Atlantic Council
SCOWCROFT CENTER
FOR STRATEGY AND SECURITY

Emerging Technologies and the Future of US-Japan Defense Collaboration

Tate Nurkin and Ryo Hinata-Yamaguchi

Atlantic Council

SCOWCROFT CENTER
FOR STRATEGY AND SECURITY

The Scowcroft Center for Strategy and Security works to develop sustainable, nonpartisan strategies to address the most important security challenges facing the United States and the world. The Center honors General Brent Scowcroft's legacy of service and embodies his ethos of nonpartisan commitment to the cause of security, support for US leadership in cooperation with allies and partners, and dedication to the mentorship of the next generation of leaders.

The Asia Security Initiative (ASI), housed within the Scowcroft Center for Strategy and Security, leverages strategic foresight to promote forward-looking strategies and constructive solutions for the most pressing issues affecting the Indo-Pacific region. ASI's central mission is to enhance cooperation between the United States and its allies and partners in the Indo-Pacific in order to develop a community of like-minded nations that are committed to adapting, defending, and revitalizing the rules-based international system. A key piece of this mission rests on providing cutting-edge analysis and actionable policy recommendations for the United States and its allies and partners as they seek coordinated responses to the rise of China in a new era of great power competition. At the same time, ASI continues to address broader issues shaping the region's strategic environment, including traditional security issues such as nuclear proliferation and maritime security, as well as emerging challenges in non-traditional areas such as energy security, geoeconomics and changing trade architecture, infrastructure development, and disruptive technologies. Ultimately, in order to narrow the gap in understanding between Washington and the rest of the Indo-Pacific, ASI prioritizes direct engagement with regional stakeholders and voices across its program. This publication was produced in partnership with the Embassy of Japan under the auspices of a project focused on the strategic impacts of emerging defense technology and the US-Japan alliance.

Emerging Technologies and the Future of US-Japan Defense Collaboration

Tate Nurkin and Ryo Hinata-Yamaguchi

ISBN-13: 978-1-61977-094-2

Cover: *Shutterstock*

April 2020

TABLE OF CONTENTS

INTRODUCTION

Geopolitical and security dynamics are shifting in the Indo-Pacific as states across the region adjust to China's growing influence and the era of great-power competition between the United States and China. These geopolitical shifts are also intersecting with the accelerating rate of innovation in technologies associated with the Fourth Industrial Revolution (4IR) to reshape the future of military-technological competition and emerging military operations.

Disparate development of artificial intelligence (AI), unmanned systems, hypersonic weapons, new materials, smart sensors, neuro and biotechnologies, and many others portends radical shifts in the nature, properties, and applications of future military capabilities. It is still uncertain *exactly* how these technologies and the capabilities they enable will affect operational environments. But, the continued development of these technologies and the evolution of their applications for defense and security purposes are already creating new operational challenges and prominently shaping strategic competition.

To ensure that innovation in novel military capabilities and underlying technologies enhances, rather than degrades, security in the region, the United States and Japan must accelerate and intensify their long-standing military and defense-focused coordination and collaboration.

This collaboration will no doubt take place in areas of traditional military capability—this paper's recommendations include, for example, endorsements of US-Japan co-development programs on Japan's future fighter- and ground-launched anti-ship cruise missiles. However, in order to overcome political, geopolitical, force-posture, industry, and resource constraints, Japan and the United States will need to be creative in devising varied mechanisms and forums for collaboration and coordination. These mechanisms must reflect prevailing new approaches to capability development and procurement; acceleration of timelines for innovation and production; increased demand for modularity, open architectures, and agility in capability development and deployment; and incentivization of new actors outside of the traditional defense industrial bases in both the United States and Japan.

While collaboration should take place across a broad suite of military and security applications of emerging technologies, the opportunities and challenges inherent in a new approach to US-Japan military collaboration are most clearly seen in the development of unmanned systems, hypersonic/hyper-velocity missiles, and the defense applications of AI.

Technologies Associated with the Fourth Industrial Revolution

- Artificial intelligence
- Internet of Things
- Cloud computing
- Quantum computing
- Big-data analytics
- Robotics
- Blockchain
- Novel materials
- Additive manufacturing and multidimensional printing
- Biotechnologies
- Neurotechnologies
- Smart sensors
- Virtual and augmented reality
- Energy capture and storage
- Space technologies

These three areas are at the center of the intensifying US-China military-technological competition. They are key to challenging or upholding military balances and stabilizing imbalances in and across key domain-area competitions—strike versus air and missile defense or undersea—on which regional and, over time, global security is at least partly based. Unmanned systems and AI are also particularly relevant to the conceptualization and implementation of new concepts of warfare, such as mosaic or multi-domain warfare, that stress formations of autonomous unmanned and manned systems distributed across domains, as well as rapid processing of information and dissemination of tactical and operational decisions.[1]

1 Bryan Clark, Dan Patt, and Harrison Schamm, "Mosaic Warfare: Exploiting Artificial Intelligence and Autonomous Systems to Implement Decision-Centric Operations," Center for Strategic and Budgetary Analysis, February 2020, v, https://csbaonline.org/uploads/documents/Mosaic_Warfare.pdf.

A Standard Missile-3 Block IB Threat Upgrade (SM-3 Blk IB TU) missile launches from the Japan destroyer, JS ATAGO (DDG-177) during Japan Flight Test Mission-05 (JFTM-05) Sept. 12, 2018. The Japan Maritime Self-Defense Force (JMSDF) and the United States Missile Defense Agency (MDA) announced the successful completion of the Aegis Ballistic Missile Defense (BMD) intercept flight test, in cooperation with the US Navy, off the coast of Kauai in Hawaii. The event, designated Japan Flight Test Mission-05 (JFTM-05), was conducted in order to demonstrate a successful engagement of a target missile from the JS ATAGO using the sea-based midcourse engagement capability provided by Aegis BMD. *Source: US Indo-Pacific Command/ Ryan Keith*

Japan Ministry of Defense's ATLA's Research and Development Priorities

- Cyber
- Underwater technologies
- The electromagnetic spectrum
- Hyper-velocity missiles
- Persistent wide-area intelligence, surveillance, and reconnaissance
- Network operations

Beyond the general recognition of the value they are bringing to future conflict, these technologies—unmanned systems and artificial intelligence, in particular—should be at the center of future US-Japan defense collaboration for five reasons that, individually and collectively, are creating new channels and opportunities for politically viable and bold collaboration.

First, future combat outcomes will, in many ways, rest on the development and deployment of military applications of these technologies and capabilities. Each of them is either specifically articulated in or directly linked with the six Japanese Ministry of Defense (MoD) research and development (R&D) priorities announced during the DSEI Japan exhibition in November 2019.[2]

Hyper-velocity missile development—both air-launched missiles with scramjet engines and hyper-velocity glide projectiles—is explicitly listed as a research and development priority.[3] In March 2020, the MoD's Acquisition, Technology, and Logistics Agency (ATLA) released a roadmap for the incremental development of both a hyper-velocity glide projectile (HVGP) and a hypersonic cruise

2 Stew Magnuson, "DSEI Japan News: New Threats Prompt Japanese Military to Refocus R&D," *National Defense*, November 19, 2019, https://www.nationaldefensemagazine.org/articles/2019/11/19/dsei-japan-news-new-threats-prompt-japanese-military-to-refocus-its-military-rd.

3 The Japanese "Defense of Japan" paper, which includes the Mid-Term Development Program, frequently refers to "hyper-velocity" missiles, rather than "hypersonic" missiles. This variance can cause confusion, given the use of the term "hyper-velocity projectiles" in the US context to describe a potential solution to the US and allied missile-defense challenge. Nonetheless, mentions of Japanese use of "hyper-velocity" in this paper are in direct reference to boost-glide vehicles and air-launched hypersonic weapons.

Figure 1: A map of East Asia showing the location of the Senkaku islands, of varying territorial claims. *Source: Shutterstock/dikobraziy*

missile (HCM) as well as the warheads with which these missiles will be armed.[4] And while the document's focus is on domestic development, it does leave open the possibility of "international joint development."[5] Unmanned systems are central to other priorities, such as persistent wide-area intelligence, surveillance, and reconnaissance (ISR) and underwater technologies. Indeed, in November 2019, the chief scientist of the ATLA noted the value of "long-endurance multi-purpose platforms such as [unmanned underwater vehicles] and [unmanned surface vehicles]" in anti-submarine warfare and the broader underwater competition.[6]

In addition, the 2019 Mid-Term Defense Program (MTDP) specifically states that the "MOD/SDF will make focused investments in important technologies including artificial intelligence and potentially game-changing cutting-edge technologies."[7] Japan will no doubt hope to feature its own industry in driving these priorities. Nonetheless, the prominence of these development plans and the urgency and relevance of the requirement offer opportunities for US-Japan coordination, collaboration, and potential joint development.

