

JANUARY 2024

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*Building Future Capabilities in the Time of AUKUS*

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MARK F. CANSIAN

A Report of the CSIS Defense-Industrial Initiatives Group

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# Executive Summary

This report aims to help the defense industry and governments identify future capabilities to deal with the rising challenge from China. The AUKUS agreement has been a major development in facing this challenge, but insights here apply to the full spectrum of U.S. allies and partners in the Pacific. Although strategists seek to expand the number of submarines, the U.S. submarine fleet will not grow beyond its current size until the 2040s. Thus, the project studies wargames and the war in Ukraine to identify ways for the United States and its partners to manage this submarine gap.

## The Challenge Ahead

The need for action is clear. China's military buildup is well documented and continuing. Its fleet now outnumbers the U.S. Navy, and its ground-based missile force is massive. The United States has many partners and allies in the region, but the lack of an integrating structure like the North Atlantic Treaty Organization (NATO) means that any coalition responding to Chinese aggression must be developed bilaterally. This requires U.S. presence and leadership.

The AUKUS agreement between Australia, the United Kingdom, and the United States represents a major development in the Western Pacific. Pillar 1 of the agreement will develop an Australian nuclear submarine capability and enhance U.S. submarine presence in Australia. Pillar 2 seeks to share emerging technologies across the three countries. The insights of this report relate particularly to Pillar 2.

Strategists inside and outside of government see submarines as a key capability in a conflict with China because of the stealth and firepower of these platforms. They have proposed U.S. submarine fleets ranging in size from 66 to 78 vessels, compared to the current fleet of 53. However, the U.S. submarine fleet will decline through the 2020s due to a lack of submarine construction in the 1990s, reaching a low of 46 in 2030 before rebuilding and returning

to the current level in the late 2030s. Fleet levels after that are highly speculative, but even under optimistic circumstances, the submarine fleet will not reach the size targeted by strategists until the 2040s or beyond.

## Filling the Gap

What should the United States and its partners do to manage the impending gap in submarine numbers over the coming decades?

Wargames of a Chinese invasion, blockade, or gray zone squeeze of Taiwan illuminate capabilities that would be helpful. Early assessments of the war in Ukraine give additional insights.

The following provides a thematic menu of possibilities. Some are available in the near term, while others are possible in the longer term. Not all will work out, but many could evolve into programs of record that would balance China's military buildup, enhance deterrence, and strengthen warfighting if deterrence fails.

### **Make existing submarines more effective:**

- Large uncrewed underwater vessels (UUVs) can operate autonomously inside the Chinese defensive zone.
- Medium UUVs can extend the reach of individual submarines.
- Enhanced submarine maintenance would increase the number of operational submarines.

### **Bring more forces to bear more effectively:**

- Deployable command, control, communications, and intelligence (C3I) packages would allow U.S. forces to link more effectively with allies and partners.
- Contractors can expand coalition training without diverting military personnel.
- Operational contracting can supplement limited military logistics units in providing the logistics needed to cover the vast expanses of the Pacific.

### **Plan to operate in a hostile environment:**

- Dispersed aircraft basing complicates Chinese targeting.
- Building hardened aircraft shelters would protect aircraft remaining at large bases during conflict.
- Stronger surface ship defenses would allow operations deeper inside the Chinese defensive zone.
- Assisting Taiwan in developing a balanced force with both traditional and asymmetric capabilities would hedge against the spectrum of threats it faces, from gray zone harassment to invasion.
- Sustaining efforts to build resilience against cyberattacks would help prevent such attacks from having an operational or strategic effect even if they cannot be fully thwarted.
- Backup systems for communications and geolocation would provide a hedge against jamming and GPS spoofing.
- Peacetime preparations can enhance wartime operations in an environment where logistics are contested.

### **Hedge against unconventional threats:**

- Stronger countermine capabilities, long neglected by the U.S. Navy, would protect against a common adversary tactic.

- Counter-swarming capabilities would allow military and civilian ships to continue operations without resorting to lethal force against harassing elements.
- Uncrewed aerial systems (UASs) could be used to harass Chinese harassers.

**Defend against air threats in all their manifestations:**

- Upgraded defenses against cruise and ballistic missiles would protect forces against an expanding and constantly evolving threat.
- Expanding and fielding systems to counter adversary UASs would protect friendly forces from adversary reconnaissance and attack amid the ubiquity of such systems on the battlefield, and defensive systems against aircraft are generally too expensive for this use.

**Think offensively, even when on the defensive:**

- Enhanced jamming and counter-C3I would disrupt China's ability to coordinate forces.
- Uncrewed surface vessels (USVs) can extend the awareness and reach of crewed vessels.
- UASs can perform missions that are too dangerous, extended, or monotonous for crewed platforms.
- Hypersonic missiles, even if niche weapons, can contribute to campaigns by attacking high-value, well-defended targets.
- Sea mines with standoff capabilities can emplace minefields with less risk to the launch platforms.

This report does not make recommendations on which of these capabilities to pursue. That requires an in-depth analysis of each capability's cost, technological maturity, operational effectiveness, and political acceptability. The report does recommend moving forward across many possibilities to illuminate the most promising approaches and to provide signals to industry about where it should focus its attention and resources.



# Why This Study?

Pacific security has been at the top of the national security agenda since at least 2014, when the Obama administration announced an end to the United States' focus on counterinsurgency and regional stability and laid out five challenges: Russia, China, North Korea, Iran, and global terrorism. China was challenge number two after Russia, which had just occupied Crimea. The Trump administration continued this framework, clearly articulated a new focus on great power conflict, and moved China to the top position ahead of Russia. The Biden administration has essentially continued this approach.<sup>1</sup>

The most dramatic recent event in this space has been the signing of the AUKUS agreement between Australia, the United Kingdom, and the United States to develop a nuclear-powered Australian submarine fleet and share key technologies. The challenge from China and the AUKUS response has spawned a wide variety of analyses. This study adds to that body of research by focusing on one key question: What promising technologies are available in the near and mid-term to enhance capabilities while the United States and its partners wait for this expanded submarine force to arrive? The report aims to help industry work with governments to pursue these capabilities.

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1 For example, compare the similar threat descriptions in U.S. Department of Defense, *Quadrennial Defense Review 2014* (Washington, DC: Department of Defense, March 2014), v, <https://history.defense.gov/Portals/70/Documents/quadrennial/QDR2014.pdf?ver=tXH94SVvSQLVw-ENZ-a2pQ%3d%3d>; U.S. Department of Defense, *Summary of the 2018 National Defense Strategy of the United States* (Washington, DC: Department of Defense, January 2018), 1, <https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf>; and U.S. Department of Defense, *National Defense Strategy of the United States of America* (Washington, DC: Department of Defense, October 2022), 2, <https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.PDF>.

The report does not claim to be a comprehensive analysis of what is needed to compete against China. That would include new operational concepts, force posture, force readiness, force size and structure, relations with partners and allies, and budget—all important topics but beyond the scope of this project.

After this short introduction, the report is organized as follows:

Chapter 2 examines today's security environment in the Western Pacific, including a brief overview of the challenge from China, U.S. alliances and partnerships in the region, and finally the AUKUS agreement.

Chapter 3 describes what wargames and campaign analyses say about potentially useful capabilities. The chapter concludes with insights from the war in Ukraine.

Chapter 4 analyzes the U.S. submarine fleet and the submarine industrial base. It concludes that while additional submarines would provide critical capabilities, the U.S. submarine fleet will decline through the mid-2030s. Therefore, enhanced near and midterm capabilities will need to come from elsewhere to meet China's rising military challenge.

Finally, Chapter 5 pulls all these threads together. It identifies capabilities that should be expanded, technological areas for exploration, and some services that the defense industry might provide.

# Today's Security Environment in the Western Pacific

## *China's Challenge, U.S. Alliances, and AUKUS*

This chapter sets the stage by exploring three key elements of today's security environment in the Western Pacific: the China challenge, U.S. alliances and partnerships, and the AUKUS agreement. These shape the military requirements the United States, Australia, and other partners must meet to compete in this environment.

### **China's Challenge**

It is commonplace to note how China has become increasingly assertive diplomatically and politically, backed by a massive military expansion. This assertiveness arises from China's view of itself as an alternative to the U.S.-led international system based on free markets and democratic values. As a result, the Biden administration's National Security Strategy identifies China as the primary global competitor to the United States: "The PRC is the only competitor with both the intent to reshape the international order and, increasingly, the economic, diplomatic, military, and technological power to do it. Beijing has ambitions to create an enhanced sphere of influence in the Indo-Pacific and to become the world's leading power."<sup>2</sup> In response, Congress has taken several legislative actions, from bolstering U.S. semiconductor manufacturing via the CHIPS Act of 2022 to cutting off U.S. funding from Chinese entities that abuse human rights via the Uyghur Forced Labor Prevention Act of 2021.<sup>3</sup> The House of Representatives has created a committee focused on China: the House Select Committee on Strategic

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2 The White House, *National Security Strategy* (Washington, DC: White House, October 2022), 23, <https://www.whitehouse.gov/wp-content/uploads/2022/10/Biden-Harris-Administrations-National-Security-Strategy-10.2022.pdf>.

3 *Chips and Science Act*, H.R.4346, 117th Congress, 1st sess., introduced July 1, 2021, <https://www.congress.gov/bill/117th-congress/house-bill/4346/text>; and "Uyghur Forced Labor Prevention Act," U.S. Customs and Border Protection, updated July 21, 2023, <https://www.cbp.gov/trade/forced-labor/UFLPA>.

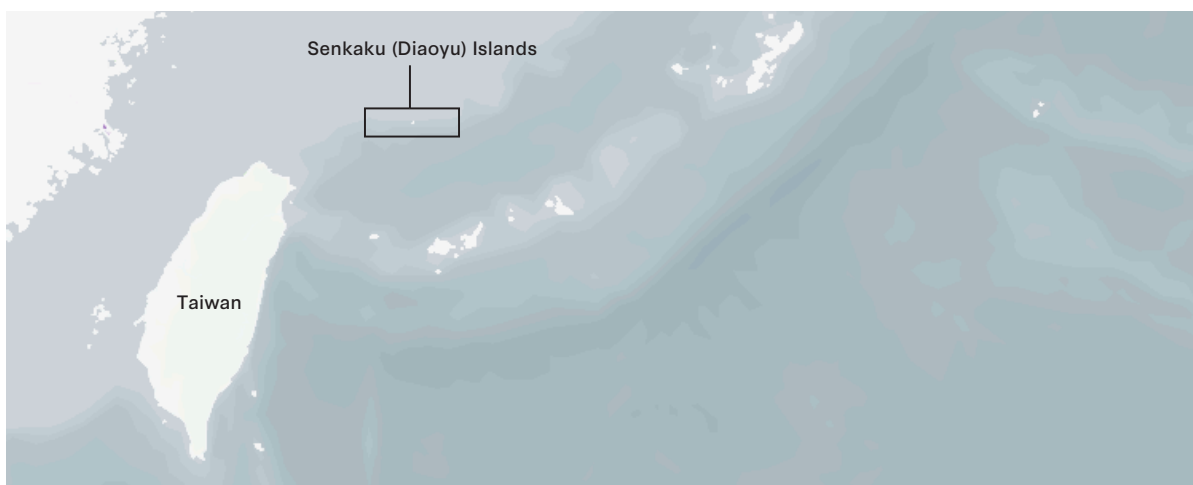
Competition between the United States and the Chinese Communist Party.<sup>4</sup>

To implement its new strategic vision, China began a long-term military modernization program in the late 1990s, focusing particularly on air and maritime capabilities. This was a change from China's previous military strategy, which was land-focused, relied on masses of poorly trained conscripts, and could not exert influence at a distance from its borders. Its poor performance in the 1979 border war with Vietnam underscored its weakness, as did the 1996 transit of the Taiwan Strait by U.S. naval forces.

