of efforts underway to develop and field such weapons. Some of these efforts focusing on modifying existing weapons so as to achieve new capabilities in the near term; other efforts involve developing new-design, next-generation weapons that would be fielded in later years. At a February 25, 2016, hearing before the Seapower and Projection Forces subcommittee of the House Armed Services Committee, Navy officials summarized these efforts, stating that

The Department[of the Navy]’s Cruise Missile Strategy is fully funded in the PB17 [President’s Budget for FY2017] budget submission. Developmental and sustaining efforts of this strategy include: support of Tomahawk Land Attack Block III and Tactical Tomahawk (TACTOM) Block IV through anticipated service lives; integration of modernization and obsolescence upgrades to TACTCOM during a mid-life recertification program (which adds 15-years of additional missile service life), fielding of the Long Range Anti-Ship Missile (LRASM) as the Offensive Anti-Surface Warfare (OASuW) Increment 1 material solution to meet near to mid-term threats, and development of follow-on Next Generation Strike Capability (NGSC) weapons to address future threats and to replace or update legacy weapons, while bringing next generation technologies into the Navy’s standoff conventional strike capabilities. NGSC will address both the OASuW Increment 2 capabilities to counter long-term anti-surface warfare threats, and the [requirement for the] Next Generation Land Attack Weapon (NGLAW) to initially complement, and then replace, current land attack cruise missile weapon systems.

Tomahawk provides an attack capability against fixed and mobile targets and can be launched from both surface ships and submarines. The current variant’s, TACTOM, 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. As

¹⁸⁷ 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.

part of our distributed lethality plan, the Navy will also commence development of an all-weather seeker into the Block IV Tomahawk weapon system.

The FY 2017 budget request supports the completion of technology maturation and initiation of integration and test of the air-launched OASuW/Increment 1 program and procurement of the initial All-Up-Round weapons. Increment 1 provides Combatant Commanders the ability to conduct ASuW operations against high value surface combatants and denies adversaries the sanctuary of maneuver. The program has completed transition from Defense Advanced Research Projects Agency to Navy leadership and is scheduled to field on the B-1 [bomber] by the end of FY 2018 and F/A-18E/F by the end of FY 2019.

To ensure Navy maintains its strike capability in the next decade and beyond, the Department is pursuing an overarching NGSC strategy to develop a family of more lethal, survivable, and affordable multi-mission standoff weapons employable from multiple platforms. The family of NGSC weapons will be capable of attacking land and maritime, stationary and mobile targets while supporting two of the Navy's primary mission areas: power projection (land attack from the air/sea/undersea) and sea control against enemy surface action groups and other combatants (ASuW). To the maximum extent possible, the Navy plans to utilize common components and component technologies (e.g. navigation, communications, seeker, guidance and control) to reduce cost, shorten development timelines, and promote interoperability. Based on performance requirements and launch parameters, it is likely the missile airframes and propulsion systems will differ between the air-launched and sea-launched weapons. The NGLAW is planned as the follow-on surface/sub-surface launched long-range strike capability to address the 2028 (and beyond) land attack and ASuW threats and gaps. NGLAW is envisioned to complement, and then eventually replace, the Tomahawk Weapon System, which will be operational until the mid-late 2040s. OASuW Increment 2 is planned to address the long-term air-launched anti-surface warfare requirements for employment within advanced anti-access environments.¹⁸⁸

A December 14, 2015, press report states:

Worried about China's increasing naval might, the U.S. Navy is scrambling to buy new anti-ship missiles for the first time in decades and throwing out its old playbook for war strategy in the Pacific....

The emerging threat from China in particular has prompted American naval commanders to reevaluate their war-fighting strategy and to rush work on a new anti-ship missile for surface ships. The Pentagon plans to modify existing missiles that initially had been designed for other purposes, starting with the Tomahawk, which traditionally had been used against stationary targets on land....

The last time the American Navy sank another ship was in 1988, when the Perry-class frigate USS Simpson knocked out an Iranian gunboat four days after an Iranian mine struck an American vessel in the Persian Gulf. The Simpson was retired from the Navy's fleet this past September.