Second, these capabilities are priorities because they help Japan cope with two challenges that cut at the future efficacy of the JSDF: distance and demographics.

Over the past four years, Japan has taken proactive steps to improve its capacity to defend the contested Senkaku Islands, which China also claims. Japan Ground Self-Defense Force (JGSDF) units have been deployed to bases on several islands southwest of Okinawa, and the JSDF also established the Amphibious Rapid Deployment Brigade (ARDB) to respond to fast-moving gray-zone contingencies in these more distant islands.[8]

Hypersonic/hyper-velocity missiles travel at speeds of Mach 5 and above, and can serve as an important component of the rapid defense of these islands. Similarly, increased incorporation of unmanned systems offers a cost-efficient means of providing surveillance of these islands, while applications of machine learning can help Japan better process and use the information collected from a wide range of sensors.

Japan's MoD is also cognizant of how demographics are straining its future force. There is real and urgent concern embedded throughout Japan's 2019 MTDP over the effects of a declining population on Japan's ability to recruit and retain personnel. Here, unmanned systems again play a crucial role as a force multiplier, enabling the Japan Self-Defense Force (JSDF) to carry out missions, such as persistent ISR, that humans and manned platforms cannot, or that strain human endurance to its limits, potentially undermining recruitment and retention. Machine learning and other AI technologies will have a similar multiplying effect by reducing the human burden in areas like intelligence processing and speeding up critical training offerings of the forces that are available to Japan—both areas of potential US-Japan collaboration.

4 Kosuke Takahashi, "Japan developing new anti-surface warheads for future hypersonic missiles", *Jane's Defence Weekly*, March 12, 2020, https://www.janes.com/article/94850/japan-developing-new-anti-surface-warheads-for-future-hypersonic-missiles.
5 Yoshihiro Inaba, "Japan To Develop And Deploy Supersonic Glide Weapons That Can Target Ships", *Naval News*, March 4, 2020, https://www.navalnews.com/naval-news/2020/03/japan-to-develop-and-deploy-supersonic-glide-weapons-that-can-target-ships/.
6 Magnuson, "DSEI Japan News: New Threats Prompt Japanese Military to Refocus R&D."
7 Japan Ministry of Defense, "Defense of Japan 2019, Chapter 4: New Medium Term Defense Program (MTDP), etc.," 234, https://www.mod.go.jp/e/publ/w_paper/pdf/2019/DOJ2019_2-4-1.pdf.
8 Yoshihiro Inaba, "Japan MoD Announces New Deployment and Training Plan for JGSDF With Focus on Island Defense," *Naval News*, December 26, 2019, https://www.navalnews.com/naval-news/2019/12/japan-mod-announces-new-deployment-training-plan-for-jgsdf-with-focus-on-island-defense/.

Indicative (Not Exhaustive) Unmanned Systems Missions

- Strategic and tactical intelligence collection, surveillance, and reconnaissance
- Data/communications link
- Electronic warfare
- Identification/suppression of enemy air defenses
- Targeted strike
- Environmental/infrastructure monitoring
- Delivery/transport
- Battle damage assessment
- Facility/border monitoring
- Mine clearance and explosive-ordnance disposal
- Escort missions
- Unmanned system interceptor

Third, unmanned systems and AI applications for national security are broad capability/technology areas encompassing numerous applications in support of multiple mission sets. The diversity of applications of AI and unmanned systems offer many collaboration opportunities that do not raise political alarms or concerns about technology transfer and industrial base.

In unmanned air, ground, surface, and undersea vehicles (UAVs, UGVs, USVs, and UUVs), *velocity of demand* across a growing number of missions and platform types is driving an increase in the *volume of suppliers* offering a *variety of solutions* differentiated by unique design or technological features. Collaboration on unmanned systems, then, does not have to be around a specific type of unmanned system operating in a single domain and carrying out a specific mission.

Similarly, military applications of AI go well beyond the controversial applications of lethal autonomous weapons systems (LAWS) and facial-recognition systems. The recently released Atlantic Council Strategy Paper *A Candle in the Dark: US National Security Strategy for Artificial Intelligence* articulates eight broad categories of military and security-related applications of AI to include several areas that are considerably more palatable applications, especially for Japan.[9]

Fourth, these are all areas in which Japan has developed domestic capability or has active programs around which meaningful collaboration can be built. In unmanned systems, Japan is largely emphasizing UAVs to improve information collection and other ISR missions "in areas remote from Japan and persistent airborne monitoring during situations with heightened tensions."[10] Japan has already procured Global Hawk high-altitude, long-endurance (HALE) UAVs for this mission, and set up a squadron to support Global Hawk operations that is set to become active in 2021. In addition, the Japanese company IHI unveiled an autonomous underwater mine-detection system designed to acquire, process, classify, and relay information about "mine-like objects, among other things" during the DSEI Japan defense exhibition in November 2019, reflecting an interest and competency in unmanned solutions to undersea threats.[11]

In the military context, Japan's AI attention has been on machine learning designed to enhance collection and processing of information. For example, Japan plans to equip an undisclosed number of its Kawasaki P-1 maritime patrol aircraft (MPA) with AI to boost the platform's intelligence-gathering capabilities.[12]

The MoD is also developing both a hyper-velocity glide vehicle and an air-launched hyper-velocity missile that uses a scramjet engine to reach hypersonic speeds. Japan expects the latter system to be fielded around 2030 and an "improved hypersonic cruising missile" about five years later. A boost-glide system would come along around the mid-2030s.[13]

Fifth, artificial intelligence and unmanned systems rely on innovation taking place in the private sector, further expanding channels of US-Japan coordination and collaboration. Japan's strengths in defense-relevant science and

9 Tate Nurkin and Stephen Rodriguez, *A Candle in the Dark: US National Security Strategy for AI, Atlantic Council*, December 10, 2019, 23, https://www.atlanticcouncil.org/wp-content/uploads/2019/12/AC_CandleinDark120419_FINAL.pdf.
10 Japan Ministry of Defense, "Defense of Japan 2019, Chapter 4: New Medium Term Defense Program (MTDP), etc.," 234.
11 Gabriel Dominguez, "DSEI Japan 2019: IHI Unveils Autonomous Underwater Mine Detection System," *Jane's Defence Weekly,* November 18, 2019, https://www.janes.com/article/92640/dsei-japan-2019-ihi-unveils-autonomous-underwater-mine-detection-system.
12 Kosuke Takakashi, "Japan to Outfit Kawasaki P-1 MPA with Artificial Intelligence," *Jane's Defence Weekly*, November 13, 2019, https://www.janes.com/article/92545/japan-to-outfit-kawasaki-p-1-mpas-with-ai-technology.
13 Stew Magnuson, "DSEI Japan News: New Threats Prompt Japanese Military to Refocus R&D."