This has changed. As the Department of Defense (DOD)'s annual assessment of Chinese military power notes:

In 2022, the PRC turned to the PLA [People's Liberation Army] as an increasingly capable instrument of statecraft. Throughout the year, the PLA adopted more coercive actions in the Indo-Pacific region while accelerating its development of capabilities and concepts to strengthen the PRC's ability to "fight and win wars" against a "strong enemy," counter an intervention by a third party in a conflict along the PRC's periphery, and to project power globally.<sup>5</sup>

### Map 1: Taiwan and Senkaku (Diaoyu) Islands



The DOD report also documents the continuing expansion of the Chinese military. The Chinese navy—the People's Liberation Army Navy (PLAN)—grew from 216 ships in 2005 to 351 ships in 2022, making it nearly 60 ships larger than the U.S. Navy.<sup>6</sup> China's nuclear modernization has accelerated, growing from 300 to 500

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4 For a description of the committee's activities, see its website at <https://selectcommitteeontheccp.house.gov/>.

5 Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China 2023* (Washington, DC: Department of Defense, 2023), i-ii, <https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF>.

6 PLAN fleet size from Ronald O'Rourke, *China Military Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress*, CRS Report No. RL33153 (Washington, DC: Congressional Research Service, October 2023), 9, (based on DOD annual reports on Chinese military power), <https://sgp.fas.org/crs/row/RL33153.pdf>. Many analysts argue that ship count is a weak metric for naval strength and that others like tonnage and missile tubes are better. By these measures, The United states still

nuclear warheads, “exceed[ing] some of our [DOD’s] previous expectations.”<sup>7</sup>

This military buildup and assertive diplomacy—characterized in China as a “wolf warrior” attitude—pose challenges to countries in the region.<sup>8</sup> Three challenges—to Taiwan, Japan, and the South China Sea region—are particularly important:

- **Taiwan:** China has been emphatic that Taiwan is a part of greater China. It therefore regards Taiwan as a renegade province, not an independent or autonomous entity. China has also been clear about its intention to reunite Taiwan with the mainland and that it will not renounce the use of force to achieve reunification.<sup>9</sup>

Admiral Philip S. Davidson, commander of U.S. Indo-Pacific Command (INDOPACOM) until April 2021, testified the same year that the Chinese threat to invade Taiwan “is manifest . . . in the next six years.”<sup>10</sup> Although others have disputed the timetable, the sense of threat from China has become much more acute. The notion of a “Davidson window” has thus entered the national security vocabulary.

**Japan:** Japan and China have a long history of conflict, from the Mongol invasions of the thirteenth century to the Japanese invasion of China in the 1930s and 1940s. Recently, those tensions have focused on the Senkaku Islands (called the Diaoyu Islands by China), which both nations claim. China has sailed warships near Japan and fired missiles into Japan’s Exclusive Economic Zone. Japan also has concerns about China’s client, North Korea, which has launched missiles over Japan and regularly threatens nuclear holocaust.

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*Admiral Philip S. Davidson, commander of U.S. Indo-Pacific Command (INDOPACOM) until April 2021, testified the same year that the Chinese threat to invade Taiwan “is manifest . . . in the next six years.” . . . The notion of a “Davidson window” has thus entered the national security vocabulary.*

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maintains a lead, though that lead is diminishing. See, for example, Louis Johnson, “Is Nikki Haley’s Measurement of Naval Power Correct? Fact Check,” *Tampa Bay Times*, December 8, 2023, <https://www.tampabay.com/news/florida-politics/2023/12/09/haley-naval-ships-us-china-politifact/>.

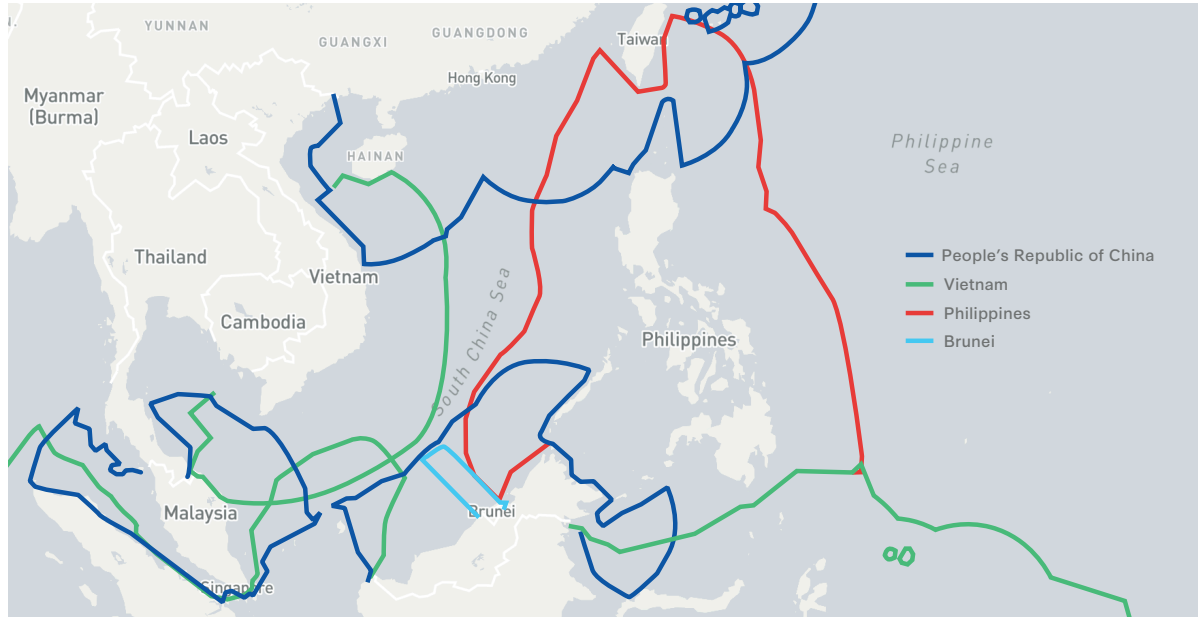
7 Jim Garamone, “DOD Report Details Chinese Efforts to Build Military Power,” U.S. Department of Defense, October 19, 2023, <https://www.defense.gov/News/News-Stories/Article/Article/3562442/dod-report-details-chinese-efforts-to-build-military-power/>.

8 For a description of “wolf warrior” diplomacy and its derivation, see Bonny Glaser, host, “China’s Wolf Warrior Diplomacy: A Conversation with Peter Martin,” *ChinaPower Podcast*, CSIS, February 2, 2021, <https://www.csis.org/podcasts/chinapower/chinas-wolf-warrior-diplomacy-conversation-peter-martin>.

9 Yew Lun Tian and Ben Blanchard, “China Will Never Renounce Right to Use Force over Taiwan, Xi Says,” Reuters, October 16, 2022, <https://www.reuters.com/world/china/xi-china-will-never-renounce-right-use-force-over-taiwan-2022-10-16/>.

10 Mallory Shelbourne, “Davidson: China Could Try to Take Control of Taiwan in ‘Next Six Years,’” USNI News, March 9, 2021, <https://news.usni.org/2021/03/09/davidson-china-could-try-to-take-control-of-taiwan-in-next-six-years>.

## Map 2: Maritime Claims in South China Sea



Source: "Maritime Claims of the Indo-Pacific," *Asia Maritime Transparency Initiative*, CSIS, <https://amti.csis.org/maritime-claims-map/>.

**South China Sea region:** Although recent attention has focused on Taiwan, the South China Sea is also a region of intense competition. The region is important because of the high level of seaborne traffic and large oil and gas deposits.<sup>11</sup> China's infamous "nine-dash line," by which China seeks to claim most of the South China Sea, exacerbates regional tensions.<sup>12</sup> These claims have put China in competition with the Philippines, Vietnam, Malaysia, Brunei, and Taiwan, which also have territorial claims. China has been aggressive in asserting its claims, including by building and fortifying artificial islands in the region, demanding that ships and aircraft recognize an expanded Chinese identification zone, and harassing the ships of other nations. Such tactics were seen recently as China endeavored to prevent the Philippines from resupplying a garrison in the Second Thomas Shoals.<sup>13</sup> The United States does not take a position on territorial claims but regularly conducts freedom of navigation operations in the region, to which China strongly objects.

11 Ben Dolven, Caitlin Campbell, and Ronald O'Rourke, "China Primer: South China Sea Disputes," Congressional Research Service, IF10607, August 21, 2023, <https://crsreports.congress.gov/product/pdf/IF/IF10607>.

12 China has apparently replaced the "nine-dash line" with a new "ten-dash line." Colin Clark, "New Chinese 10-Dash Map Sparks Furor across Indo-Pacific: Vietnam, India, Philippines, Malaysia," *Breaking Defense*, September 1, 2023, <https://breakingdefense.sites.breakingmedia.com/2023/09/new-chinese-10-dash-map-sparks-furor-across-indo-pacific-vietnam-india-philippines-malaysia/>. For a description of the origins of the "nine-dash line," see "Limits in the Seas No. 143: China Maritime Claims in the South China Sea," U.S. Department of State, December 5, 2014, <https://www.state.gov/wp-content/uploads/2019/10/LIS-143.pdf>.

13 Seth Robson, "Philippine Commodore Fears Territorial Grab after Chinese Ships 'Swarm' Contested Reefs," *Stars & Stripes*, July 11, 2023, [https://www.stripes.com/theaters/asia\\_pacific/2023-07-11/philippines-beijing-south-china-sea-10704090.html](https://www.stripes.com/theaters/asia_pacific/2023-07-11/philippines-beijing-south-china-sea-10704090.html); and Kathleen Magramo, "Philippines Says South China Sea Outpost Resupplied despite Chinese Harassment," *CNN*, August 22, 2023, <https://www.cnn.com/2023/08/22/asia/philippines-brp-sierra-madre-south-china-sea-intl-hnk/index.html>.

## Alliances and Partnerships

The United States has a strong set of Pacific alliances with a variety of wealthy, powerful, and strategically located nations. In addition, the United States has less formal security links to many other countries. However, all these relationships are bilateral, not united through a common structure like the North Atlantic Treaty Organization (NATO). As a result, nations will react individually to any crisis. Such ally countries include:

- **Australia:** The Australia, New Zealand, and United States Security Treaty (ANZUS Treaty) binds the United States, Australia, and New Zealand to meet common dangers together, and the countries have a long security relationship, having fought side by side in six wars: World War I, World War II, Korea, Vietnam, Desert Storm, and Iraq.<sup>14</sup> The relationship has become closer with the AUKUS agreement (discussed later) and regular rotations of U.S. aircraft and Marines to bases in northern Australia.

China has attempted to squeeze Australia economically to make Australia's policies more China friendly. For example, in 2020, after Canberra questioned the origins of Covid-19, China imposed restrictions on the import of Australian beef, wine, and other commodities.<sup>15</sup> This alerted Australia to the dangers that China posed. In a 2022 event held at CSIS, Australian deputy prime minister and defense minister Richard Marles noted, "For the first time in decades, we are thinking hard about the security of our own strategic geography; the viability of our trade and supply routes; and above all the preservation of an inclusive regional order founded on rules agreed by all, not the coercive capabilities of a few."<sup>16</sup>

Australia is a strong democracy with high-quality armed forces. As Australia's 2023 Defence Strategic Review states, a close relationship with the United States has ensured that, since the 1960s, "While small in size, the ADF [Australian Defense Force] was [is] highly capable and could outmatch potential regional opponents in critical areas of technology, planning, and operations."<sup>17</sup>

The downside is that Australia's armed forces are relatively small, and Australia is far from some potential conflict zones.

- **Japan:** The United States and Japan are bound through the Treaty of Mutual Cooperation and Security of 1960. This authorizes the United States to station troops in Japan and obligates the parties to defend each other if either is attacked on the territories administered by Japan.<sup>18</sup> This alliance is particularly important because 53,600 U.S. troops are stationed in Japan, about half on Okinawa.<sup>19</sup> The Japanese constitution

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14 "Australia and the United States," Australia Embassy and Consulates, November 14, 2022, <https://usa.embassy.gov.au/australia-and-united-states>.

15 Matthew Reynolds and Matthew P. Goodman, *Deny, Deflect, Deter: Countering China's Economic Coercion* (Washington, DC: CSIS, March 2023), <https://www.csis.org/analysis/deny-deflect-deter-countering-chinas-economic-coercion>.

16 "The U.S.-Australia Alliance: Aligning Priorities in the Indo-Pacific with Deputy Prime Minister Richard Marles," (public event, CSIS, July 11, 2022), <https://www.csis.org/events/us-australia-alliance-aligning-priorities-indo-pacific-deputy-prime-minister-richard-marles>.

