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ATTAINING ALL-DOMAIN CONTROL: CHINA'S ANTI-ACCESS/AREA DENIAL (A2/AD) CAPABILITIES IN THE SOUTH CHINA SEA

BY
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About this report

The U.S. Defense Threat Reduction Agency (DTRA) sponsored this study to examine the broader weapons of mass destruction (WMD) environment in Southeast Asia 5–10 years into the future. The study focuses specifically on how the five key U.S. maritime partners in Southeast Asia—Indonesia, Malaysia, the Philippines, Singapore, and Vietnam—perceive China's expanding nuclear weapon and missile capabilities, potential U.S.-China nuclear parity and competition, and preferences for U.S. policy related to nuclear arms control and risk reduction measures.

The statements made and views expressed in this publication do not necessarily reflect the views of the Pacific Forum, the project sponsors, or the study participants' respective organizations and affiliations. For questions, please email maritime@pacforum.org.

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ATTAINING ALL-DOMAIN CONTROL: CHINA'S ANTI-ACCESS/AREA DENIAL (A2/AD) CAPABILITIES IN THE SOUTH CHINA SEA

By Olli P. Suorsa

China's People's Liberation Army (PLA) has developed a formidable anti-access and area denial (A2/AD) capability designed to deter and repel the United States' intervention in China's near seas in times of conflict. The hotly contested South China Sea is one of the PLA's main operational directions and a theatre of potential military clash between China, the U.S., and South East Asian claimant states. This report takes stock of the PLA's A2/AD capabilities, assessing the PLA Southern Theatre Command's (STC) early-warning, target acquisition and strike systems, as well as the potential, however unlikely, for the employment of weapons of mass-destruction (WMD) in a South China Sea conflict. It discusses South East Asian states and the U.S.'s efforts to counter the growing capability asymmetry in the South China Sea to erect minimum deterrence and ensure continued military access to the semi-enclosed sea. The report concludes with practical policy recommendations to improve U.S. forces' survivability and resilience in the face of conventional (and WMD) attack against its bases in the region and proposes a cooperative model for ally and partner capacity building.

INTRODUCTION

The topic of China's anti-access/area denial (A2/AD) capabilities is a complex one and involves a host of different capabilities and operating domains. The PLA is rapidly attaining an all-domain control of the South China Sea. The PLA's three-decade long modernization is bearing fruit in both quantity and quality of new hardware and pose a formidable A2/AD challenge to both the United States and the South East Asian claimant states to the South China Sea. This article tries to provide a holistic overview of China's contemporary A2/AD capabilities, which the People's Liberation Army (PLA) can employ in a conflict in the South China Sea. To achieve this goal, the author divides the PLA's A2/AD capabilities into two familiar categories: sensors and shooters, the PLA's ability to find and fix surface and air targets and engage them with a growing panoply of ground-, sea-, and air-based long-range fires.

This study takes a stock of the PLA's A2/AD capabilities, including the sensors and shooters available for the PLA STC, responsible for military operations in the South China Sea theatre of operations. It discusses the potential, however unlikely, use of weapons of mass destruction in a conflict. It then turns to a brief assessment of military balance across the South China Sea with a look at South East Asian South China Sea claimant states and the U.S.'s military capabilities in the region. The study concludes with four practical policy recommendations to deal with PLA's conventional (and WMD attacks), including accelerated adaption of dispersed operational footprint, strengthened active and passive defenses, return of a serious CBRN protection mindset and training, and a collaborative framework for ally and partner capacity building. The report begins with a look at the China's contemporary A2/AD capabilities in the South China Sea theatre of operations.

CHINA'S A2/AD CAPABILITIES IN THE SOUTH CHINA SEA

The PLA aims to achieve its goal of thoroughly modernized military by 2027 and conclude defense force modernization by 2035. The PLA's multi-decade-long all-encompassing modernization has helped Beijing erect a 'counter-intervention' force, which is commonly known in the West as the system of systems associated with PLA's A2/AD capabilities to deny adversary access to a battlespace and prevent its exploitation to strike at one's own center of gravity.[1]