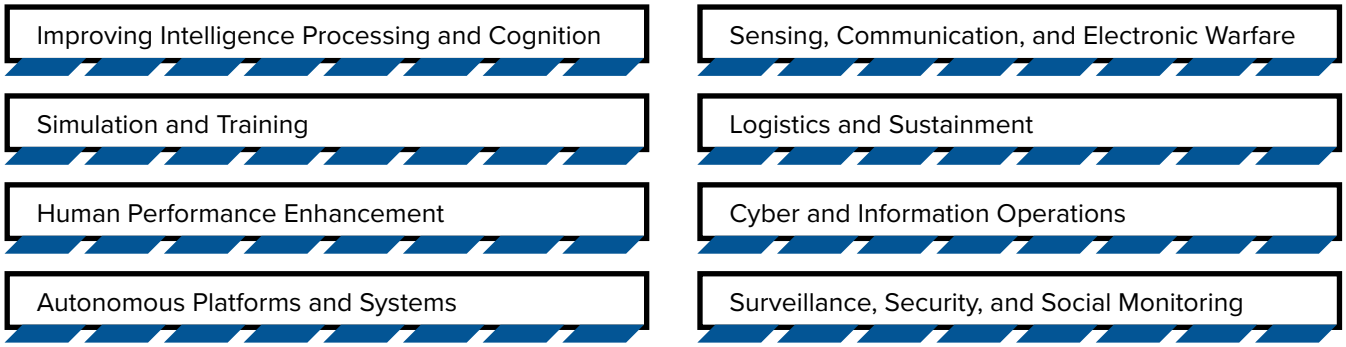

Figure 2: A framework for bounding the ways in which AI-enabled capabilities are being applied in support of defense and security efforts by the US Department of Defense and other military and security communities throughout the world.

technology—such as material sciences, robotics, batteries, and machine learning—largely emanate from the commercial sector. According to Hirokazu Hokazono, chief defense scientist at ATLA, devising ways to better integrate these technologies is a priority: "What is most important is that we sweep those technologies up and integrate them into our defense technology systems."[14]

The US Department of Defense (DoD) also has struggled with effectively incentivizing its commercial high-tech industry to participate in defense procurements, largely due to concerns on the part of this industry about the cumbersome nature of US DoD bureaucracy and procurement and constraints on profit margins, pricing, and return on investment.[15]

The Science-Technology-Capability-Effect Continuum

The discussion of 4IR-enabled military capabilities raises a critical tension in this analysis—the difference between four important concepts that sit roughly on a continuum ranging from "science" to "technology" to "capability" to "effect."

Moving from one node to the next requires additional innovations, some of which go well beyond technology. Moving from science to technology, for example, requires experimentation and advancement of understanding the parameters of advanced technologies' structure and performance. Moving from technology to capability requires a range of nontechnological innovations, all of which will help define the nature of US-Japan equipment and technology collaboration, including

- establishment and refinement of doctrine and operational concepts;
- building supporting infrastructure, including education, training, and logistics;
- resolving ethical and ease-of-use issues;
- creating a business case for industry to support; and
- facilitating adoption through regulatory, procurement, and legal shifts.

Moving from technology to effect is largely a matter of effective implementation.

These distinctions go well beyond semantics and, as a result, open up opportunities for mutually beneficial US-Japan collaboration defense in areas such as operational concepts, training, and research on ethical use of AI and other 4IR technologies.

14 Stew Magnuson, "US-Japan Defense Tech Cooperation Stymied by Cultural Hurdles," *National Defense*, January 17, 2020, https://www.nationaldefensemagazine.org/articles/2020/1/17/us-japan-defense-tech-cooperation-stymied-by-cultural-hurdles.

15 Tate Nurkin, *In an Era of Great-Power Competition, Procurement Reform Not More Regulation for the Defense Industrial Base, Atlantic Council*, February 7, 2020, https://atlanticcouncil.org/blogs/new-atlanticist/in-an-era-of-great-power-competition-procurement-reform-not-more-regulation-for-the-defense-industrial-base/.

DRIVERS, TENSIONS, AND CONSTRAINTS SHAPING COLLABORATION

Political and geopolitical drivers and constraints—as well as disparities in respective military posture, mission focus, and risk tolerance—will influence the dimensions of US-Japan collaboration and help determine answers to three critical questions: on what technologies, through what mechanisms, and to what end should the United States and Japan deepen cooperation in science, technology, and military capabilities?

Threat Perception in the Age of Great-Power Competition

The United States and Japan both prioritize a free and open Indo-Pacific, and share similar perceptions of the threats to this objective and to their respective national securities emanating from China's military modernization, North Korea's nuclear and missile programs, and, to a lesser extent, Russia's efforts to reinforce its status as an Indo-Pacific power. Still, within this general alignment, differences in priorities and preferred responses could limit the nature of coordination by decreasing trust and catalyzing potential conflicts of geopolitical interest for both Japan and the United States.

The most significant threat both countries face stems from China. Beijing's aggressive behaviors and specific territorial claims to the Senkaku Islands, and the frequent incursions of Chinese military ships and planes into Japanese territorial waters, exclusive economic zone (EEZ), and air-defense exclusion zone (ADIZ) are a persistent, and nearly existential, concern for Japan. China's military modernization program has made progress over several decades across several priority areas (see figure 4 below), and is increasingly providing the People's Liberation Army (PLA) the capabilities to press territorial claims and hold at risk Japanese and US forces not just in Japan, but across the region.

However, Japan's perception of China as its most pressing security threat is at least partially balanced by the reality that it is also Japan's most important economic partner—as China is for most Indo-Pacific states.[16] As a result, Tokyo takes a two-track approach to Beijing that rests on increasing JSDF and Japan Coast Guard (JCG) readiness and deterring China, while also emphasizing the need to further develop the economic relations not only to meet trade and investment interests, but also to curb the likelihood of conflict.

The current US administration's confrontational approach to China, represented most prominently by the National Defense Strategy and the "trade war," presents advantages and potential vulnerabilities for Japan. Certainly, the pushback and calling out of China's geopolitical, military, and trade behaviors is welcome. Yet, the trade conflict between the United States and China has triggered dilemmas for the Japanese that point to the potential effects on trade, as well as the possibility that Japan may be expected to take sides or act as a mediator.

The United States and Japan have also been aligned in their perception of North Korea's development of nuclear weapons, ballistic missiles, and asymmetric capabilities in the cyber and maritime domains. Since the launch of *Taepodong-1* over Japan in August 1998, Japan and the United States have worked together to develop ballistic-missile defense capabilities. This shared concern has served as the foundation for defense industrial collaboration. Raytheon and Mitsubishi Heavy Industry's (MHI) joint development of the standard missile-3 block IIA (SM-3 Block IIA) stands as a hard-won success in US-Japan defense industry collaboration. The missile is expected to be a key component of the Navy's ballistic-missile defense system, as well as the current two Aegis Ashore ground facilities in Romania and Poland and the two planned facilities in Japan.[17]

But here, too, there are gaps in the approaches favored by the current administrations in Washington and Tokyo. Notably, the Donald Trump administration's recent public embrace of North Korean leader Kim Jung-Un has raised anxiety in Japan that the Trump administration may agree to a deal "that protects the US mainland, but stops short of removing North Korea's capacity to strike Japan."[18] The recent impasse in the US-North Korea dialogue is unlikely to fully allay these concerns.

US-Japan responses to North Korea are also complicated by the issue of the return of Japanese citizens abducted by North Korea in the 1970s and 1980s. Japan has called

16 Fang Tiang, "China Rises to 16 Asian Country's Biggest Trading Partner," *People's Daily Online*, November 12, 2018, http://en.people.cn/n3/2018/0112/c90000-9314972.html.

17 Paul McLeary, "New US/Japanese Missile Ready for New Generation of Threats," *Breaking Defense*, August 1, 2019, https://breakingdefense.com/2019/08/new-missile-interceptor-striking-as-threats-grow/.

18 Lindsay Maizland and Beinu Ku, "The US-Japan Security Alliance," Council on Foreign Relations, August 22, 2019, https://www.cfr.org/backgrounder/us-japan-security-alliance.