17 Department of Defence, *National Defence: Defence Strategic Review 2023* (Canberra: Commonwealth of Australia, 2023), <https://www.defence.gov.au/about/reviews-inquiries/defence-strategic-review>.

18 "Japan-U.S. Security Treaty," Ministry of Foreign Affairs of Japan, n.d., <https://www.mofa.go.jp/region/n-america/us/q&a/ref/1.html>.

19 Troop strength from "Military and Civilian Personnel by Service/Agency by State/Country - September

allows the country to maintain only self-defense forces as a result of the country's defeat in World War II; indeed, its military is called the Japanese Ground Self Defense Force. For decades, Japanese governments have defined self-defense as 1 percent of GDP and focused on defensive weapons. However, in response to China's aggressiveness, Japan has made plans to acquire more offensive weapons, increase its defense budget above the traditional 1 percent, and conduct exercises aimed at China.<sup>20</sup>

- **South Korea:** The United States and South Korea are bound through the 1953 Mutual Defense Treaty. As a result of the Korean War of 1950 to 1953, the United States still has 24,300 troops stationed in the country and a joint military command with the South Korean armed forces.<sup>21</sup> The Mutual Defense Treaty obligates the parties to defend each other if either is attacked in the Pacific on territories under their administrative control.<sup>22</sup> South Korea has powerful armed forces, but they are designed for national defense. Although South Korea sent combat troops to Vietnam and peacekeepers to Afghanistan, the willingness of the South Koreans to participate in conflict outside of the Korean Peninsula is unclear. South Korean president Yoon Suk Yeol has strengthened ties with the United States and other regional partners such as Japan and has been willing to criticize China. However, he has stated that in the event of a U.S. conflict with China, South Korea would keep its forces at home to deter any aggression by North Korea.<sup>23</sup>
- **The Philippines:** The United States and the Philippines are linked through the 1951 U.S.-Philippines Mutual Defense Treaty and a long history of mutual security arrangements dating back to when the Philippines was a U.S. colony. Although the United States has provided equipment and training over the years, the Philippine armed forces are relatively limited, being equipped with older equipment. A major recent development is a set of agreements by which the Philippines granted the United States access to nine bases.<sup>24</sup>
- **Thailand:** The United States and Thailand are bound to defend each other's territory in the Asia-Pacific by the Southeast Asia Collective Defense Treaty of 1954. As a result, the countries conduct regular military exercises together.<sup>25</sup> However, Thailand's military forces are weak, as are its democratic institutions. This limits the strength of the relationship.

In addition to formal alliances, the United States has security relationships with several countries in the region:

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2023" Defense Manpower Data Center, <https://dwp.dmdc.osd.mil/dwp/app/dod-data-reports/workforce-reports>.

20 Gabriel Dominguez, "With Eye on China, Japan Developing Missiles to Protect Remote Islands," *Japan Times*, June 13, 2023, <https://www.japantimes.co.jp/news/2023/06/13/national/japan-missile-development/>.

21 "Military and Civilian Personnel by Service/Agency by State/Country" DMDC.

22 "Mutual Defense Treaty between the United States and the Republic of Korea; October 1, 1953," Avalon Project, Yale Law School, n.d., [https://avalon.law.yale.edu/20th\\_century/kor001.asp](https://avalon.law.yale.edu/20th_century/kor001.asp).

23 Josh Smith, "Home to 28,000 U.S. Troops, South Korea Unlikely to Avoid a Taiwan Conflict," Reuters, September 27, 2022, <https://www.reuters.com/world/asia-pacific/home-28000-us-troops-skorea-unlikely-avoid-taiwan-conflict-2022-09-26/>.

24 "Philippines, US Announce Locations of Four New EDCA Sites," U.S. Department of Defense, April 3, 2023, <https://www.defense.gov/News/Releases/Release/Article/3349257/philippines-us-announce-locations-of-four-new-edca-sites/>.

25 Murray Hiebert, "The United States Makes Up Critical Terrain in Thailand," CSIS, *Commentary*, September 2, 2022, <https://www.csis.org/analysis/united-states-makes-critical-terrain-thailand>.



- **Taiwan:** Although the United States has no formal security agreement with Taiwan, the Taiwan Relations Act of 1979 states, “Any effort to determine the future of Taiwan by other than peaceful means, including by boycotts or embargoes is considered a threat to the peace and security of the Western Pacific area and of grave concern to the United States.”<sup>26</sup> For decades, U.S. policy has been governed by “strategic ambiguity” regarding how the United States would react to any Chinese attack on Taiwan. However, Congress and President Biden have recently indicated that the United States would defend Taiwan.<sup>27</sup>
- **Singapore:** The United States and Singapore have an agreement that allows U.S. access to port facilities in the city-state but are not formal allies.<sup>28</sup> Singapore’s legendary founder, Lee Kuan Yew, established this relationship after the United Kingdom withdrew from Asia in the 1960s, and it has since been a central element of Singapore’s security architecture. However, that close relationship has faded somewhat since Lee’s death in 2015, and most Singaporeans now view China more positively than the United States.<sup>29</sup> Prime Minister Lee Hsien Loong has stated that Singapore does not want to choose sides in a U.S.-China war.<sup>30</sup>
- **India:** India is a major military power with nuclear weapons and 1,460,000 personnel on active duty in its armed forces.<sup>31</sup> It is also intensely independent, being one of the founding members of the Non-Aligned Movement. It resists the establishment of formal alliances. However, increased tensions with China have compelled India to augment security ties with partners, including the United States, Australia, and Japan. India has been incrementally diversifying its defense imports away from Russia while attempting to jump-start a stronger indigenous defense manufacturing base.
- **Vietnam:** Once bitter enemies, Vietnam and the United States have been pushed together by mutual concerns about China. China is Vietnam’s traditional enemy, having occupied the country at various times in the past and most recently having fought a border war in 1979. Although Vietnam has large ground forces—its army numbers 412,000 personnel—its air and naval forces are limited, and it is overshadowed militarily by China.<sup>32</sup> Therefore, Vietnam is unlikely to participate in a U.S.-China conflict unless attacked directly.

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26 *Taiwan Relations Act*, H.R. 2497, 96th Cong., 1979, <https://www.congress.gov/bill/96th-congress/house-bill/2479>.

27 Brett Samuels, “Biden: US Would Defend Taiwan Militarily If China Invaded,” *The Hill*, May 23, 2022, <https://thehill.com/homenews/administration/3497693-biden-us-would-defend-taiwan-militarily-if-china-invaded/>.

28 “PM Lee Hsien Loong at the Joint Press Conference with US Vice President Kamala Harris (March 2022),” Singapore Prime Minister’s Office, March 30, 2022, <https://www.pmo.gov.sg/Newsroom/Remarks-by-PM-Lee-Hsien-Loong-after-the-meeting-with-US-Vice-President-Kamala-Harris-Mar-2022>.

29 William Choong, “Chinese-U.S. Split Is Forcing Singapore to Choose Sides,” *Foreign Policy*, July 14, 2021, <https://foreignpolicy.com/2021/07/14/singapore-china-us-southeast-asia-asean-geopolitics/>.

30 Huileng Tan and Christine Tan, “‘We Will Be Asked to Pick a Side if US-China Tensions Rise’ Says Asian Leader,” CNBC, October 20, 2017, <https://www.cnbc.com/2017/10/19/singapore-prime-minister-lee-hsien-loong-on-us-china-relationships.html>.

31 International Institute for Strategic Studies, *Military Balance 2022* (London: IISS, February 2022), 265–66, <https://www.iiss.org/publications/the-military-balance/the-military-balance-2022>.

32 *Ibid.*, 315–17.

The bottom line is that the United States will be able to draw on support from many other countries in the event of a crisis or a conflict. However, the amount and nature of the support will depend on the circumstances. Further, any action will require U.S. leadership since all these relationships are bilateral. There is no substitute for U.S. forces and presence.

## AUKUS

AUKUS is a defense collaboration between Australia, the United Kingdom, and the United States that was initially announced in September 2021. A joint report followed from defense industry associations in the three countries. In March 2023, the three countries signed a trilateral agreement describing how AUKUS would be operationalized.<sup>33</sup> The agreement aims to “boost defense capabilities, accelerate technological integration, and expand the industrial capacity of all three nations.”<sup>34</sup> On December 2, 2023, the AUKUS defense ministers met, reaffirmed the three nations’ commitment to the program, and elaborated on implementation plans.<sup>35</sup>

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***Any action will require U.S. leadership since all these relationships are bilateral. There is no substitute for U.S. forces and presence.***

AUKUS has two pillars. Pillar 1 will assist Australia in acquiring conventionally armed nuclear attack submarines (SSNs). Under the agreement, the United States will sell Australia three to five Virginia-class submarines in the early 2030s. The United States will also base a submarine rotational force in western Australia as early as 2027. Starting in 2032, the United Kingdom and Australia will co-develop a new nuclear-powered submarine class to enter service in the late 2030s, with initial production in the UK and later production in Australia. The three nations will cooperate to build a stronger trilateral submarine industrial base.<sup>36</sup> The additional submarine capacity will increase Australia’s ability to defend its sea routes from Chinese interference.<sup>37</sup> The United Kingdom has recently signed contracts for £4 billion (\$5 billion) to develop the

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33 “Operationalizing AUKUS,” Aerospace Industries Association, March 8, 2023, <https://www.aia-aerospace.org/publications/operationalizing-aucus/>; and “Joint Leaders Statement on AUKUS,” The White House, March 13, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/03/13/joint-leaders-statement-on-aucus-2/>.

34 Charles Edel, “The United States, Britain, and Australia Announce the Path Forward for AUKUS,” CSIS, *Critical Questions*, March 16, 2023, <https://www.csis.org/analysis/united-states-britain-and-australia-announce-path-forward-aucus>.

35 “AUKUS Defense Ministers Meeting Joint Statement,” Australian Government Defense, December 2, 2023, <https://www.minister.defence.gov.au/statements/2023-12-02/aucus-defense-ministers-meeting-joint-statement>.

36 Ashley Townshend, “The AUKUS Submarine Deal Highlights a Tectonic Shift in the U.S.-Australia Alliance,” Carnegie Endowment for International Peace, *Commentary*, March 27, 2023, <https://carnegieendowment.org/2023/03/27/aucus-submarine-deal-highlights-tectonic-shift-in-u.s.-australia-alliance-pub-89383>.

37 James Carouso, “AUKUS Is a Big Deal, and Big Deals Should Lead to Big Debates,” CSIS, *Commentary*, April 28, 2023, <https://www.csis.org/analysis/aucus-big-deal-and-big-deals-should-lead-big-debates>.

new submarine design.<sup>38</sup> In addition to submarine construction, Pillar 1 calls for rotating U.S. submarines to Australia's west coast and enhanced basing there.

AUKUS Pillar 2 seeks to enhance cooperation in key technological and functional areas.<sup>39</sup> Eight intragovernmental working groups coordinate Pillar 2 activities: undersea capabilities, quantum technologies, artificial intelligence and autonomy, advanced cyber, hypersonic and counter-hypersonic capabilities, electronic warfare, innovation, and information sharing. The defense ministers identified six capability areas for cooperation (anti-submarine warfare, undersea vehicle launch and recovery, quantum positioning, navigation, and timing, and resilient and autonomous artificial intelligence). The defense ministers also specified a variety of processes and structures for coordinating capability development and conducting experiments.

Pillar 2 activities are expected to help fill the partnership's capability gaps in the decades before Pillar 1's SSN procurement activities take effect.<sup>40</sup> A recent technology readiness experiment (dubbed T-REX 23-2) moved Pillar 2 forward by evaluating 11 advanced technologies.<sup>41</sup>

The agreement has received tremendous fanfare and has the potential for unprecedented military and industrial cooperation among the participants. The deal is particularly important to Australia, as AUKUS is one of the largest military projects the country has ever undertaken.<sup>42</sup> However, as one U.S. official described it, AUKUS will remain a promise rather than a reality for many years. It has great future potential but involves modest steps in the near term.

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38 "£4 Billion UK Contracts Progresses AUKUS Submarine Design," UK Ministry of Defence, October 1, 2023, <https://www.gov.uk/government/news/4-billion-uk-contracts-progresses-aukus-submarine-design>.