¹⁸⁸ 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 Robert S. Walsh, 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, 2016, pp. 24-26.

In the years since that showdown, the American fleet developed sophisticated missile defenses, drones, sonars, new fighter jets, and other hardware. But the Navy still has the same Harpoon anti-ship missiles that were first fielded in 1977.

Military officers believe Chinese warships could possibly shoot down or outmaneuver the aging Harpoon in a conflict, and that more sophisticated weapons are needed to provide the United States with a credible counterweight.

As a result, the Navy is pushing to arm its surface vessels and submarines with more effective anti-ship missiles with longer ranges — and better chances of evading high-tech defenses. Researchers tested a converted Tomahawk last January to see if it could hit a moving target at sea, and defense officials said the test was a success. The Navy plans to start deploying the weapon in “the fleet in the next few years,” said Lt. Robert Myers, a Navy spokesman.

The Navy is also studying the possibility of modifying a newer weapon, the Long Range Anti-Ship Missile, which is designed to be fired from an aircraft. Other options include a Norwegian manufactured naval strike missile that is already in production, or rejiggering a sophisticated air defense missile, the SM-6.¹⁸⁹

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 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.

A September 22, 2015, press report states:

Beyond visual range air-to-air missiles (BVRAAM) are long-range missiles used by fighters to knock out enemy fighters, bombers, tankers, drones and other aircraft from ranges beyond 30km. On September 15, 2015, China successfully test fired its latest iteration, the PL-15, firing from a fighter to destroy a target drone.

The PL-15 is developed by the 607 Institute. It is the replacement for China's current BVRAAM, the radar guided, PL-12, which reportedly has a range of approximately 100km. Compared to the PL-12, the PL-15 has an improved active radar seeker and jam-resistant datalinks, along with a dual pulse rocket motor to extend its range.

Even in the prototype stage, the PL-15 is already an international star. Speaking at the 2015 Air Force Association conference the same week as the test, USAF Air Combatant Commander General Hawk Carlisle cited the PL-15 as the reason for Congress to fund a new missile to replace the American AMRAAM. His reasons for concern is the PL-15's range. By incorporating a ramjet engine, its range could reach 150-200km, was well as its

¹⁸⁹ Dan De Luce, “The U.S. Navy Wants to Show China Who’s Boss,” *Foreign Policy*, December 14, 2015.

terminal maneuverability. That would out-range existing American air-to-air missiles, making the PL-15 not just a threat to fighters like the F-35, but also to US bombers and aerial tankers critical to American air operations across the vast Pacific. General Carlisle called "out-sticking" the PL-15 a high priority for the USAF.

As the PL-15 moves to deployment stage, it will equip Chinese stealth fighter jets, such as the J-20 and J-31, as well as the older J-10, J-11, J-15 and J-16 fighters. This makes keeping up with the PL-15 an important part of American efforts to out-do an innovative and improving Chinese military system.¹⁹⁰

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.

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."¹⁹¹ 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.¹⁹²

¹⁹⁰ Jeffrey Lin and P.W. Singer, "Chinese Air-to-Air Missile Hits Targets, Spooks USAF Generals," *Popular Science*, September 22, 2015.

¹⁹¹ David A. Fulghum, "USAF: Slash And Burn Defense Cuts Will Cost Missions, Capabilities," *Aerospace Daily & Defense Report*, September 30, 2011: 6.

¹⁹² "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.

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.¹⁹³ 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 (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),¹⁹⁴ and accelerating development and deployment of the electromagnetic rail gun (EMRG), 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.¹⁹⁵

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."¹⁹⁶

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).

¹⁹³ 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.

¹⁹⁴ 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 (name redacted) .

¹⁹⁵ 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. See also Sydney J. Freedberg Jr., "Cyber, EW Are Secret Missile Defense Weapons Too Secret To Use," *Breaking Defense*, December 4, 2015.

¹⁹⁶ Greg Sheridan, "China's Military Provocation in The Pacific An Accident Waiting to Happen," *The Australian*, August 9, 2014.