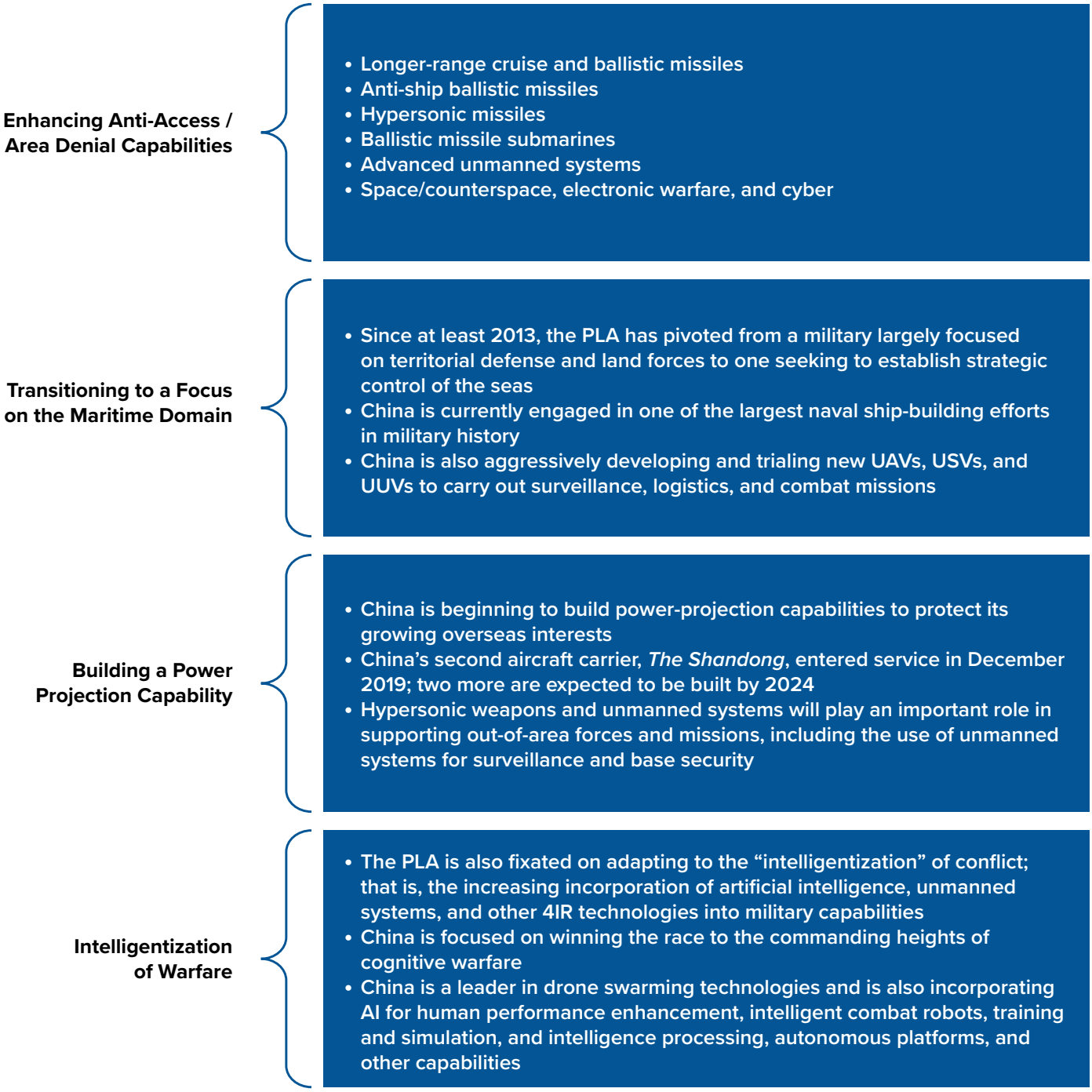

Figure 4: Key priorities and capabilities shaping China's military modernization. *Source: Tate Nurkin*

on other states, including the United States, to mount diplomatic pressure on North Korea, though the level of US urgency on this issue is not as high as that of Japan.[19]

Japan still has unsettled territorial disputes with Russia over the Kurile Islands, and must deal with frequent incursions of Russian military planes into Japanese airspace. Economic cooperation with Russia is vital for Japan, in part, to secure the import of gas from Sakhalin. Conversely, Russia is sensitive to developments in the US-Japan alliance that would pose a threat to its own regional and national security interests. A frequently cited reason for Russian incursions into Japanese

19 Ibid.

(and South Korean) airspace is as a means of objecting to and putting stress on US cooperation with its allies.[20]

Even marginal differences in perception produce limits to the parameters of US-Japan joint development of, and coordination on, military capabilities. Especially provocative programs like joint hypersonic-missile development will be viewed as escalatory, and will likely generate a response from China, Russia, and/or North Korea that could complicate other trade or geopolitical interests that go beyond Northeast Asia. One example: Chinese pressure on Association of Southeast Asian Nations (ASEAN) states in response to more aggressive collaboration could upset delicate balances among Southeast Asian states, many of which are actively hedging between the United States and China. Of course, the converse also applies. The United States and Japan generally view China's continued development of hypersonic missiles (and display of the DF-17 at the October 1 military parade in Beijing) as escalatory, stimulating opportunities for innovation and collaboration on potential countermeasures.

Moreover, the Republic of Korea will likely see substantial US-Japan collaboration not through an adversarial lens, but certainly through the lens of strained relations stemming from both historical and contextual issues, further complicating US-Japan-Republic of Korea trilateral cooperation.

Defense Posture, Missions, and Risk-Tolerance Gaps

The United States and Japan have varied defense postures closely linked to their recent histories, as well as political and geopolitical realities that will also shape the nature of the defense capability-development partnership.

The United States, as an Indo-Pacific state, is comfortable with power projection, offensive military capability, and geopolitical and military competition and confrontation—even if the Trump administration's demand for an increase in Japan's burden sharing reflects a highly transactional approach that eschews the strategic value of a prominent US forward presence. US weariness of "forever wars" is undoubtably affecting US foreign, defense, and security policy in the Middle East, but Indo-Pacific policy focus has sharpened around resistance to, and deterrence of, China's status-quo-challenging behavior and expanding military modernization.

Japan's more defensive and risk-averse posture is rooted in the constraints of the nation's self-imposed laws, codes of conduct, and policies related to Article 9 of the Japanese constitution, which limit the ways in which Japan can respond to security challenges and crises. Some incremental adjustments to Article 9 have taken place since the 2000s—notably, the Armed Attack Situation Response Act enacted in 2003 and the Measures Based on the Armed Attack Situation Response Act of 2004, which authorize the JSDF to respond more effectively to contingencies.

A more significant development came in 2015 with the passing of the Legislation for Peace and Security, which includes Japan's ability to respond to "gray-zone" situations that threaten the nation's security, as well as partially exercising the right of collective self-defense. However, these were only moderations of the laws that established considerable restrictions on Japan's defense operations and continue to restrain JSDF's ability to mobilize.

The JSDF is among the most technologically advanced militaries in the world, though its modern capabilities must be seen within the context of Japan's self-defense-oriented posture. In the next five to ten years, then, the JSDF's readiness will be enhanced through capabilities that are either explicitly defensive or sit at the seam between defensive and offensive, like, for example, a ground-launched anti-ship cruise missile. This is a different and more limited modernization approach than that shaping US capability and operational concept development, which is rooted in a need for strategic forward deployment and robust expeditionary forces capable of fighting out-of-area and multi-domain conflicts.

In addition, collaboration on new capabilities that advance Japan's transition to "cross-domain" operations or to become more competitive in domains such as cyber, the electromagnetic spectrum, and space will introduce new opportunities, but also dilemmas and capacity challenges for Japan's defense planning. Considering the legal, political, bureaucratic, and resource constraints of this transition, domestic joint-capability development is likely to be incremental, which could be too slow to counter the gains of China's technology-driven modernization effort.

Creativity, trust, and boldness will be required to bridge the gap between the long-term nature of traditional joint development programs and the increasingly urgent need to meet readiness and capability gaps. Here again, a focus on unmanned systems, and AI in particular, offers promise, given the relatively shorter timelines associated with the development of underlying technologies.

Industry

Japan's defense industry has demonstrated expertise in many technical areas, including components, missile systems, sensors, manufacturing, ship and submarine building, land systems, and batteries. Japan's capability

20 "Incursion by Russian Plane Seen as Test of Japan's Collaboration with US and South Korea," *Japan Times*, July 29, 2019, https://www.japantimes.co.jp/news/2019/07/29/national/airspace-incursion-russian-plane-seen-testing-japans-collaboration-u-s-south-korea/#.Xk1QMG5FxZc.

development can also draw on a commercial technology sector that excels in machine learning, robotics, new materials, and energy capture and storage.

However, much like the JSDF, Japan's defense industrial base has been largely constrained and distorted by the restrictions of Article 9 and the three principles prohibiting defense exports. With a single core customer with customized requirements that, in many cases, were not shared by the market, Japan's defense industrial base remained small, but technically accomplished. And, these attributes created a self-reinforcing cycle: the small, expensive, and bespoke nature of the industry led the JSDF to procure high-end military equipment directly from the United States through foreign military sales, frequently depriving Japanese industry of experience and revenue opportunities.