39 John Christianson, Sean Monaghan, and Di Cooke, "AUKUS Pillar Two: Advancing the Capabilities of the United States, United Kingdom, and Australia," CSIS, *CSIS Briefs*, July 10, 2023, <https://www.csis.org/analysis/aukus-pillar-two-advancing-capabilities-united-states-united-kingdom-and-australia>.

40 Patrick Parrish and Luke Nicastro, *AUKUS Pillar 2: Background and Issues for Congress*, CRS Report No. R47599 (Washington, DC: Congressional Research Service, 2023), <https://crsreports.congress.gov/product/pdf/R/R47599>.

41 Georgina DiNardo, "DOD says AUKUS Pillar II capabilities tested at recent tech readiness experiment," Inside Defense, November 13, 2023, <https://insidedefense.com/daily-news/dod-says-aukus-pillar-ii-capabilities-tested-recent-tech-readiness-experiment>.

42 Mick Ryan, "AUKUS Submarine Agreement: Historic but Not Yet Smooth Sailing," CSIS, *Commentary*, March 17, 2023, <https://www.csis.org/analysis/aukus-submarine-agreement-historic-not-yet-smooth-sailing>.

# What War and Wargames Say about Conflict in the Western Pacific

Three potential conflicts in the Western Pacific are particularly important to examine because of their plausibility, potential severity, and relevance to AUKUS commitments. The first is a full-scale conventional war between China and a U.S.-led coalition. The second is a blockade of Taiwan. The third is Chinese gray zone activities, particularly in the South China Sea. Collectively, these describe the broad set of military demands that would be put on the United States and its partners and that AUKUS needs to hedge against. Wargames and associated analyses can illuminate the nature of such conflicts and the military requirements that flow from them. A real war—the Russian invasion of Ukraine—provides additional insights. Many other potential conflicts, such as North Korean aggression, constitute serious threats but are less relevant to the AUKUS agreement and competition with China because the conflict would be relatively low-tech (except for missiles and nuclear weapons) and mainly on the ground.

## Chinese Invasion of Taiwan

As noted in the first chapter, China has been unrelenting in its goal of uniting Taiwan with the mainland. A Chinese military invasion of Taiwan may not be the most likely course of action to accomplish this goal. However, given China’s rhetoric and military buildup, an invasion is plausible and the most dangerous Chinese course of action. Several Taiwan-focused wargames warrant consideration:

- **CSIS Wargame:** For the reasons described above, CSIS conducted a project that examined Taiwan invasion scenarios.<sup>43</sup> The project developed a wargame and ran 25 iterations in a dozen scenarios.

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43 Mark F. Cancian, Matthew Cancian, and Eric Heginbotham, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan* (Washington, DC: CSIS, January 2023), <https://www.csis.org/analysis/first-battle-next-war-wargaming-chinese-invasion-taiwan>.

Because the wargame was based entirely on unclassified information, the project could describe the assumptions, mechanics, and results in detail. Several findings bear on requirements for future capabilities:

- Submarines were highly lethal. Whereas surface ships had to pull back in the face of the Chinese anti-ship missile threat, submarines could push into the Chinese defensive bubble, often called the anti-access/area denial (A2/AD) zone or weapons engagement zone.<sup>44</sup> Once inside the Taiwan Strait, they rapidly exhausted their inventories of missiles and torpedoes against the Chinese invasion fleet. Indeed, the project dubbed this the “happy time” for U.S. submarines.

Their ability to strike the Chinese center of gravity, the amphibious ships, made them particularly valuable. However, once submarines expended their munitions, they had to travel to either Sasebo or Guam to reload before returning to the fight. This conveyor belt—strike, return to base, reload, transit back to the war zone, strike again—was effective but slow. U.S. players always wanted more submarines.

Bombers were survivable and highly effective. They could be based outside of Chinese missile range, thus avoiding attack on the ground. Armed with long-range missiles, bombers could launch from outside of the Chinese air defense zone and strike ground and naval targets at relatively low risk.

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### ***Submarines were highly lethal. . . . Their ability to strike the Chinese center of gravity, the amphibious ships, made them particularly valuable.***

- However, long-range anti-ship munitions were too few. The United States ran out of these munitions after just a few days. Their long range was critical, allowing U.S. aircraft to launch from outside of the range of Chinese air defenses.
- U.S. fighter/attack aircraft were most vulnerable on the ground. About 90 percent of U.S. and coalition aircraft losses occurred on the ground to Chinese missile strikes. The Chinese have enough long-range missiles to saturate U.S. bases several times over the course of a conflict.
- Hypersonic missiles were valuable but niche weapons. They were extremely effective in striking high-value defended targets. However, their high cost limits inventories, so they lack the volume needed to counter the immense numbers of Chinese air and naval platforms.
- Surface ships were highly vulnerable to Chinese missile attacks. As long as China retained substantial long-range missile inventories, U.S. and coalition surface ships had to back off to the east

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44 The Center for Strategic and Budgetary Assessments (CSBA) developed the concept of A2/AD strategies. The concept’s original description was in Andrew Krepinevich, Barry Watts, and Robert Work, *Meeting the Anti-Access and Area-Denial Challenge* (Washington, DC: Center for Strategic and Budgetary Assessments, May 2003), <https://csbaonline.org/research/publications/a2ad-anti-access-area-denial>; “weapon engagement zone,” a similar concept comes from Marine Corps strategy documents and is discussed in Michelle Macander and Grace Hwang, “Marine Corps Force Design 2030: Examining the Capabilities and Critiques,” CSIS, *Critical Questions*, July 22, 2022, <https://www.csis.org/analysis/marine-corps-force-design-2030-examining-capabilities-and-critiques>.

of Guam. It was too dangerous for them to remain within range of Chinese anti-ship missiles. Once China's missile inventories declined as they repeatedly struck land targets such as air bases, the surface ships could move forward.

- Taiwan's surface ships and aircraft struggled to survive. These traditional capabilities are valuable in day-to-day operations to counter Chinese harassment and encroachment but are highly vulnerable to the massive and growing Chinese navy and air force in a major conflict. Most Taiwanese surface ships and aircraft were destroyed in the first few days. The balanced force structure that served Taiwan so well from 1949 needs re-examination, a discussion that is already taking place as Taiwanese national security literature considers a "porcupine strategy."<sup>45</sup>
- **CNAS Wargames:** The Center for New American Security (CNAS) has run several wargames on a U.S.-China conflict over Taiwan.<sup>46</sup> These wargames arrived at conclusions similar to those of the CSIS wargame, with several additional insights:
  - The United States has insufficient supporting forces. It also lacks enough access to partner or allied bases across the Indo-Pacific to sufficiently disperse its forces to survive initial attacks and blunt China's initial strikes.
  - The United States needs a greater emphasis on conducting logistics in a contested environment so that it can sustain combat power beyond the first days or weeks of a war.
  - China is likely to engage in nuclear brinkmanship despite its stated "no first use" policy.
  - Taiwan requires improved training for its armed forces, especially its reserves.
  - Taiwan is highly dependent on imports of critical supplies and should stockpile these resources in advance of a conflict.
  - Several critical capabilities are needed, including long-range precision-guided weapons, undersea capabilities such as uncrewed underwater vessels (UUVs), and improved passive and active base defenses.
- **RAND Wargames:** RAND conducted a series of wargames focused especially on technologies that can be applied in the near term. Although the details have not been released and are apparently classified, some general insights are available.<sup>47</sup> Some particularly useful capabilities were as follows:
  - Multi-domain decoys and smart sea mines, which can disrupt the adversary's kill chain.
  - Real-time language translation, which can enhance situational awareness for allies while protecting friendly information.
  - Integrated warfighting networks, which can make better use of networked devices on the tactical edge.

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45 For the original discussion of this strategy, see William S. Murray, "Revisiting Taiwan's Defense Strategy," *Naval War College Review* 61, no. 3 (2008): 13-40, <https://digital-commons.usnwc.edu/nwc-review/vol61/iss3/3/>.

46 Stacie Pettyjohn, Becca Wasser, and Chris Dougherty, *Dangerous Straits: Wargaming a Future Conflict over Taiwan* (Washington, DC: Center for a New American Security, June 2022), <https://www.cnas.org/publications/reports/dangerous-straits-wargaming-a-future-conflict-over-taiwans>.

47 Jim Miter and Ylber Bajraktari, "These Technologies Could Defeat China's Missile Barrage and Defend Taiwan: Analysis," *Breaking Defense*, August 22, 2023, <https://www.rand.org/blog/2023/08/these-technologies-could-defeat-chinas-missile-barrage.html>.

## Chinese Blockade of Taiwan

Many commentators consider a Chinese blockade of Taiwan more likely than an invasion because such an approach is less violent and confrontational.<sup>48</sup> Blockades are different from invasion scenarios because political and diplomatic aspects are often paramount, though military capabilities still have a key role. Therefore, it is worthwhile to examine analyses and wargames about blockades to see which military capabilities might be useful in countering a blockade.

- **Chinese Military Exercises:** In recent years, China has conducted regular exercises simulating a blockade of Taiwan. Exercise Joint Sword in April 2023 was revealing. Chinese military commentators cited the effort to attain “information agility” whereby China would speed up the kill chain through a “system-of-systems” approach.<sup>49</sup> China also conducted major military exercises in the seas around Taiwan in September 2023, which included practicing sustained carrier-based air operations that would be useful in enforcing a blockade on Taiwan.<sup>50</sup>
- **CSIS Emerging Wargame Results:** CSIS is beginning a series of wargames and analyses of a Chinese blockade of Taiwan as a follow-on to its *First Battle of the Next War* invasion analysis. Although this work is still in progress, several emerging insights are worth noting.
  - Sea mines are especially attractive in blockades because of their covertness and persistence. China has many mines and the platforms to employ them. Its doctrine explicitly includes such use.
  - Missile attacks are part of a blockade strategy. Chinese exercises conducted before House Speaker Nancy Pelosi’s Taiwan visit showed how China might use missiles to impose a blockade.
  - China will harass civilian shipping. Although cargo ships are large and imposing, they are risk averse and therefore susceptible to pressure unless provided with mechanisms for resistance.
  - China might attack civilian shipping. Cargo ships are highly survivable because of their large size but need protection and incentives to accept the risk of damage or loss.
  - Several capabilities are needed: sea mines and mine clearance, protection packages for merchant shipping, and missile defense.
- **RAND Analysis:** A 2002 RAND study examined the implications of a blockade of Taiwan.<sup>51</sup> Although the study focused mostly on the political and economic aspects of such an operation, it did note the likelihood of China employing swarming tactics. In such situations, China often uses nonmilitary

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48 This report uses the term “blockade” to describe a Chinese effort to cut Taiwan off from outside trade and communications. Technically, a blockade is an act against a foreign power, and China considers Taiwan to be a breakaway province. Thus, much of the literature uses the word “quarantine” to describe such Chinese efforts. However, blockade is often used colloquially to describe all interdiction efforts, and this report will follow that practice.

49 David Chen, “‘Joint Sword’ Exercises around Taiwan Suggest a Shift in PLA Operational Doctrine,” Jamestown Foundation, May 5, 2023, <https://jamestown.org/program/joint-sword-exercises-around-taiwan-suggest-a-shift-in-pla-operational-doctrine/>.

50 David Pierson and Amy Chang Chien, “China Conducts Major Military Exercises in Western Pacific,” *New York Times*, September 14, 2023, <https://www.nytimes.com/2023/09/14/world/asia/china-ships-taiwan-japan.html>.

51 Bradley Martin, Kristen Gunness, Paul DeLuca, and Melissa Shostak, *Implications of a Coercive Quarantine of Taiwan by the People’s Republic of China* (Santa Monica, CA: RAND Corporation, 2002), for example, 9–11, [https://www.rand.org/pubs/research\\_reports/RRA1279-1.html](https://www.rand.org/pubs/research_reports/RRA1279-1.html).

platforms such as the China Coast Guard, Maritime Militia, or fishing vessels to crowd an adversary ship and prevent it from accomplishing its mission.