The PLA has developed a layered and survivable A2/AD system-of-systems. The striking power is provided by a dense and layered antiship, anti-air, and anti-surface missile systems, which can engage targets out to hundreds of miles from China's coastline.[2] Deployment of similar capabilities on Chinese artificial islands in the South China Sea further extends the reach of PLA's A2/AD capabilities. Moreover, the PLA Rocket Force's ballistic and cruise missiles can attack carrier strike groups and military bases across the First Island Chain and up to the Second Island Chain at moment's notice. This complex is supported by a secure and survivable communications network and robust electronic warfare, cyber, information, and space capabilities towards what it calls the "informatized warfare" to develop ability to "blind" and "deafen" adversary's "eyes" and "ears" at the outset of a conflict while ensuring access to its own.[3]

To extend the reach of its A2/AD capabilities further into the South China Sea, China embarked on a massive artificial island buildup program between 2013 and 2018. China reclaimed land and constructed seven artificial islands in the Spratly Island group in the southern part of the South China Sea. The three largest artificial islands—the Fiery Cross Reef, Subi Reef, and Mischief Reef—are equipped with three-kilometer-long runways, aircraft shelters, underground storage for weapons and fuel, and significant early-warning search and track radars and antiship and anti-air missile emplacements, increasing the PLA's reach across the entire South China Sea. The six artificial islands complement similarly constructed islands in the Paracel group of reefs and banks in the northern part of the South China Sea.

This section continues with an overview of PLA's sensors and shooters with focus on the capabilities assigned to the STC, which is responsible for the PLA's military operations in the South China Sea area of operations.

Sensors

China has constructed a dependable and robust early-warning and targeting network spanning across the STC's area of responsibility with an aim to attain information superiority over the South China Sea battle space.[4] The PLA has developed multiple means to find, geolocate, identify, track, and target adversary movement on the surface, below the surface, and in air over the South China Sea. This sensing network is comprised of a coastal radar chain, space-based intelligence, surveillance, and reconnaissance (ISR), as well as ocean surveillance satellites, a string of underwater sensing and listening devices, as well as crewed and uncrewed ISR aircraft.

China's coastal radar chain is built around line-of-sight (LoS) early-warning radars, which provide maritime picture up to at least 200 NM from China's coastline, and extremely long range over-the-horizon back-scatter (OTH-B) radars, with range exceeding 2,000 NM. In addition, the radar coverage has been substantially increased through at least two dozen radar stations erected on China's artificial islands in the Paracels and Spratlys, providing an unprecedented situational awareness across most of the South China Sea.[5]

China's space-based sensing capabilities have gone through aggressive expansion as part of the PLA's "informatized warfare" concept.[6] It has established a dependable constellation of ISR, satellite communications

[1] Sam J. Tangredi, *Anti-Access Warfare: Countering A2/AD Strategies* (Annapolis: Naval Institute Press, 2013), 1-2.
[2] U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023).
[3] For a comprehensive look at PLA's capabilities in the South China Sea, see, J. Michael Dahm, *Introduction to South China Sea Military Capability* Study (The John Hopkins University Applied Physics Laboratory LLC: South China Sea Military Capability Series – A Survey of Technology and Capabilities on China's Military Outposts in the South China Sea, July 2020)
[4] J. Michael Dahm, *Introduction to South China Sea Military Capability* Study, 5.
[5] J. Michael Dahm, *Air and Surface Radar* (The John Hopkins University Applied Physics Laboratory LLC: South China Sea Military Capability Series – A Survey of Technology and Capabilities on China's Military Outposts in the South China Sea, July 2020), 1.
[6] U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023), 97.

and navigation (the indigenous BeiDou system)[7], and meteorology satellites, which today consists of more than 290 satellites—a two-fold increase since 2018.[8] China's space-based ISR capabilities comprise electro-optical/infra-red (EO/IR), synthetic and inverse synthetic aperture radars (SAR/ISAR), and electronic intelligence (ELINT) satellites, which provide an all-weather 24-hour earth surface and ocean surveillance capability.[9] Furthermore, it is thought that Chinese satellite constellation provides high-enough revisit time providing target updates to PLA's "shooters".[10]

To plug gaps in ground- and space-based sensor network, a host of new crewed and uncrewed special mission aircraft have been introduced into PLA Air Force and Naval Aviation service. The special mission aircraft help PLA to achieve information superiority in battle space through identifying location and disposition of opposing forces, electronic order of battle, intercept communications, and provide geographical, topographical, and weather information.[11] These special mission aircraft include, the KJ-500 airborne-early warning and control aircraft (AEW&C), which provides long-range aerial picture; signals and imagery intelligence (SIGINT and IMINT) aircraft like Y-9JB and Y-9DZ; and the KQ-200 (also known as the Y-8Q) maritime patrol and anti-submarine warfare (MPA-ASW).[12]