Since the ban on defense export sales ended in 2014, Japan has sought to develop its domestic industrial base to service not just the Japanese MoD, but also an increasingly open and competitive global market. Japan's industry has not yet scaled a defense exports capability. However, the industry is gaining confidence and increasingly seeking to expand both its capabilities and international relationships in order to develop the experience and capabilities required to more effectively compete in the international market. Notably, the Japan DSEI exhibition held in November 2019 was the first fully integrated global defense show held in Japan, drawing defense companies from throughout the world.[21]

This increasing confidence and efforts to expand international relationships are creating tension between three important defense and security priorities that are central to future prospects for US-Japan defense collaboration. These include

- the difficult choice between a desire to build capacity through fully domestic or joint development programs;
- the need to get more value from defense procurement efforts to meet increasingly complex and fast-moving threats; and
- the need to further strengthen the US alliance.

US defense companies have a history of engaging in joint programs with Japanese companies. Still, there have been challenges in the past, both in terms of execution and expectations (particularly around transfer of critical technologies) that could shape the nature of joint development programs and US-Japan collaboration more broadly. An indicative and useful example: the ongoing discussion of whether and how the United States will play a part in Japan's F-2 replacement has been affected, in part, by different perceptions of the nature of joint technology research. US defense officials have "emphasized operational concepts and capability requirements as the basis for collaboration," while Japanese officials have "continued to focus on technology development and industrial base interests."[22]

Resource Issues

Japan's defense spending has steadily increased over the past eight years, with the draft defense budget for the 2020 fiscal year set to be 5.3 trillion yen ($48 billion)—the largest in Japan's history.[23]

However, the self-imposed spending limit of 1 percent of gross domestic product (GDP) remains in place, forcing major trade-offs in capability development. Prime Minister Shinzo Abe has stated that the 1-percent-of-GDP cap could be revised in the future. Yet, exactly when and how defense-budget increases will take place remains uncertain, given the other major priorities in the Japanese economy. Moreover, whether the requests made by the MoD to increase its budget are accepted or not depends on the nature of the request. Long-term, over-the-horizon funding items may be scrutinized, moderated, or even rejected given the historic and contextual political and geopolitical issues discussed above, placing a premium on impactful capabilities and technologies with shorter development timelines, such as unmanned systems, open-architecture software, and AI.

Human resources are another major concern. Currently, the JSDF has two hundred and fifty thousand active personnel; roughly one hundred and fifty thousand are in the JGSDF, while the JASDF and JMSDF have roughly forty-five to fifty thousand each.[24] The imbalance constrains developments in areas that are most essential—air and naval forces. It is easy to state that Japan needs to enhance the readiness of the JASDF and JMSDF by acquiring new platforms. Manning those systems would pose significant challenges, again opening up interest in and opportunities for unmanned systems development and procurement.

21 "Japan's Defence Industry: Ready for Business," DSEI Japan, August 27, 2019, https://www.dsei-japan.com/news/japans-defence-industry-ready-for-business.
22 Gregg Rubinstein, "Japan's Future Fighter Program and the US-Japan Alliance: Collaboration or Collision," Carnegie Endowment for International Peace, May 22, 2019, https://carnegieendowment.org/2019/05/22/japan-s-future-fighter-program-and-US-japan-alliance-collaboration-or-collision-pub-79179.
23 "Japan's Defence Ministry Eyes Record Defence Budget Amid North Korea and China Threats," *Japan Times*, August 31, 2019, https://www.japantimes.co.jp/news/2018/08/31/national/politics-diplomacy/japan-eyes-record-defense-budget-amid-north-korean-chinese-threats/#.Xk1Rym5FxZc.
24 "The Military Balance 2018," International Institute for Strategic Studies, February 2018, 270, https://www.iiss.org/publications/the-military-balance/the-military-balance-2018.

OPPORTUNITIES AND RECOMMENDATIONS

The US-Japan alliance remains a vital part of the national defense of both countries, as well as the broader defense and security of the region. Shifts in both the geopolitical landscape and the nature of emerging military capabilities are catalyzing changes in the way that Japan and the United States should think about partnership in the development and deployment of novel military capabilities.

Bold and creative thinking is required to devise means of collaborating and coordinating on the incorporation of novel capabilities and technologies, especially unmanned systems and AI, as well as hypersonic missiles that will strengthen the alliance and deter and dissuade China, North Korea, Russia, and other actors. Collaboration should focus on four levels of engagement, which roughly correspond to the recommendations for "multifaceted and multilayered security cooperation" between the United States and Japan, articulated in the MoD's MTDP: "Japan will promote defense cooperation and exchanges which include joint training and exercises, defense equipment and technology cooperation, capacity building assistance and interchanges among military branches."[25]

Development of Technology and Military Capabilities

The most important component of cooperation on defense capabilities is direct coordination and collaboration on emerging technologies and capabilities such as AI, unmanned systems, and hypersonic missiles.

This coordination and collaboration can, and should, take many forms. Certainly, ambitious and structured joint programs that bring together the technical and manufacturing competence of the defense industrial bases of Japan and the United States should be a component of US-Japan collaboration. For example, the United States should pursue co-development of a long-range, ground-based anti-ship cruise missile system to better meet the challenge of China's increasing maritime strength and focus.

Similarly, despite political challenges, technology-transfer concerns, and residue of frustration from all parties lingering from the F-2 joint development project, the United States should take measures to incentivize Japan to work with Lockheed Martin on the F-2 replacement program. The stakes for this program are high. According to US-Japan defense analyst Gregg Rubinstein, "Successfully defining a path to US-Japanese collaboration on this program could make the F-3 an alliance-building centerpiece of cooperative defense acquisition" while failure to do so could "undermine prospects for future collaboration in defense capabilities development."[26] Notably, on April 1, ATLA announced that it had rejected a Lockheed Martin design plan that combined elements of the F-22 and F-35 fighters. According to the announcement, "developing derivatives of existing fighters cannot be a candidate from the perspective of a Japan-led development." The announcement does not close the door on Japan-US collaboration. However, it does set parameters around possible collaboration and reinforce the MoD's need for the program to be Japan-led."[27]

But, ambitious years-long, or even decades-long, co-development projects may not always be politically viable in the environment described above, and come with challenges. The SM-3 IIA co-development project is considered a successful example of joint US-Japan industry collaboration. But, even proponents of this program note that "it continuously encountered a problem in communications between government and industry, [and] ensuring the funding."[28] In addition, the optics of US-Japan collaboration in certain programs can play into strategic narratives of US aggressiveness or encirclement, or could alienate other allies and partners in the region. There are also concerns from the US perspective about potentially losing revenue, transfer of sensitive technologies, and the potential replacement of US companies with Japanese ones in critical supply chains.

Moreover, lengthy joint programs are not always required in a development environment that emphasizes speed, flexibility, software, autonomy, modular capabilities to carry out diverse missions, and the ability to upgrade and spin off new products quickly. Indeed, the demand velocity for new unmanned systems and AI-enabled capabilities mandates the implementation of multiple approaches to collaboration and the establishment of flexible mechanisms and forums for collaboration—some of which may be transactional or short-lived in nature, while others may be more structured.

25 Japan Ministry of Defense, "Defense of Japan 2019, Chapter 4."
26 Gregg Rubinstein, "Japan's Future Fighter Program and the US-Japan Alliance: Collaboration or Collision."
27 Franz Stefan-Gady, "Japan Rejects Lockheed Martin Plans for Next-Generation Fighter Aircraft", *The Diplomat*, April 2, 2020, https://thediplomat.com/2020/04/japan-rejects-lockheed-martin-plans-for-next-generation-fighter-aircraft/.
28 Stew Magnuson, "US-Japan Defense Tech Cooperation Stymied by Cultural Hurdles."