- **Other Studies:** In a study published by the China Maritime Studies Institute, former U.S. intelligence officer and East Asia expert Lonnie Henley describes how a blockade might unfold. He notes Taiwan's maritime vulnerability due to the concentration of its major ports on Taiwan's west coast, closest to Chinese power. He argues for enhancing mine clearance, developing concepts and technologies for blockade running and convoy operations, and degrading the Chinese integrated air defense system through electronic and kinetic methods.<sup>52</sup>

A Carnegie-sponsored study by Sean Mirski examined the dynamics of a U.S. naval blockade of China. Nevertheless, the study identifies several capabilities that would be needed in the event of a Chinese blockade, particularly sea mines, mine clearance, and maritime domain awareness.<sup>53</sup>

A forthcoming CSIS study on Taiwan blockade scenarios raises the possibility of cyberattacks being part of a Chinese blockade operation.<sup>54</sup>

## Gray Zone Competition in the South China Sea

Gray zone competition refers to actions short of war that challenge U.S. interests, influence, or power in ways designed to avoid direct U.S. military responses.<sup>55</sup> Although these activities could occur anywhere in the Pacific, the South China Sea is a region of particular attention because of Chinese ambitions, making it a flashpoint for conflict.

In 2023, RAND conducted a wargame simulating Chinese gray zone coercion of Taiwan. Their findings highlight the conditions under which a conflict over Taiwan might begin and illuminate which capabilities would be useful to the United States and its allies and partners.<sup>56</sup> Their conclusions include the following:

- Gray zone coercion is relatively unlikely to escalate to full-blown war.
- The United States will consider escalating to military force if Taiwan faces an existential threat, such as a blockade or an invasion.
- Taiwan will not escalate without explicit U.S. support.
- The United States is more likely to intervene to support Taiwan if the island takes steps to defend itself.
- Several capabilities are needed: air defense, maritime surveillance, and anti-harassment tools.

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52 Lonnie D. Henley, "China Maritime Report No. 26: Beyond the First Battle: Overcoming a Protracted Blockade of Taiwan," *China Maritime Report*, no. 26 (March 2023), <https://digital-commons.usnwc.edu/cgi/viewcontent.cgi?article=1025&context=cmsi-maritime-reports>.

53 Sean Mirski, "Stranglehold: The Context, Conduct, and Consequences of an American Naval Blockade of China," *Journal of Strategic Studies* 36, no. 3 (February 2013): 385-421, doi:10.1080/01402390.2012.743885.

54 Bonny Lin, *Taiwan Blockade Scenarios*, forthcoming.

55 Although there are many definitions, this one, used in CSIS studies, covers the essentials. See John Schaus and Michael Matlaga, "Competing in the Gray Zone," CSIS, *Critical Questions*, October 24, 2018, <https://www.csis.org/analysis/competing-gray-zone>.

56 Raymond Kuo et al., *Simulating Chinese Gray Zone Coercion of Taiwan: Identifying Redlines and Escalation Pathways* (Santa Monica, CA: RAND Corporation, 2023), [https://www.rand.org/pubs/conf\\_proceedings/CFA2065-1.html](https://www.rand.org/pubs/conf_proceedings/CFA2065-1.html).



## The Real War in Ukraine

The war in Ukraine is occurring in a different geography than would a war in the Western Pacific. In Ukraine, the ground domain dominates, whereas the air and maritime domains would dominate conflict in the Western Pacific. Nevertheless, the war in Ukraine provides a current example of high-intensity conflict between large and well-equipped adversaries and, therefore, is relevant to all future conflicts. Although it will be many years before the lessons learned from this conflict are fully examined and understood, several important insights relevant to a conflict in the Western Pacific can be discerned now.

- **The Importance of Inventories:** In the post-Cold War period, the United States and its allies assumed that future wars would have a short, high-intensity phase. If there were an extended stabilization phase, it would not put heavy demands on firepower, so inventories of weapons and munitions would not need to be extensive. However, the war in Ukraine has had a fundamentally different character. The continuing demands for weapons and munitions have strained U.S. and coalition inventories, limiting what they can send, as deliveries deplete stockpiles to levels that threaten other global commitments.<sup>57</sup>
- **The Need for Industrial Surge:** Maintaining full stockpiles of all systems for long wars is impossible because of the high cost. Industrial surge must be able to meet the demands of longer and more intensive wars. However, in the United States and elsewhere, most surge capabilities have been eliminated in the name of efficiency. Production levels were set to produce weapons and munitions efficiently at peacetime rates.<sup>58</sup>
- **The Major and Evolving Role of Uncrewed Systems:** Ukrainian ground forces note the ubiquity of uncrewed aerial systems (UASs) that spot targets for artillery attacks.<sup>59</sup> “Kamikaze” UASs fly into targets, whether personnel or vehicles, acting as a tactical cruise missile. Uncrewed surface vessels (USVs) have attacked Russian ships and driven them from Crimea.<sup>60</sup>
- **The Centrality of Connectivity:** Ukrainian forces have connected their diverse and expanding forces by using Starlink, a civilian system. They have thus avoided what might have been a major limitation on Ukrainian operations—an inability to communicate rapidly and reliably across geography, organizations, and domains.
- **The Power of Electronic Warfare:** Communications are routinely jammed. GPS spoofers—widely anticipated for many years—are commonplace.
- **The influence of narrative.** Narrative shaping has been an essential tool for Ukraine to drive political support. It has dominated the information space by reaching out to experts and journalists, sending representatives—including the president—to other countries to make their argument, and ensuring that good news got out while bad news was restricted.

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57 Mark F. Cancian, “Rebuilding U.S. Inventories: Six Critical Systems,” CSIS, *Commentary*, January 9, 2023, <https://www.csis.org/analysis/rebuilding-us-inventories-six-critical-systems>.

58 Seth G. Jones, *Empty Bins in a Wartime Environment: The Challenge to the U.S. Defense Industrial Base* (Washington, DC: Rowman & Littlefield 2023), <https://www.csis.org/analysis/empty-bins-wartime-environment-challenge-us-defense-industrial-base>.

59 Many terms are used to describe flying systems with no personnel aboard: uncrewed aerial systems, uncrewed aerial vehicles, remotely piloted vehicles, and drones. This report uses uncrewed aerial systems for simplicity.

60 Peter Dickinson, “Putin’s Fleet Retreats: Ukraine Is Winning the Battle of the Black Sea,” Atlantic Council, October 4, 2023, <https://www.atlanticcouncil.org/blogs/ukrainealert/putins-fleet-retreats-ukraine-is-winning-the-battle-of-the-black-sea/>.

# Submarines

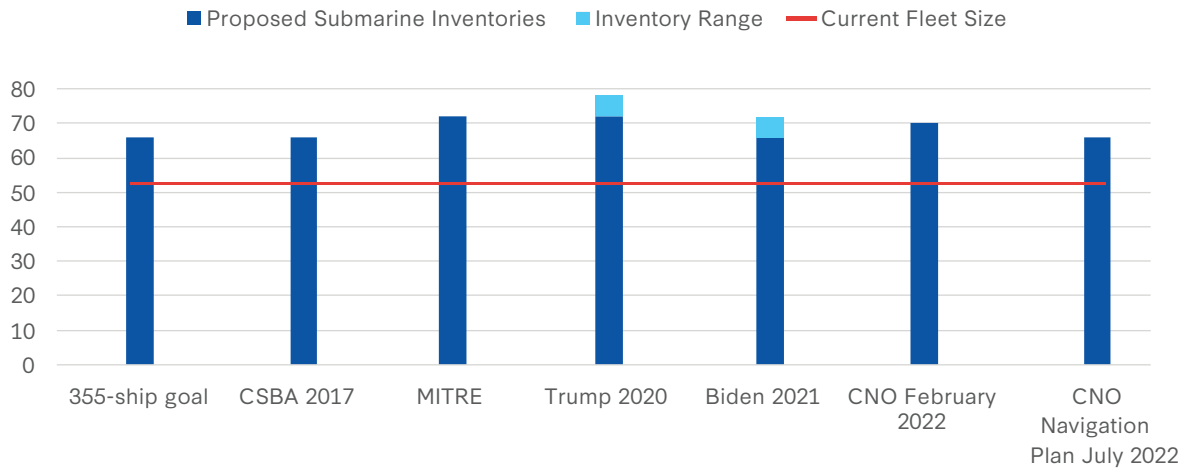
## *The Unobtainable Solution*

In light of Chinese threats, the AUKUS agreement, and wargame results, a clear solution would be for the United States to build more submarines. Indeed, a strong submarine force is a feature of nearly every proposed fleet architecture, whether developed by government organizations or outside experts, and is the foundation of AUKUS. However, expanding the submarine fleet in the near or midterm is not possible because of constraints on the submarine industrial base. Indeed, the size of the submarine fleet will drop below the current level through the mid-2030s. Therefore, enhanced near- and midterm capabilities to meet a rising Chinese military challenge will need to come from elsewhere. This chapter lays out the strategic desirability of submarines, the difficulties in building more, and the future size of the submarine fleet.

**Strong Support from Strategists:** Strategists like SSNs because the firepower and covertness of these platforms are useful in great power conflicts. Unlike surface ships, submarines can easily operate inside an adversary’s defensive bubble.

Figure 1 shows how support for increasing the submarine fleet—including SSNs and guided missile submarines (SSGNs)—has been strong across many different fleet architectures developed by the Navy, the Office of the Secretary of Defense, and think tanks. The horizontal line shows the current level of the attack submarine fleet (FY 2024). The vertical bars show the proposed level in the different architectures, all of which are above the current inventory level.

**Figure 1: Target Inventory for Attack Submarines (SSNs and SSGNs) Compared with Current Fleet**



Source: Fleet architectures as described by the DOD, Navy, and research organizations.<sup>61</sup>

**The Implementation Challenge:** The problem is getting to these higher goals. The obvious solution would be to build more submarines, but having two submarine construction programs operating simultaneously—for Columbia-class ballistic missile submarines (SSBNs) and Virginia-class SSNs—puts pressure on the shipbuilding budget and the submarine industrial base.

In the president’s proposed FY 2024 defense budget, building two SSNs and one SSBN will cost \$16.1 billion in a Navy shipbuilding account that totals \$29.5 billion for new construction.<sup>62</sup> The Congressional Budget Office estimates that: “The three alternatives in the Navy’s 2024 plan would require average annual shipbuilding appropriations that were 31 percent to 40 percent more than the average over the past five years.”<sup>63</sup>

SSBNs have the highest priority because of their strategic nuclear role. As Admiral Lisa Franchetti stated in her confirmation hearing, “CLB [the *Columbia* class] is the Navy’s number one acquisition priority, with no further margin for program delay. The Navy must fully fund CLB to meet U.S. Strategic Command (USSTRATCOM)

61 Current fleet size from “DON Battle Force Ship Inventories,” in Deputy Assistant Secretary of the Navy *Highlights of the Department of the Navy FY 2024 Budget* (Washington, DC: Department of Defense, 2023), [https://www.secnav.navy.mil/fmc/fmb/Documents/24pres/Budget\\_Highlights\\_Book.pdf](https://www.secnav.navy.mil/fmc/fmb/Documents/24pres/Budget_Highlights_Book.pdf). Proposed fleet architectures of presidential administrations and CNOs in Ronald O’Rourke, *Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress*, CRS Report No. RL32665 (Washington, DC: Congressional Research Service, October 4, 2023), <https://crsreports.congress.gov/product/pdf/RL/RL32665/393>. Fleet architectures as described by research organizations in Bryan Clark et al., *Restoring American Seapower: A New Fleet Architecture for the United States Navy* (Washington, DC: Center for Strategic and Budgetary Assessments, January 23, 2017), [https://csbaonline.org/uploads/documents/CSBA6224-Fleet\\_Architecture\\_Study\\_WEB.pdf](https://csbaonline.org/uploads/documents/CSBA6224-Fleet_Architecture_Study_WEB.pdf); and MITRE Corporation, *Navy Future Fleet Platform Architecture Study* (McLean, VA: MITRE Corporation, July 2016), <https://apps.dtic.mil/sti/pdfs/AD1026948.pdf>.

62 Deputy Assistant Secretary of the Navy *Highlights of the Department of the Navy FY 2024 Budget*, 140.

63 Congressional Budget Office, *An Analysis of the Navy’s Fiscal Year 2024 Shipbuilding Plan* (Washington, DC: Congressional Budget Office, October 2023), <https://www.cbo.gov/publication/59508>.

requirements for the first patrol no later than October 2030 to replace retiring Ohio-class SSBNs.”<sup>64</sup> Because of this program’s high priority, it will be fully funded, including any cost growth. So far, the Columbia class has not shown large cost growth, but programs of that size and technical complexity often do, and the program has high schedule risk. In October 2022, the Navy estimated that there was a high probability that procurement costs would be greater than what the Navy previously forecast: 54 percent for the first Columbia-class boat (excluding costs for plans) and 49 percent for boats 2 through 12.<sup>65</sup> Attack submarines will have to fight for the remaining shipbuilding funds.