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."¹⁹⁷

A May 21, 2014, press report states:

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.¹⁹⁸

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."¹⁹⁹

¹⁹⁷ Michael Fabey, "Ford Carriers Sport New Radars To Deflect Threats," *Aviation Week & Space Technology* (<http://aviationweek.com>), May 29, 2014.

¹⁹⁸ Jon Harper, "Navy's Top Admiral: Reducing Carrier Fleet Would Burn Out Sailors, Ships," *Stars and Stripes* (www.stripes.com), May 21, 2014.

¹⁹⁹ Michael Fabey, "U.S. Navy Looks To 'Series of Systems' To Counter Chinese Anti-Ship Missile," *Aerospace Daily & Defense Report*, April 24, 2014: 5. See also Spencer Ackerman, "How To Kill China's 'Carrier-Killer' Missile: Jam, Spoof And Shoot," *Danger Room (Wired.com)*, March 16, 2012; 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.

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:

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.²⁰⁰

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.²⁰¹

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.²⁰²

²⁰⁰ Department of Defense, Director, Operational Test and Evaluation, *FY 2011 Annual Report*, December 2011, p. 294.

²⁰¹ 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.

²⁰² Christopher J. Castelli, "DOD Testing Chief Drops Public Discussion Of ASBM Target Shortfall," *Inside the Navy*, January 21, 2013.

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 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.²⁰³ In November 2015, it was reported that during the weekend of October 24, 2015, a Chinese attack submarine closely trailed the U.S. Navy aircraft carrier *Ronald Reagan* (CVN-76) while it was steaming around the southern end of Japan toward the Sea of Japan; the event was reported to be the closest encounter between a Chinese submarine and a U.S. Navy aircraft carrier since 2006.²⁰⁴ In December 2015, it was reported that during the encounter, the submarine conducted a simulated missile attack on the carrier.²⁰⁵

Improving the Navy's ability to counter China's submarines could involve further increasing ASW training exercises,²⁰⁶ 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).²⁰⁷ 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.²⁰⁸

²⁰³ 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.

²⁰⁴ Bill Gertz, "Chinese Submarine Stalked U.S. Aircraft Carrier," *Washington Free Beacon*, November 3, 2015; Franz-Stefan Gady, "Closest Encounter Since 2006: Chinese Submarines Tailed US Aircraft Carrier," *The Diplomat*, November 4, 2015.

²⁰⁵ Bill Gertz, "Chinese Submarine Practiced Missile Attack on USS Reagan," *Washington Free Beacon*, December 15, 2015.

²⁰⁶ For a press report of one such exercise, see David S. Cloud, "Aboard A U.S. Nuclear Sub, A Cat-and-Mouse Game with Phantom Foes," *Los Angeles Times*, September 25, 2015.

²⁰⁷ 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*, October 24, 2014; Richard Scott, "Nodes, Networks And Autonomy: Charting A Course For Future ASW," *Jane's International Defence Review*, December 2014: 47-51; "Japan, U.S. Running Undersea Listening Post to Detect Chinese Subs," *Japan Times*, September 10, 2015.

²⁰⁸ For articles discussing torpedo defense systems, including ATTs, see Richard Scott, "Ships Shore Up," *Jane's* (continued...)

Navy's Fleet Architecture

Some observers, viewing China's maritime anti-access/area-denial (A2/AD) forces, 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 aircraft carriers and other large ships and an increased reliance on smaller ships. 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. The issue was examined, for example, in a report by DOD's Office of Force Transformation (OFT) that was submitted to Congress in 2005.²⁰⁹

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 could also argue that the Navy has already taken important steps toward fielding a more distributed fleet architecture through its plan to acquire 40 LCSs and 12 JHSVs, and through the surface fleet's recently announced concept of distributed lethality, under which offensive weapons are to be distributed more widely across all types of Navy surface ships and new operational concepts for Navy surface ship formations are to be implemented.²¹⁰

(...continued)

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.

²⁰⁹ 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 (name redacted). 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.