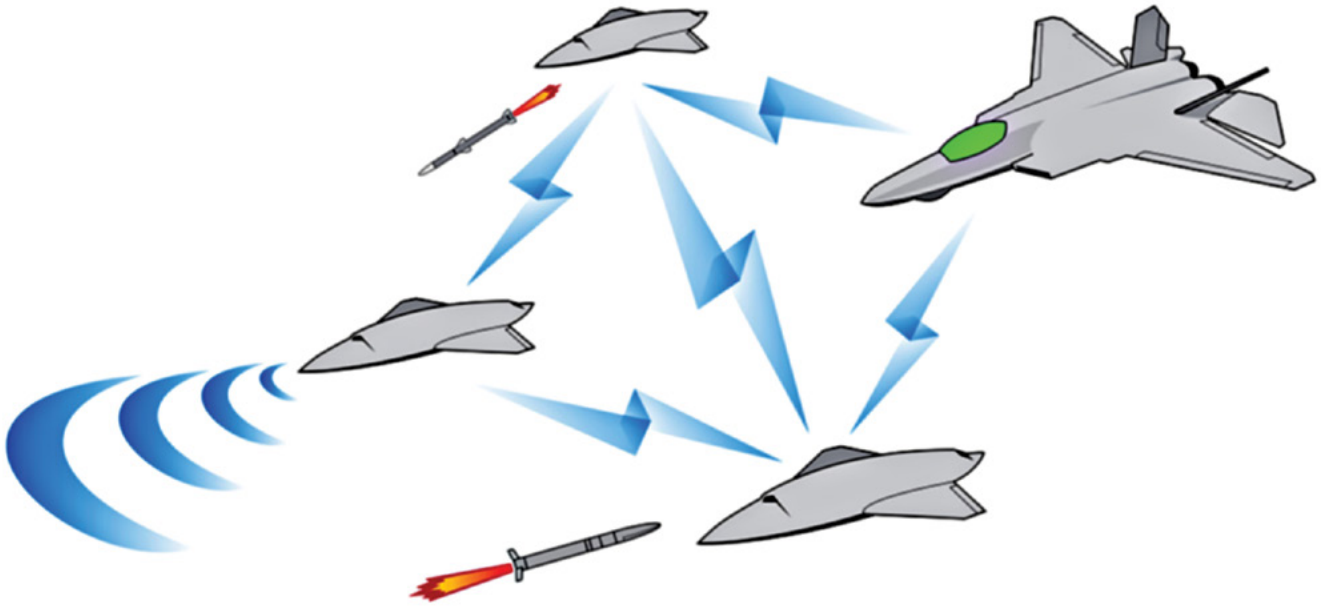

Figure 5: A diagram of the Combat Support Unmanned Aircraft Concept. *Source: Japan Ministry of Defense*

In this environment, the universe of potential areas of formal and informal collaboration is exceptionally wide. Priority areas of collaboration should focus on capabilities and programs that

- enhance JSDF and US ability to carry out their respective missions in key domain and capability areas—especially air and missile defense, undersea, space, the electromagnetic spectrum, and cyber domains;
- fill the persistent gaps and concerns in the JSDF capabilities, such as those around distance and demographics/personnel;
- leverage demonstrated technology-development strengths in each country, including those resident outside of the traditional defense industry;
- are politically feasible and sustainable; and
- add specific value to the alliance's ability to deter China and other threats, and maintain leadership in key emerging technology and capability areas.

Below is discussion of a notional, indicative, and not fully inclusive list of relevant capabilities and technology areas that meet these criteria, as well as potential models for collaboration and coordination on unmanned systems and AI, in particular. Hypersonic missile collaboration is more politically and geopolitically sensitive, but there remain possible opportunities in the area of hypersonic missiles, including in hypersonic weapon defense.

- **Emerging Unmanned Technologies and Concepts: "Loyal Wingman" and Swarms:** The pace of innovation in, and integration of autonomy into, unmanned systems is accelerating, and forcing militaries around the world to develop new operational concepts to effectively exploit autonomous systems. In the short term, the central focus is on novel ways to team manned and unmanned systems, including through concepts that use manned platforms such as fighter jets, surface ships, or tanks as command-and-control platforms managing a small group of unmanned air, ground, surface, or, potentially, underwater systems.

  Japan is among the countries that has publicly expressed interest in these concepts and capabilities. In September 2016, ATLA announced that it was seeking to develop the "Combat Support Unmanned Aircraft," a concept similar to "loyal wingman" programs under development in the United States, Europe, and Australia.

  The concept involves UAVs operating in conjunction with a manned aircraft—in Japan's case, likely the F-3. In drawings included with ATLA's description of the program, three unmanned systems are flying in formation with the F-3, each carrying out a different mission: one is a sensor platform, the second is firing an air-to-air missile, and the third is drawing enemy fire away from the manned aircraft.[29] This concept could offer a

29 "Unmanned Wingman for Japan's Piloted Force Planned for 2030s," *Aviation Week*, September 23, 2016, https://aviationweek.com/defense-space/unmanned-wingmen-japans-piloted-force-planned-2030s.

Figure 6: The Blowfish vertical take-off and landing unmanned aerial vehicle manufactured by private Chinese unmanned systems company Zhuhai Ziyan on display at the UMEX exhibition in Abu Dhabi on February 23, 2020. In May 2019, Ziyan released video of several Blowfish operating in a swarm of ten UAVs to carry out a combat mission. https://www.youtube.com/watch?v=IbGiuMPLo3M. *Source: Tate Nurkin*

powerful force multiplier for Japan as it seeks to deal with the quantitatively superior threat from China.

The Australian program is particularly notable in the context of US-Japan military collaboration because the system is being developed by Boeing Australia, indicating US government and industry willingness to work with close allies to develop this novel capability.

Unmanned swarms could be another closely related capability on which the United States and Japan could collaborate, given the aggressiveness with which Chinese state-owned enterprises and private unmanned-systems companies have pursued development of swarms.

- **Unmanned Underwater Vehicles and Anti-Submarine Warfare Capabilities:** Balances in the undersea domain are, much like the strike versus air- and missile-defense competition, critical to shaping the future stability of the Indo-Pacific. This domain has been growing considerably more crowded, competitive, and contested over the past decade, as states across East Asia seek to either develop or procure advanced submarines as part of a "keeping up with the Joneses" dynamic.[30]

  UUVs are now a prominent part of this dynamic, and China and the United States are both currently developing extra-large unmanned underwater vehicles (XLUUVs) that "can roam the world's oceans to perform a wide range of missions."[31] In addition, in March 2019,

30 David Pierson, "Military Spending is Soaring in the Asia-Pacific Region. Here's Why," *Los Angeles Times*, June 7, 2019, https://www.latimes.com/world/asia/la-fg-asia-defense-industry-20190607-story.html.

31 Stephen Chen, "China Military Develops Robotic Submarines to Launch a New Era of Sea Power," *South China Morning Post*, July 22, 2018, https://www.scmp.com/news/china/society/article/2156361/china-developing-unmanned-ai-submarines-launch-new-era-sea-power.

China revealed plans for a fully autonomous underwater base run by autonomous machines, reflecting both the growing importance of the undersea domain for future military and geopolitical competition and the relevance of unmanned systems in this competition.

IHI already developed a domestically designed and built UUV in October 2019, but, to date, the focus of Japan's interest in UUVs has largely been on mine detection and countermeasures. ATLA officials have identified further research on next-generation underwater mine-detection technology as a priority, though Japan has reportedly already agreed to work with France on the development of these technologies.[32] There remains an opportunity for heightened coordination on USVs and UUVs for anti-submarine-warfare missions that can help counter the increasingly prominent and capable Chinese submarines, as well as more asymmetric undersea threats from North Korea.

- **AI-Enabled Synthetic Training Environments:** Incorporation of virtual and augmented reality, cloud computing, big-data analytics, and machine learning are producing opportunities in the simulation and training markets. New synthetic training environments are allowing military personnel to gain repetitions in low-cost, low-risk environments before they are advanced to more expensive live training settings, speeding up the overall training process. The US Air Force's "Pilot Training Next program's use of an AI trainer to evaluate not only student [performance] but also how each individual student learned led to thirteen of the twenty pilots that took part in the trial graduating in half the time it normally takes to complete USAF's Air Force Specialized Undergraduate Pilot Training course."[33]

  The United States and Japan have previously explored the use of joint synthetic training in a 2016 fleet synthetic-training joint exercise. Given both countries' need to accelerate training, their shared competency in machine learning and virtual and augmented reality, and a highly fractured simulation and training market, there is potential for a collaborative program to develop a synthetic simulation and training capability, to stress the specific operational contingencies to which US and Japanese forces will have to respond.

- **"Counter" technologies:** Counter-UAV capabilities also constitute effect areas for US-Japan collaboration, and could also offer opportunities for subsequent exports.