Further, only two shipyards build submarines, General Dynamics’ Electric Boat Division (GD/EB) in Groton, CT, and Huntington Ingalls Industries’ Newport News Shipbuilding (HII/NNS), in Newport News, VA.<sup>66</sup> The Navy is investing \$2.4 billion over the next five years to strengthen the submarine industrial base to handle both programs. The president has proposed another \$3.4 billion in his October 2023 Ukraine/Israel supplemental.<sup>67</sup> Nevertheless, the challenge for the industrial base—both shipyards and suppliers—is to ramp up production from one “regular” Virginia-class boat per year (the volume of work before FY 2011) to the equivalent of about five “regular” Virginia-class boats per year (the approximate volume of work represented by two Virginia Payload Module-equipped Virginia-class boats and one Columbia-class boat).

The AUKUS agreement, by providing nuclear submarines and nuclear facilities to the Royal Australian Navy, will put additional pressure on the U.S. submarine industrial base even as it strengthens security in the Western Pacific.

**A Shrinking Fleet:** Figure 2 shows the size of the submarine fleet over time. The dotted horizontal line shows the level of the current fleet (FY 2024).

The solid line shows the current plan. In the near term, the size of the attack submarine fleet declines, bottoming out at 46 boats in FY 2030. This decline reflects the low production rates of the 1990s and 2000s, when the strategic focus was on regional conflicts, and the Navy often built only one submarine a year. The large inventory from the Cold War has kept the fleet size high for many years, but those Cold War submarines are now retiring in large numbers.

To mitigate this trough, the Navy has extended the service life of some older *Los Angeles*-class submarines.

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64 See Questions 82, 72, and 77 in “Senate Armed Services Committee Advance Policy Questions for Admiral Lisa M. Franchetti, USN,” Inside Defense, September 15, 2023, <https://insidedefense.com/document/franchettis-answers-advance-policy-questions>.

65 Ronald O’Rourke, *Navy Columbia (SSBN-826) Class Ballistic Missile Submarine Program: Background and Issues for Congress*, CRS Report No. R41129 (Washington, DC: Congressional Research Service, September 2023), 18–21, <https://crsreports.congress.gov/product/pdf/R/R41129/241>.

66 Ronald O’Rourke, *Navy Virginia (SSN-774) Class Attack Submarine Procurement: Background and Issues for Congress*, CRS Report No. RL32418 (Washington, DC: Congressional Research Service, September 14, 2021), <https://sgp.fas.org/crs/weapons/RL32418.pdf>.

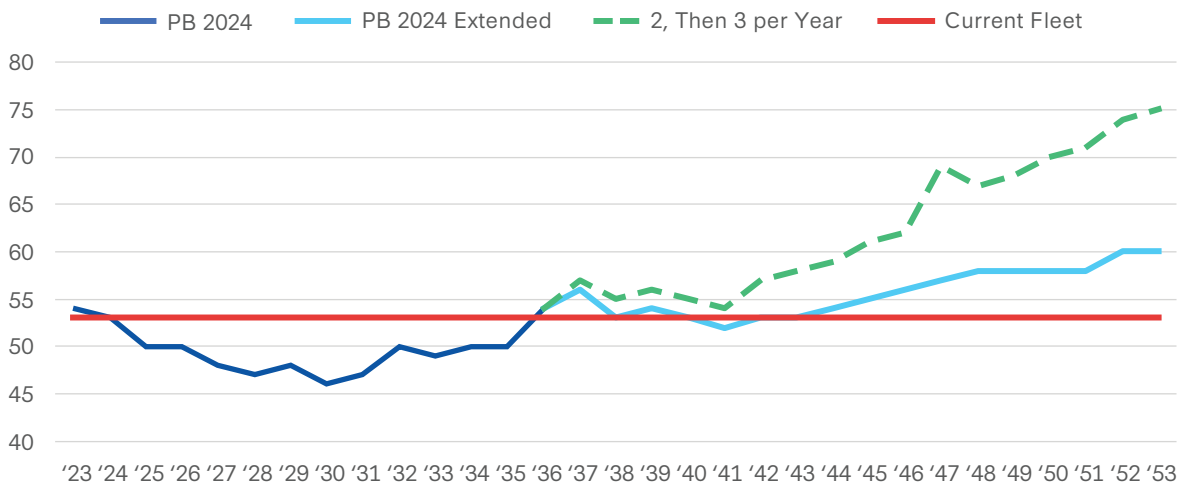
67 Office of the Chief of Naval Operations, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2023* (Washington, DC: Department of Defense, April 2022), 11, <https://media.defense.gov/2022/Apr/20/2002980535/-1/-1/0/PB23%20SHIPBUILDING%20PLAN%2018%20APR%202022%20FINAL.PDF>. Supplemental description in “FACT SHEET: White House Calls on Congress to Advance Critical National Security Priorities,” The White House, October 20, 2023, <https://www.whitehouse.gov/briefing-room/statements-releases/2023/10/20/fact-sheet-white-house-calls-on-congress-to-advance-critical-national-security-priorities/>.

There is unlikely much more that can be done using this approach.

Figure 2 also shows two alternative futures. One line extends the Navy’s base plan, which builds two SSNs in most years (solid line). Fleet size eventually recovers as new ships join the fleet, reaching the level of today’s submarine fleet in the late 2030s but never rising to the recommended level of most fleet architectures. This plan could change, as it does not incorporate the effects of the 2022 *National Defense Strategy*; that analysis is still undergoing review. Neither does it include the effects of the AUKUS agreement, which was signed after the projection was developed. Nevertheless, whatever plan emerges next year, the previously described limits on the submarine industrial base will constrain it in the near- and mid-term.

The alternative (dashed line) assumes that the Navy builds three SSNs per year once production of the *Columbia* class ends and pressure on the industrial base eases. Under these circumstances, the submarine fleet reaches the target level of many proposed architectures in the late 2040s and the level of the most ambitious plans in the early 2050s. The obstacle to achieving this alternative, higher level of production would be finding the budget space.<sup>68</sup>

**Figure 2: Projected Attack Submarine Fleet, FY 2023–FY 2053**



Source: Data from Long-Range Naval Inventory tables in the Office of the Chief of Naval Operations, *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2024* (Washington, DC: Department of Defense, March 2023), [https://www.govexec.com/media/navy\\_2024\\_shipbuilding\\_plan.pdf](https://www.govexec.com/media/navy_2024_shipbuilding_plan.pdf).

The need to give priority to the *Columbia*-class program and AUKUS, the limits of the industrial base, and the aging of the existing fleet constrain what the Navy can do in the near and midterm to increase the size of the submarine fleet.

In theory, regional allies might help fill the gap, but numbers and capabilities are limited. Taiwan has four old submarines (30+ years), though it has begun construction on a modern class. Australia has six Collins-class submarines, but these are aging and based far from potential conflict areas. Japan has 22 excellent

68 This alternative is based on “Alternative 2” in the Navy’s 30-year shipbuilding plan but builds submarines consistently at three per year when the *Columbia*-class production ends, whereas the Navy’s “Alternative 2” drops to two submarines in some years.

submarines but may not be involved and, if involved, might be unwilling to use its forces offensively. Beyond these countries, the analysis in Chapter 2 indicates that it is unlikely that other allies or partners would be willing to provide military forces to a conflict.<sup>69</sup>

Thus, regardless of what strategists may want, the submarine fleet will remain below desired levels for many decades. The challenge is to find other mechanisms to compete in the Western Pacific for the two decades until a larger submarine inventory becomes available.

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***Regardless of what strategists may want, the submarine fleet will remain below desired levels for many decades.***

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69 “Submarine Proliferation Resource Collection,” Nuclear Threat Initiative, October 13, 2022, <https://www.nti.org/analysis/resource-collections/submarine-proliferation-resource-collection/>.

# Filling the Gaps

## *What to Do until More Submarines Arrive*

**A**UKUS offers a powerful mechanism for enhancing U.S. and partner security interests in the Western Pacific. A coalition submarine fleet with increased numbers, wider basing, and more diversified capabilities will enhance deterrence and strengthen warfighting.

However, since additional submarines will not be available for many years, the United States and its partners need to take other measures. Pillar 2 of AUKUS offers a mechanism with its focus on technological cooperation. Beyond AUKUS, the United States has many other relationships in the Western Pacific that would benefit from an expanded menu of capabilities.

The threats described in Chapter 2 and the wargame results described in Chapter 3 suggest several potentially useful capabilities, which are described below.

### **Making Existing Submarines More Effective**

Because the size of the submarine fleet will decline through the 2020s, there is a need to increase the effectiveness of the submarines that are available. Two items come up repeatedly in wargames and the warfighting literature:

- **Uncrewed Underwater Vehicles:** The Navy is investigating a range of UUVs, from the very small to the very large.<sup>70</sup> The Navy envisions UUVs being a force multiplier for their motherships, which will not

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70 U.S. Department of the Navy, *Unmanned Campaign Framework* (Washington, DC: Department of the Navy, March 2021), [https://www.navy.mil/Portals/1/Strategic/20210315%20Unmanned%20Campaign\\_Final\\_LowRes.pdf](https://www.navy.mil/Portals/1/Strategic/20210315%20Unmanned%20Campaign_Final_LowRes.pdf).

decrease in numbers. Two kinds have promise for enhancing the effectiveness of existing submarines.

On the high end, there is the Orca, 50 tons and the size of a bus. The Orca, the only Extra-Large UUV (XLUUV) program, will initially provide a minelaying capability, with the platform deploying the planned Hammerhead mine. This mine would be tethered to the seabed and armed with an antisubmarine torpedo, similar to the Navy's Cold War-era CAPTOR antisubmarine mine. Although six prototype Orcas are being built, they are still experimental and not a program of record.<sup>71</sup>

Medium UUVs (MUUVs) are systems with a diameter larger than 10 inches but less than 21 inches, allowing torpedo tube deployment. The two primary MUUV missions are intelligence gathering ("Intelligence Preparation of the Operational Environment") and mine countermeasures. By deploying from a submarine, they can respond rapidly to a tactical situation.

A recent trilateral exercise by the United States, United Kingdom, and Australia—Technology Readiness Experimentation, or T-REX 23-2—tested some of these capabilities.<sup>72</sup>

CSIS's working group of outside experts noted that UUVs were attractive because of their stealth, but also that command and control underwater was extremely difficult. It represented a technological challenge that industry needs to overcome.

- **Improved Submarine Maintenance:** What matters ultimately is not how many submarines a fleet has but how many submarines it can deploy. U.S. submarine availability has been low because of maintenance backlogs. In recent years, availability has run about 60 percent; that figure is up to 64-67 percent now, and the Navy hopes to get it up to 80 percent.<sup>73</sup> Extended shipyard maintenance periods for submarines contribute to this low availability rate. From FY 2015 to FY 2019, only 5 of 33 submarine maintenance periods were completed on time, with a total of 6,296 days (about 17 years) lost to maintenance delay.<sup>74</sup> Across the fleet, the difference between 60 percent and 80 percent availability is 10 boats that should be sailing the seas but are instead sitting in shipyards. The budget supplemental proposed in October 2023 contains \$3.4 billion for the submarine industrial base. This would help substantially, though it will take years before the fleet feels the effects of those funds.<sup>75</sup>

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71 Ronald O'Rourke, *Very Large Unmanned and Undersea Vehicles*, CRS Report No. R45757 (Washington, DC: Congressional Research Service, updated September 5, 2023), <https://sgp.fas.org/crs/weapons/R45757.pdf>.

72 Justin Katz, "AUKUS nations test undersea unmanned tech in defense of critical infrastructure," *Breaking Defense*, November 13, 2023, <https://breakingdefense.com/2023/11/aukus-nations-test-undersea-unmanned-tech-in-defense-of-critical-infrastructure/>.