²¹⁰ Navy surface fleet leaders announced the distributed lethality concept in early 2015. The aim of distributed lethality is to boost the surface fleet's capability for attacking enemy ships and make it less possible for an enemy to cripple the U.S. fleet by concentrating its attacks on a few very-high-value Navy surface ships (particularly the Navy's aircraft carriers). See Thomas Rowden, Peter Gumataotao, and Peter Fanta, "Distributed Lethality," *U.S. Naval Institute Proceedings*, January 2015: 18-23; Sam LaGrone, "SNA: Navy Surface Leaders Pitch More Lethal Ships, Surface Action Groups," *USNI News*, January 14, 2015; Kris Osborn, "Navy Unveils New Surface Warfare Strategy," *Military.com*, January 14, 2015; Sydney J. Freedberg Jr., "'If It Floats, It Fights,': Navy Seeks 'Distributed Lethality,'" *Breaking Defense*, January 14, 2015; Mike McCarthy and Megan Eckstein, "Navy Eyeing A 'Hunter Killer' Surface (continued...)"

Legislative Activity for FY2017

The Navy's proposed FY2017 budget was submitted to Congress on February 9, 2016.

(...continued)

Fleet, Would Require Upgunning Existing Ship Fleets," *Defense Daily*, January 15, 2015: 1-3; Richard Scott, "Offensive Language: USN Sets Out Surface Firepower Strategy," *Jane's International Defence Review*, May 2015: 42-47; Megan Eckstein, "Navy Studying Implications of Distributed Lethality in Wargames Series," *USNI News*, July 9, 2015; Lara Seligman, "Navy Establishes Task Force To Study Impact of Distributed lethality," *Inside the Navy*, July 10, 2015.

Appendix A. 2014 ONI Testimony on China's Navy

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 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.²¹¹

²¹¹ [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/> (continued...)

Appendix B. Joint Concept for Access and Maneuver in Global Commons (JAM-GC)

This appendix provides additional background information Joint Concept for Access and Maneuver in the Global Commons (JAM-GC), previously known as Air-Sea Battle (ASB).

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.²¹² 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

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²¹² 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.”

the difference between AirLand Battle and the AirSea Battle concept. National or military strategies employ 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.²¹³

DOD Unclassified Summary Released June 2013

On June 3, 2013, DOD released an unclassified summary of the Air-Sea Battle concept.²¹⁴ The following pages reprint the document.

²¹³ Source: transcript of hearing.

²¹⁴ 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 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=

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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.

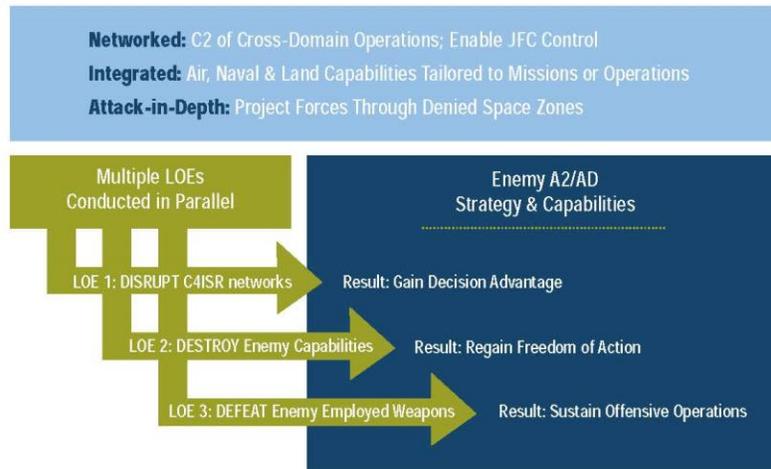


Figure 1. Components of ASB's Conceptual Design 'NIA/D3'

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.

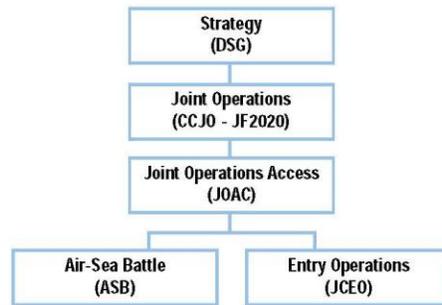


Figure 2. Relationship between Strategy, CCJO, JOAC, JCEO & ASB

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.

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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

Author Contact Information

(name redacted)
Specialist in Naval Affairs
[redacted]@crs.loc.gov7-....

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