  A December 2019 study from the Center for the Study of the Drone at Bard College outlines the dramatic growth in the counter-drone market over the last year. The report lists 537 systems developed by 227 companies in thirty-eight countries, up from 235 products listed in the center's February 2018 report.[34]

  The United States is among the many countries developing these technologies, which disable or destroy unmanned systems using either "soft-kill"—most frequently jamming—or "hard-kill"—kinetic, or even novel, means such as nets—techniques. Japan's ATLA has also successfully tested a prototype "high-power microwave generation system" on seven commercially available drones. ATLA envisions installing these systems on naval vessels to protect against attacks from multiple drones or cruise missiles. Furthermore, the MTDP lists high-power microwave devices that can instantaneously disable a large number of drones as one of three urgent electronic-warfare R&D priorities.[35]

  Even though the market is growing more crowded, there is room for Japan and the United States to produce a differentiated solution. The Bard College report's main findings stressed the technical and operational challenges hindering the development and deployment of counter-UAV weapons, including many related to the non-technical innovations required to move from a mature technology to a deployable capablity such as "complex questions around safety, practicality, policy, and legality."[36]

  In addition, while there are challenges to a joint hypersonic missile program, a joint hypersonic missile defense program may be more feasible and could build upon previous US-Japan collaboration on missile defense.

Building, Refining, and Testing Operational Concepts

The transition from technology to capability also requires development of operational concepts, an area that can be

32 Kosuke Takakashi, "Japan's ATLA Details Upcoming R&D Projects," *Jane's Defence Weekly*, October 3, 2019, https://www.janes.com/article/91683/japan-s-atla-details-upcoming-r-d-projects.
33 Master Sgt, Joshua Strang, "AETC Explores Learning Possibilities Through New Pilot Training," *Air Education and Training Center*, December 7, 2017, https://www.aetc.af.mil/News/Article/1391431/aetc-explores-learning-possibilities-through-new-pilot-training-program/.
34 Kazuki Yoshikawa, "Japan Fully Zaps Drones with Microwave Beams," *Nikkei Asian Review*, December 31, 2019, https://asia.nikkei.com/Business/Technology/Japan-successfully-zaps-drones-with-microwave-beams.
35 Japan Ministry of Defense, "Defense of Japan 2019," 297, https://www.mod.go.jp/e/publ/w_paper/pdf/2019/DOJ2019_2-4-1.pdf.
36 Arthur Holland Michel, "Counter-Drone Systems," Second Edition, Center for the Study of the Drone, December 2019, https://dronecenter.bard.edu/files/2019/12/CSD-CUAS-2nd-Edition-Web.pdf.

constrained by the differing force postures of the United States and Japan. While the JSDF is well trained, some procedures and capability areas are less developed than those of the United States. For example, capabilities for joint operations in the JSDF still remain nascent, placing a premium on the development, dissemination, and testing of new operational concepts.[37]

Priority research and operational concept development areas would be

- joint, cross-domain operations in ground, naval, amphibious, air, cyber, electromagnetic, and space operations;
- alliance-based readiness kill chain (RKC), so that the United States and Japan can work seamlessly to deal with fast-moving threats;
- measures against hybrid-warfare capabilities used by non-state actors and rogue states (such as North Korea) to also include the potential for advanced and AI-enabled influence operations;
- joint studies on the future of multi-domain/cross-domain warfare and longer-term studies of how emerging technologies may change the operational environment; and
- more frequent bilateral command-post and field exercises with greater focus on advancing Japan's readiness for "cross-domain operations."

Science and Technology (S&T) Collaboration

Coordination and collaboration in those areas in which Japan and the United States have demonstrated competencies resident in the defense industrial base should be accompanied by efforts to invigorate the US-Japan science and technology superstructure in support of two objectives: enhancing scientific understanding and development of key technology areas, and leveraging relevant research being carried out in the commercial high-tech sector and applied research institutes.

The Joint High-Level Committee (JHLC) on Science and Technology provides a forum for governmental discussion on US-Japan S&T collaboration. During its May 2019 meeting, the JHLC specifically referenced "advancing industries of the future, specifically quantum science and technology and artificial intelligence," two technologies at the center of the US-Japan-China military-technological competition.[38]

Progress has been made in avenues for cooperation on quantum technology that could serve as a model for more in-depth coordination on AI. On December 19, 2019, the United States and Japan signed an agreement to partner on quantum information science and technology (QIST).[39] The partnership will take place "in venues such as workshops, seminars, and conferences to discuss and recognize the progress of research in QIST, which in turn will lead to the identification of overlapping interests and opportunities for future scientific cooperation."[40]

The May 2019 JHLC meeting also stressed the need for Japan and the United States to explore "new avenues for collaboration," including using Japan's Cabinet Office's nascent Moonshot Research and Development Program, which seeks to develop novel technologies to address pressing societal challenges.[41]

Advancing research on kinetic or traditional military capabilities would almost certainly be well outside this program's remit. Still, there are likely opportunities for meaningful S&T research that could address sub-threshold threats related to AI, such as AI-enabled cyberattacks or disinformation that are aligned with Japanese and US defense and security priorities. Indeed, the program's English-language overview brief provides examples of the types of problems that could be of interest, including defending against cyberterrorism.[42] Joint research on AI ethics—a prominent issue for the use of AI for defense and security purposes that has lagged behind technological development—could offer another option that would help position the United States and Japan as global leaders in establishing AI norms.[43]

Expanding to Multilateral Network

Efforts at coordination and collaboration on emerging technologies, developing relevant military capabilities, and testing operational concepts cannot be a solely bilateral effort between the United States and Japan.

37 John Wright, "Solving Japan's Joint Operations Problem," *The Diplomat*, January 31, 2018, https://thediplomat.com/2018/01/solving-japans-joint-operations-problem/.
38 "Joint Statement: Joint High Level Committee Meeting on Science and Technology Cooperation Between the Government of the United States of America and the Government of Japan," Japan Ministry of Foreign Affairs, May 2, 2019, https://www.mofa.go.jp/files/000475056.pdf.
39 "Quantum Leap: US and Japan Sign Statement Promoting Quantum Cooperation," US Embassy in Japan, December 19, 2019, https://jp.usembassy.gov/us-japan-sign-statement-promoting-quantum-cooperation/.
40 Ibid.
41 "Joint Statement: Joint High Level Committee Meeting on Science and Technology Cooperation Between the Government of the United States of America and the Government of Japan," Japan Ministry of Foreign Affairs.
42 "Moonshot Research and Development Program," Japan Cabinet Office (Science, Technology and Innovation), https://www8.cao.go.jp/cstp/english/moonshot1.pdf.
43 Khari Johnson, "China Could Lead World in AI Research in Coming Years, Elsiver Research Finds," *Venture Beat*, December 11, 2018, https://venturebeat.com/2018/12/11/china-could-lead-world-in-ai-research-in-coming-years-elsevier-report-finds/.

US Marine Corps Maj. Clark Smith, the operations officer with the Ground Combat Element, Marine Rotational Force – Darwin (MRF-D), receives a gift from Japan Ground Self-Defense Force (JGSDF) Col. Suguru Iwahara, during the closing ceremony for Exercise Southern Jackaroo, Shoalwater Bay Training Area, Queensland, Australia, June 3, 2019. Southern Jackaroo is a trilateral exercise hosted by 6th Battalion, Royal Australian Regiment, in conjunction with MRF-D Marines and service members from the JGSDF. *Source: US Marine Corps/ Cpl. Destiny Dempsey)*

The United States and Japan should look for opportunities to expand, and should network with likeminded states—namely Australia, India, and select ASEAN states. The Republic of Korea should also be part of this expanded multilateral approach, though the currently heightened tensions between Japan and South Korea may restrict engagement. In addition, the United States should work to bring in Canada, the United Kingdom, and New Zealand, and expand and enhance the cooperation between Indo-Pacific states and the "Five Eyes"—especially with the objective of enhancing information security and establishing standardization of operating practices.

As with operational concept development, training will be a critical component to facilitating and reinforcing multilateral collaboration. Indeed, Japan is already seeking to step outside of its more risk-averse approach to expand its engagement in trainings with the United States and other allies and partners in the region.

Most notably, in June 2019, Japan committed to increase its participation in the large-scale war-fighting Talisman Sabre exercise alongside US, Australian, and other regional forces. The JMSDF sent two warships—a helicopter destroyer and a tank landing ship—as well as ground troops from the Amphibious Rapid Deployment Brigade to participate in the biennial exercise. JGSDF has also participated in other operational exercises in Australia—including the Exercise Southern Jackaroo, during which Japanese howitzers were fired for the first time at a range of fifteen miles due to a lack of sufficiently large ranges in Japan.[44]

44 Mike Yeo, "Japan to Dramatically Scale Up Participation in Australian Exercise," *Defense News*, June 17, 2019, https://www.defensenews.com/training-sim/2019/06/17/japan-to-dramatically-scale-up-participation-in-australian-exercise/.