73 "Joint statement Honorable Eric K Raven, Under Secretary of the Navy, VADM William J. Houston, Commander, Naval Submarine Forces, RDML Jonathan Rucker, Program Executive Officer, Attack Submarines before the House Committee on Armed Services Subcommittee on Seapower and Projection Forces," House Armed Services Committee, October 25, 2023, <https://armedservices.house.gov/hearings/spf-hearing-submarine-industrial-base-and-its-ability-support-aukus-framework>.

74 U. S. Government Accountability Office, *Navy Shipyards: Actions Needed to Address the Main Factors Causing Maintenance Delays for Aircraft Carriers and Submarines* (Washington, DC: Government Accountability Office, August 2020), <https://www.gao.gov/products/gao-20-588>.

75 For the funding request, see Office of Management and Budget letter to the Honorable Patrick McHenry, October 20, 2023, 58-63, <https://www.whitehouse.gov/wp-content/uploads/2023/10/Letter-regarding-critical-national-security-funding-needs-for-FY-2024.pdf>.



- **Forward rearming:** In wargames, submarines rapidly exhaust their munition inventories and must return to base to reload. Currently, those reload locations are limited to Guam and Yokosuka. The Navy is considering additional reload locations and could, for example, build more submarine tenders. Accelerating the reload cycle gets submarines get back into the fight more quickly.

## Bringing More Forces to Bear, More Effectively

As noted in Chapter 2, the United States has many allies and partners in the Western Pacific. The challenge is bringing these forces to bear, especially since there is no overarching alliance like NATO to establish joint structures and set standards. Instead, these must be established bilaterally. Measures to enhance cooperation include:

- **Coalition Command, Control, Communications, and Intelligence (C3I) Packages:** These systems are critical for creating a common operating picture across an entire coalition. However, every country has its own technologies and procedures. Therefore, systems that allow the U.S. C3I systems to link with those of an ally or partner would be enormously valuable.

Such systems must be effective without multibillion-dollar acquisition programs, imposition of common standards, or years of training and exercises. Although all these approaches would be useful, they are likely unobtainable except with the closest allies because of the cost and need to exchange highly sensitive data. One example of an alternative approach would be a deployable package that could sit in an allied or partner command center. This would build on the fusion centers that already exist. However, many other approaches are possible.

In considering solutions, the perfect is the enemy of the good. It would be better to have some simple systems in the hands of U.S. and allied forces now, given the immediacy of the threat, rather than wait for the perfect network solution in the distant future.

The working group emphasized that these arrangements need to be made before war breaks out. Improvising joint C3I during a conflict takes time, misses warfighting opportunities, and weakens defenses.

- **Air and Maritime Domain Awareness:** All three potential conflict scenarios—*invasion, blockade, and gray zone competition*—require excellent air and maritime domain awareness. The United States and its allies and partners need to know the location of potential adversaries’ forces, their own forces, and coalition forces. The latter can be challenging because allied and coalition forces do not always connect to friendly information systems. Low-tech solutions may, therefore, be a better option to bridge gaps in air/maritime domain awareness with some allies and partners.<sup>76</sup> This requirement does not diminish as the intensity of conflict diminishes; it is as important for gray zone competition and blockades as it is for full-scale conflict.
- **Coalition Training:** Some allies, such as Australia and Japan, have highly trained forces; others struggle to attain adequate levels of training proficiency. All allies and the United States need training on how to work together. Analyses and wargames often gloss over “soft” factors such as training. The United States has recognized the need for training and education for decades, instituting a wide variety of training programs with allies. The availability of troops and units to conduct this training is frequently a constraint. Expanded contractor support could increase coalition training opportunities and thereby link military forces more closely.

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76 The project thanks Tyler Hacker of CSBA for the insights about the utility of low-tech systems.

Contractors can supplement military personnel in meeting these training demands and have done so in the past. Indeed, contractors have been described as the fourth element of military force structure, along with active-duty troops, National Guard and reserves, and government civilians.<sup>77</sup>

- **Contractor Logistics Support:** Many allies and partners struggle with obsolescent equipment and readiness challenges. All militaries must compete with the civilian sector for technically skilled personnel to maintain the equipment. Further, maintainers are often junior enlisted personnel who are essentially apprentices as they gain experience. As with training, one solution is to have contractors augment military personnel. Contractors often have substantial technical skills that can supplement military maintenance efforts, not just in peacetime but also in wartime. The U.S. experience in Iraq and Afghanistan was that contractors would stay at their posts in conflicts as long as they understood the risks beforehand.

## Operating in a Hostile Environment

China has been able to threaten adversary forces at increasing distances by building large missile forces, and it is not alone in this regard. Russia and Iran have similarly developed long-range capabilities. Although this environment is widely understood and appreciated in the United States, it will nevertheless be a shock for U.S. naval and air forces, which have operated in sanctuary for many decades. The following actions would enhance the ability to operate in this hostile environment:

- **Aircraft Dispersion:** Wargaming indicates that aircraft are most vulnerable on the ground. For many years, the U.S. solution to airbase defense was interceptors. That is still an essential part of any strategy but is insufficient because of the potentially massive strikes that China can conduct.

Therefore, another element of the strategy needs to be dispersal. The Air Force has recognized this with its agile combat employment doctrine. The doctrine seeks to “shift operations from centralized physical infrastructures to a network of smaller, dispersed locations that can complicate adversary planning and provide more options for joint force commanders.”<sup>78</sup> Part of implementing the doctrine involves training personnel and conducting exercises. However, part requires creating the units and equipment needed to operate successfully from many more sites, some of which may be austere and lack the required supporting capabilities.

- **Aircraft Survivability:** The Air Force has made some investments in explosive ordinance demolition and runway repair, recognizing that air bases will be attacked. These initiatives should be continued.

One aspect of aircraft survivability that the Air Force has not embraced is hardened shelters. Although the United States built many during the Cold War, it has not built any since. Yet, dispersal alone is insufficient because of the large number of aircraft requiring forward basing and the need to continue using large U.S. bases despite missile strikes. Without hardened shelters, any aircraft at these bases would be highly vulnerable.

- **Surface Ships’ Defensive Capabilities:** Surface ships that want to operate west of Guam during a conflict with China need strong defensive capabilities. Indeed, any ship operating near a hostile shore

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77 Mark Cancian, “Contractors: The New Element of Military Force Structure,” *Parameters* 38, no. 3 (2008), doi:10.55540/0031-1723.2431.

78 U.S. Air Force, *Doctrine Note 1-21, Agile Combat Employment* (Washington, DC: Air Force, August 2022), 4, [https://www.doctrine.af.mil/Portals/61/documents/AFDN\\_1-21/AFDN%201-21%20ACE.pdf](https://www.doctrine.af.mil/Portals/61/documents/AFDN_1-21/AFDN%201-21%20ACE.pdf).

needs strong and vigilant defenses, as the Russian cruiser Moskva learned to its sorrow. The Navy is aware of this and is constantly upgrading ship defensive systems. This project is never done, as adversaries continue to develop new attack capabilities that require new responses.

- **Asymmetric Capabilities for Taiwan:** Taiwan’s need for asymmetric defenses has been widely discussed and needs no expansion here. This does not mean that Taiwan should retire all of its conventional capabilities. However, it does mean that asymmetric capabilities—land-based antiship missiles, land-based air defenses, sea mines, and missile boats—need greater priority because of their ability to survive in this increasingly hostile environment.<sup>79</sup> This is often called a “porcupine” strategy and has been hotly debated in Taiwan.<sup>80</sup> A more balanced force structure would also enhance deterrence by reducing the possibility of a debilitating Chinese first strike.
- **Resilience against Cyberattacks:** Cyber defenses are now well established as integral to modern warfare. These defenses need to be tended continuously like those in any other domain. The war in Ukraine has shown that robust cyber defenses are possible, particularly when developed in connection with commercial firms. These defenses cannot deflect all attacks but can protect friendly assets sufficiently so that cyberattacks do not have a major operational impact.
- **Resilience against Electronic Warfare:** The working group emphasized that China has powerful electronic warfare capabilities, and many wargames have speculated about what these capabilities might be able to do. This represents a level of threat that other post-Cold War adversaries have not possessed. Decades of operating in “electronic sanctuary” have created vulnerabilities in U.S. and allied forces even as electronic systems have greatly enhanced military capabilities.

One vulnerability is the loss of communications. Such a loss would not be absolute because some mechanisms for communication will always be available. However, a generation of military officers has become accustomed to reliable voice, internet, chat rooms, and video and will find it difficult to operate in a severely degraded communications environment. Finding ways to harden communications, for example, by using wire and cable instead of airwaves, would cushion the force against electronic warfare shock.

Related to the loss of communications is the loss of the Global Positioning System (GPS). As with reliable communications, U.S. and partner forces have come to expect reliable GPS service for guiding munitions, ascertaining unit locations, and developing a common operating picture. Indeed, GPS is so ingrained into U.S. operations that loss of its capability would have second and third-order effects that are not fully understood. Alternatives to GPS, such as determining location through inertial navigation systems and even old-fashioned map reading, are available. However, the accuracy, precision, and low cost of GPS make adopting alternatives difficult despite the system’s widely recognized vulnerability.

- **Contested Logistics:** Since the German U-boats of World War II, no adversary has been able to interfere with U.S. logistics flow. That is changing. China can now disrupt flows within the second island chain and will soon be able to reach beyond that. Building logistics systems that can operate in a contested environment requires new technologies, platforms, and concepts. The Navy has begun such adaptation

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79 For example, Cancian, Cancian, and Heginbotham, *First Battle of the Next War*, 123–25; and Pettyjohn, Wasser, and Dougherty, *Dangerous Straits*, 12.

80 For a detailed discussion of a porcupine strategy for Taiwan, see Murray, “Revisiting Taiwan’s Defense Strategy,” cited earlier.

by closing the Red Hill depot and instead building a network of fuel distribution points, including on-call tankers.<sup>81</sup> The military services are conducting wargames to understand what contested logistics mean operationally.<sup>82</sup> However, programmatic efforts in this space have just begun.

## Hedging against Unconventional Threats

When thinking about threats, it is natural to mirror image, imagining that threats to U.S. forces are the same as threats to adversary forces. For many aspects of great power conflict, this is true. However, some challenges from adversaries lack strong U.S. counterparts, and these need careful consideration lest the United States be surprised. Such challenges include:

- **Countering Mines:** Periodically, a major article appears in military journals noting how sea mines have constituted the greatest threat to U.S. Navy ships since World War II and bemoaning the lack of preparation to deal with this well-documented threat. The United States could encounter mines in any future conflict, whether due to an invasion of Taiwan, a blockade, or gray zone competition. Countering mine warfare requires locating minefields, clearing lanes, and then keeping the lanes open. This, in turn, requires a spectrum of capabilities from mine reconnaissance to mine neutralization. In the past, the United States has developed a variety of imaginative approaches, from using sea mammals to spot mines to sailing sacrificial ships through minefields. Yet, U.S. countermine capabilities today remain weak.<sup>83</sup>
- **Countering Maritime Swarming:** Chinese maritime swarming comes up repeatedly in wargames and analyses. The tactic seeks to defeat adversaries without kinetic attack. This low-level threat is not something the United States has had to deal with because of its powerful naval forces, but it is a day-to-day reality for many allies and partners in the Western Pacific. Technologies that inhibit swarming tactics without resorting to deadly force would be helpful.

Efforts to counter piracy developed some non-kinetic approaches such as fire hoses, restricted shipboard

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81 Heather Mongilio, “SECNAV Del Toro: Navy Will Not Need to Build Fuel Facilities to Replace Red Hill Fuel Depot,” USNI News, March 11, 2022, <https://news.usni.org/2022/03/11/secnav-del-toro-navy-will-not-need-to-build-fuel-facilities-to-replace-red-hill-fuel-depot>.

82 For a description of the Army’s wargame in this regard, the Pacific Theater Sustainment Wargame, see Susan Ray, “US Army Pacific Hosts Sustainment-Focused Wargame,” U.S. Army, April 12, 2023, [https://www.army.mil/article/265709/us\\_army\\_pacific\\_hosts\\_sustainment\\_focused\\_wargame](https://www.army.mil/article/265709/us_army_pacific_hosts_sustainment_focused_wargame). For a description of the Navy’s efforts, see Government Accountability Office, *Additional Actions Could Enhance DOD’s Wargaming Efforts* (Washington, DC: Government Accountability Office, April 2023), 11-12, <https://www.gao.gov/assets/gao-23-105351.pdf>.