CONCLUSION

Emerging technologies such as artificial intelligence, hypersonic weapons, and unmanned vehicles are reshaping the future of military operations and the strategic landscape of the Indo-Pacific. To ensure that these technologies enhance, rather than degrade, security in the region, the United States and Japan must accelerate and intensify their long-standing defense-focused coordination and collaboration, especially in capability and technology areas that are buttressing prevailing future operational concepts: unmanned systems, hypersonic missiles, and military applications of AI.

This collaboration will take place through co-development programs leveraging expertise from across each country's respective domestic defense industrial bases. However, in order to both respond to new approaches to capability development and procurement and navigate political, geopolitical, industry, resource, and force-posture constraints, Japan and the United States must be creative and bold in establishing a variety of mechanisms for engagement. Most importantly, these varied models for engagement must focus on delivering new and enhanced capability for Japan, the United States, and the alliance as they pivot to meet the difficult-to-detect, fast-moving, and formidable threats of the era of great-power competition.

ABOUT THE AUTHORS

Tate Nurkin is the founder of OTH Intelligence Group and a Non-Resident Senior Fellow with the Scowcroft Center for Strategy and Security at the Atlantic Council.

Before establishing OTH Intelligence Group in March 2018, Tate spent twelve years at Jane's by IHS Markit where he served in a variety of roles, including managing Jane's Defense, Risk, and Security Consulting practice. From 2013 until his departure, he served as the founding Executive Director of the Strategic Assessments and Futures Studies (SAFS) Center, which provided thought leadership and customized analysis on global competition in geopolitics, future military capabilities, and the global defense industry.

Substantively, Tate research and analysis has a particularly strong focus on US-China competition, defense technology, the future of military capabilities, and the global defense industry and its market issues. He also specializes in the design and delivery of alternative futures analysis exercises such as scenario planning, red teaming, and wargaming.

Tate is a frequent author and speaker on these overlapping research priorities. For example, he was the lead author of the US-China Economic and Security Review Commission's report entitled China's Advanced Weapons Systems, which was published in May 2018, and has provided testimony to the Commission on two occasions. In March 2019, he was featured on a Center for Strategic and International Studies China Power podcast on China's unmanned systems. He is the lead author of the Atlantic Council's Strategy White Paper on Artificial Intelligence, which is set to be published in the fall of 2019.

He previously worked for Joint Management Services, the Strategic Assessment Center of SAIC, and the Modeling, Simulation, Wargaming, and Analysis team of Booz Allen Hamilton. From 2014 – 2018 he served consecutive two-year terms on the World Economic Forum's Nuclear Security Global Agenda Council and its Future Council on International Security, which was established to diagnose and assess the security and defense implications of the Fourth Industrial Revolution.

Ryo Hinata-Yamaguchi is a Visiting Professor at the Pusan National University, College of Economics and International Trade, Department of Global Studies, and also an Adjunct Fellow at the Pacific Forum. Ryo has presented and published on a variety of topics relating to defense and security, and transport governance in the Indo-Pacific. Ryo previously served as a Non-Commissioned Officer in the Japan Ground Self-Defence Force (reserve) and held positions at the Universitas Muhammadiyah Malang, FM Bird Entertainment Agency, International Crisis Group Seoul Office, Sasakawa Peace Foundation, Embassy of Japan in Australia, and the Japan Foundation Sydney Language Centre. Ryo received his PhD from the University of New South Wales, MA in Strategic and Defense Studies and BA in Security Analysis from the Australian National University, and was also a Korea Foundation Language Training Fellow. Ryo is a native speaker of Japanese and English, is fluent in Korean, has some knowledge of Chinese and Malay, and is currently learning Russian.

Atlantic Council

Board of Directors

CHAIRMAN
*John F.W. Rogers

EXECUTIVE CHAIRMAN EMERITUS
*James L. Jones

CHAIRMAN EMERITUS
Brent Scowcroft

PRESIDENT AND CEO
*Frederick Kempe

EXECUTIVE VICE CHAIRS
*Adrienne Arsht
*Stephen J. Hadley

VICE CHAIRS
*Robert J. Abernethy
*Richard W. Edelman
*C. Boyden Gray
*Alexander V. Mirtchev
*John J. Studzinski

TREASURER
*George Lund

SECRETARY
*Walter B. Slocombe

DIRECTORS
Stéphane Abrial
Odeh Aburdene
Todd Achilles
*Peter Ackerman
Timothy D. Adams
*Michael Andersson
David D. Aufhauser
Colleen Bell
Matthew C. Bernstein
*Rafic A. Bizri
Dennis C. Blair
Linden Blue
Philip M. Breedlove
Myron Brilliant
*Esther Brimmer
R. Nicholas Burns
*Richard R. Burt
Michael Calvey
James E. Cartwright
John E. Chapoton
Ahmed Charai
Melanie Chen
Michael Chertoff
*George Chopivsky
Wesley K. Clark
*Helima Croft
Ralph D. Crosby, Jr.
*Ankit N. Desai
Dario Deste
*Paula J. Dobriansky
Thomas J. Egan, Jr.
Stuart E. Eizenstat
Thomas R. Eldridge
*Alan H. Fleischmann
Jendayi E. Frazer
Ronald M. Freeman
Courtney Geduldig
Robert S. Gelbard
Gianni Di Giovanni
Thomas H. Glocer
John B. Goodman
*Sherri W. Goodman
Murathan Günal
*Amir A. Handjani
Katie Harbath
John D. Harris, II
Frank Haun
Michael V. Hayden
Amos Hochstein
*Karl V. Hopkins
Andrew Hove
Mary L. Howell
Ian Ihnatowycz
Wolfgang F. Ischinger
Deborah Lee James
Joia M. Johnson
Stephen R. Kappes
*Maria Pica Karp
Andre Kelleners
Astri Kimball Van Dyke
Henry A. Kissinger
*C. Jeffrey Knittel
Franklin D. Kramer
Laura Lane
Jan M. Lodal
Douglas Lute
Jane Holl Lute
William J. Lynn
Mian M. Mansha
Chris Marlin
William Marron
Neil Masterson
Gerardo Mato
Timothy McBride
Erin McGrain
John M. McHugh
H.R. McMaster
Eric D.K. Melby
*Judith A. Miller
Dariusz Mioduski
Susan Molinari
*Michael J. Morell
*Richard Morningstar
Virginia A. Mulberger
Mary Claire Murphy
Edward J. Newberry
Thomas R. Nides
Franco Nuschese
Joseph S. Nye
Hilda Ochoa-Brillembourg
Ahmet M. Oren
Sally A. Painter
*Ana I. Palacio
*Kostas Pantazopoulos
Carlos Pascual
W. DeVier Pierson
Alan Pellegrini
David H. Petraeus
Lisa Pollina
Daniel B. Poneman
*Dina H. Powell McCormick
Robert Rangel
Thomas J. Ridge
Michael J. Rogers
Charles O. Rossotti
Harry Sachinis
C. Michael Scaparrotti
Rajiv Shah
Stephen Shapiro
Wendy Sherman
Kris Singh
Christopher Smith
James G. Stavridis
Richard J.A. Steele
Mary Streett
Frances M. Townsend
Clyde C. Tuggle
Melanne Verveer
Charles F. Wald
Michael F. Walsh
Ronald Weiser
Geir Westgaard
Olin Wethington
Maciej Witucki
Neal S. Wolin
*Jenny Wood
Guang Yang
Mary C. Yates
Dov S. Zakheim

HONORARY DIRECTORS
James A. Baker, III
Ashton B. Carter
Robert M. Gates
Michael G. Mullen
Leon E. Panetta
William J. Perry
Colin L. Powell
Condoleezza Rice
George P. Shultz
Horst Teltschik
John W. Warner
William H. Webster

**Executive Committee Members*

List as of March 10, 2020

The Atlantic Council is a nonpartisan organization that promotes constructive US leadership and engagement in international affairs based on the central role of the Atlantic community in meeting today's global challenges.

Atlantic Council

1030 15th Street, NW, 12th Floor,
Washington, DC 20005

(202) 463-7226, www.AtlanticCouncil.org