83 For recent examples of articles about the U.S. Navy’s weakness in mine countermeasure capabilities, see the following articles from the annual Naval Mine Warfare Essay Contest in the U.S. Naval War College’s journal *Proceedings*: A.J. Douglas, “Get Serious about Countering China’s Mine Warfare Advantage,” U.S. Naval Institute, June 1, 2023, <https://www.usni.org/magazines/proceedings/2023/june/get-serious-about-countering-chinas-mine-warfare-advantage>; Marc G. Tranchemontagne and Chris Price, “Mine Exploitation: What Happens When the Fleet Has to Clear Modern, Unknown Mines?,” U.S. Naval Institute, June 23, 2022, <https://www.usni.org/magazines/proceedings/2022/june/mine-exploitation-what-happens-when-fleet-has-clear-modern-unknown>; and Ben Pedersen, “Naval Mine Warfare: The Times, They Are A-Changing,” U.S. Naval Institute, October 28, 2021, <https://www.usni.org/magazines/proceedings/2021/october/naval-mine-warfare-times-they-are-changing>.

access, and barbed wire. In a blockade or gray zone confrontation, these same systems could be used to counter attempts to board transiting vessels.

Portable defensive packages might be placed on merchant ships to provide some protection. Such packages would include capabilities that are too expensive to place on every ship but inexpensive enough to be produced in large numbers and deployed on those ships that need it. Some examples include sonic systems, foams, water cannons, and dazzlers to discourage boarding parties. The aim is to increase survivability to the point where operations are viable, not to prevent all losses, which is an unattainable goal. This space is open for imaginative solutions, as major navies have historically been less susceptible to these challenges, and therefore, not thought deeply about them.

The DOD's Joint Nonlethal Weapons Program has developed a wide variety of nonlethal systems "to arm the Joint Force with the fullest range of capabilities in support of National Security objectives."<sup>84</sup> Many of the technologies developed by the task force have been used in combat. Expanding them to partner nations and commercial shippers would be new but could potentially provide significant leverage in a blockade or gray zone situation. Partner nations might find these capabilities easier to employ during gray zone or blockade confrontations because they are the ones being directly threatened. Commercial organizations might use these capabilities under the concept of self-defense, expanding what they have done to protect themselves against pirates.<sup>85</sup>

- **UASs to Harass the Harassers:** Building on the discussion above, small, shipborne UASs might help thwart harassment by Chinese ships, particularly nonmilitary vessels such as the China Coast Guard and Maritime Militia. By harassing the harassers, UASs could warn of impending danger and interfere with attacks by Chinese water cannons or "shouldering."

## Defending against All Manifestations of Air Threats

An area universally noted in discussions about future conflict is the need to counter a wide variety of air threats, from ballistic missiles, to cruise missiles, to UASs. Once the province of well-funded states, these capabilities are now obtainable by every nation. Indeed, even non-national groups such as Hezbollah and Hamas now field large rocket and cruise missile forces.

This drives a demand for air defenses to protect populations, military forces, and the flow of goods. Missile defenses need not be 100 percent effective to have value. All defenses complicate an adversary's planning. Such efforts could include:

- **Missile Defenses:** Regional U.S. ballistic missile defenses are relatively well developed since these threats have been around for a while, such as from North Korea, Iran, and Saddam Hussein's Iraq. Cruise missile defenses have received considerable attention recently as more countries have obtained these missiles, and U.S. ground-based air defenses have atrophied.

The CSIS Missile Defense Project has written extensively about these needs. Although many of these analyses have focused on U.S. homeland defense, many of the insights and systems described are

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84 "Joint Intermediate Force Capabilities Office," U.S. Department of Defense, Non-Lethal Weapons Program, n.d., <https://jnlwp.defense.gov/>.

85 Ibid. For a description of the office, its history, and some of its current programs, see their website.

applicable to overseas operations and other countries. Their 2023 report on the Russian missile offensive against Ukraine notes that U.S. missile defense systems have been largely successful in intercepting Russian missiles, that fixed air defense platforms are themselves highly vulnerable, and that passive defenses remain critical to mitigating missile threats.<sup>86</sup> Their 2022 review of North American missile defense architecture argues that U.S. homeland cruise missile defenses have been neglected, leaving the United States vulnerable to non-nuclear attack and coercion.<sup>87</sup>

Even hypersonic missiles can be countered. A pair of CSIS Missile Defense Program reports argue that, although hypersonic missiles are formidable weapons, they are not unbeatable. The United States can develop defenses, and these can be deployed overseas.<sup>88</sup>

- **Counter Uncrewed Aerial Systems:** The wars in Ukraine and between Israel and Hamas have highlighted the need to counter UASs with inexpensive systems. Systems designed for aircraft and cruise missile defense are too expensive. It makes little sense to shoot down a \$20,000 kamikaze UAS with a million-dollar missile. Further, countering the swarms of cheap, often commercial reconnaissance UASs requires many systems to cover the entire length of the front lines.

This need is not a surprise, as the United States has been developing a wide variety of such systems for some time, including small-scale interceptor rockets, electronic warfare and jammers, and nets that capture adversary UASs. While some of these countermeasures involve complex technologies, others are simple since many Chinese UASs rely on simple radio links that can easily be jammed or overpowered. Many of these countermeasures have been sent to Ukraine. On the horizon is the possibility of directed energy weapons, which could rapidly attack multiple targets at low cost per shot.

Nevertheless, the field is underdeveloped, and with UAS technology constantly evolving, a measure/countermeasure competition will play out for many years. Innovation and new systems will be needed constantly.

The working group emphasized that systems to counter small and medium-sized UASs need to be integrated with front-line units because UASs are so widely proliferated. Creating specialized units is not sufficiently responsive except for dealing with the largest UASs.

## Thinking Offensively, Even When on the Defense

Much of the literature relating to the Western Pacific is about defense and coping with Chinese A2/AD capabilities. This is reasonable considering the threat environment. However, even in defensive situations, there are opportunities for the offense. Several technologies can facilitate these opportunities:

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86 Ian Williams, *Putin's Missile War: Russia's Strike Campaign in Ukraine* (Washington, DC: CSIS, Rowman & Littlefield, 2023), <https://www.csis.org/analysis/putins-missile-war>; and Shaan Shaikh, "China's Hypersonic Future," *Missile Threat*, CSIS, December 12, 2021, <https://missilethreat.csis.org/chinas-hypersonic-future/>.

87 Tom Karako et al., *North America Is a Region, Too: An Integrated, Phased, and Affordable Approach to Air and Missile Defense for the Homeland* (Washington, DC: CSIS, July 2022), <https://www.csis.org/analysis/north-america-region-too>.

88 Masao Dahlgren and Tom Karako, *Complex Air Defense: Countering the Hypersonic Missile Threat* (Washington, DC: Rowman & Littlefield, 2022), <https://www.csis.org/analysis/complex-air-defense-countering-hypersonic-missile-threat>.

- **Jamming and Counter-C3I:** Chinese reliance on “information agility” and “system-of-systems” operational concepts opens vulnerabilities. Without fully functioning C3I systems to coordinate and integrate, the disconnected parts will be less than the integrated whole. Thus, jamming activities could pay huge dividends.
- **Uncrewed Surface Vessels:** USVs might provide a way to operate inside the Chinese defensive zone while minimizing risk to crewed surface ships. The Navy is investigating many such vessels, from the size of rowboats to the size of corvettes. All can extend the sensor range of crewed vessels. The additional standoff distance provides more warning of attack and longer-range targeting for offensive weapons. Larger USVs will likely incorporate weapons, thus increasing the magazine depth of the total fleet. The Navy is conducting many experiments in this area, not having settled on a particular architecture or set of programs.

The working group saw great potential here and noted that USV command and control was much easier than with UUVs because air is a better medium for communications than water. However, they cautioned against making the platforms multi-mission. That increased cost and complexity, removing one of their advantages over crewed systems. Instead, missions for both USVs and UASs (below) should be focused.

- **Uncrewed Aerial Systems:** Like USVs, UASs offer the ability to extend sensor range and potentially be strike assets of their own, with the ability to penetrate A2/AD zones without risking crews. Unlike USVs and UUVs, the Navy has several programs of record, the MQ-25 Stingray and MQ-4 being the most relevant here. The MQ-25 program has particular potential. Its units are beginning production and will reach the fleet in 2026. Although currently configured as tankers, they have the potential to be strike assets on their own.
- **Hypersonic Weapons:** Hypersonic weapons have become the iconic weapon of the new era, with close attention being paid to the technology’s relative development among the United States, China, and Russia. As noted earlier, the problem with hypersonic missiles is their high cost. Nevertheless, even low-inventory weapons can be hugely valuable. The ability of hypersonic weapons to strike distant, high-value, and well-defended targets holds at risk adversary assets that might otherwise be invulnerable or nearly so. Losing these assets, such as headquarters or major platforms, such as aircraft carriers, would disproportionately affect adversary capabilities and morale.
- **Standoff Sea Mines:** As previously noted, sea mines are enormously powerful weapons because of their latency and covertness. However, emplacing them can be a challenge, particularly for the United States, which abides by international rules and has relatively distant bases. Mines that need to be dropped from aircraft risk the survivability of the delivery platform. Mines that can glide some distance reduce this vulnerability. Thus, standoff mines have great potential. The United States has begun developing such a capability with the QuickStrike Extended Range mine, but there is much more that could be done given the increasing strength of Chinese and Russian air defenses.<sup>89</sup> Indeed, sea mines and similar technologies—such as new kinds of mines, decoys, and different emplacement methods—are areas where creative solutions can add friction to Chinese military plans.

The working group recommended enhancing the sea mine capabilities of regional allies since they were already present at key locations and had the latitude to conduct mining in their territorial waters.

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89 Lindsey Heflin, “B-52 Executes Long-Range Mine Test, Advancing Maritime Capabilities in a Contested Environment,” 15th Wing, May 24, 2023, <https://www.15wing.af.mil/News/Article-Display/Article/3408264/b-52-executes-long-range-mine-test-advancing-maritime-capabilities-in-a-contest/>.

## Conclusion: Opportunities for Cooperation

The foregoing lays out many areas of potential cooperation between nations and between the governments and their defense industry. All provide insight into the question of what might be done while waiting for the submarine fleet to expand. Some areas may prove more fruitful or easier to coordinate than others. Deciding which to pursue requires prototyping, experimentation, and field testing. That process needs to move forward.

Only by beginning the forward movement can the assessment process illuminate challenges that inevitably occur. For example, export controls and restrictions on data sharing are emerging as key challenges to the technology coordination envisioned by AUKUS.<sup>90</sup>

Finally, government decisions on promising technologies signal industry where it should focus its attention and resources. The defense industry in every country wants to produce products that the defense establishment requires, but these industries need pointers to ensure they are being responsive to government strategies.

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90 Brian Clark, “Indo-Pacific Expo Will Look beyond AUKUS Subs,” Breaking Defense, November 6, 2023, <https://breakingdefense.com/2023/11/indo-pacific-expo-will-look-beyond-aucus-subs/>.



# About the Author

**Mark F. Cancian** (Colonel, USMCR, ret.) is a senior adviser with the International Security Program at the Center for Strategic and International Studies (CSIS) in Washington, DC. He joined CSIS in April 2015 from the Office of Management and Budget, where he spent more than seven years as chief of the Force Structure and Investment Division, working on issues such as Department of Defense budget strategy, war funding, and procurement programs, as well as nuclear weapons development and nonproliferation activities in the Department of Energy. Previously, he worked on force structure and acquisition issues in the Office of the Secretary of Defense and ran research and executive programs at Harvard University's Kennedy School of Government. In the military, Colonel Cancian spent over three decades in the U.S. Marine Corps, active and reserve, serving as an infantry, artillery, and civil affairs officer and on overseas tours in Vietnam, Desert Storm, and Iraq (twice). Since 2000, he has been an adjunct faculty member at the Johns Hopkins School of Advanced International Studies, where he teaches a course on the connection between policy and analysis. A prolific author, he has published over 40 articles on military operations, acquisition, budgets, and strategy and received numerous writing awards. He graduated with high honors (*magna cum laude*) from Harvard College and with highest honors (Baker Scholar) from Harvard Business School.

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