Furthermore, China has developed a growing range of long-range uncrewed aerial systems (UAS), which have become an increasingly important part of the PLA's persistent ISR over land and sea territories. The PLA's uncrewed aircraft consists of a range of medium- and high-altitude long-endurance UAS, such as the WZ-7, BZK-005, TB-001, Wing Loong II, and CH-5. Flying at high altitude (between 45-60,000 feet) and capable of staying in air for up to 20-30 hours, Chinese UAS provide the PLA with a persistent maritime patrol capability over the South China Sea.[13] The PLA frequently deploys BZK-005 and WZ-07 in the Paracels and the Spratlys, giving them sufficient reach to cover virtually all the South China Sea at ease.[14]

Taken together, China's military modernization over the last two decades has produced a robust and survivable ISR system-of-systems, which helps PLA assert information dominance over the South China Sea in times of conflict. Beijing can respond to developing crises and achieve information advantage over potential adversaries by flexibly combining different and mutually supportive ISR collection and targeting means to search, identify, track, and target adversary forces over increasingly long distances, and engage them with the "shooters".

Shooters

China's A2/AD capabilities offer Beijing both offensive and defensive military options in the South China Sea. The PLA's STC, which has the primary responsibility of Chinese military operations in the South China Sea area of operations, controls significant offensive land, sea, and air capabilities.

PLA Navy

The PLA Navy plays a central role in China's A2/AD capability toolbox. In around 2017, the PLAN assumed the title of the largest navy in the world surpassing the U.S. Navy in 2017, consisting of more than 370 ships.[15, 16] Critically, China's naval expansion is not simply quantitative but also qualitative. New ships inducted into service are increasingly more modern multirole types, broadly comparable in technological sophistication to their regional and western counterparts. Importantly, China has made significant improvements in key areas and addressed long-persisting capability gaps like anti-submarine warfare and shipborne air-defense capability, and developed a strong antiship capability, transforming the PLAN into a powerful "green water" navy with growing "blue water" aspirations.[17]

The naval capabilities commanded by the STC are some of the most modern and numerous of any Theatre Command. According to the IISS Military Balance 2023 (see Table 1 below), the PLAN's South Sea Fleet (SSF) has at its disposal one aircraft carrier, 6-7 large amphibious ships

[7] China's BeiDou position, navigation, and timing (PNT) services are covered by a constellation of 49 operational satellites. In comparison, the U.S. counterpart, the Global Positioning System (GPS), has only 24 satellites in orbit. See, for example, U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023), 101.

[8] Ibid., 100.

[9] Ian Easton and Mark A. Stokes, *China's Electronic Intelligence (ELINT) Satellite Developments: Implications for U.S. Air and Naval Operations* (Project 2049 Institute, May 2018). http://www.project2049.net/wp-content/uploads/2018/05/china_electronic_intelligence_elint_satellite_develoments_easton_stokes.pdf. Accessed March 15, 2024.

[10] Clayton Swope, "No Place to Hide: A Look into China's Geosynchronous Surveillance Capabilities" (Center for Strategic and International Studies, Aerospace Security Project, 19 January 2024). http://www.csis.org/ analysis/no-place-to-hide-look-chinas-geosynchronous-surveillance-capabilities. Accessed March 15, 2024.

[11] Peter Wood and Roger Cliff, *Chinese Airborne C4ISR* (USAF Air University: China Aerospace Studies Institute, November 2020), 2.

[12] See, for example, Andreas Rupprecht, *Modern Chinese Warplanes: Chinese Air Force – Aircraft and Units* (Harpia Publishing, October 2018); or Dmitriy Komissarov and Yefim Gordon, *Chinese Air Power* (Crecy Publishing, May 2021).

[13] See, for example, J. Michael Dahm, *Special Mission Aircraft and Unmanned Systems* (The John Hopkins University Applied Physics Laboratory LLC: South China Sea Military Capability Series – A Survey of Technology and Capabilities on China's Military Outposts in the South China Sea, October 2020).

[14] Ibid.

[15] The PLAN is the largest navy in the world in term of the number of battled force ships. However, the metrics for measuring the 'size' of a navy vary. Besides the quantity of ships, whether overall (inclusive) or focused on battle force (exclusive), fleet tonnage (displacement) is another important measure. The latter provides an insight into the nature of the navy and the primary ship classes. The U.S. Navy can still be regarded as the biggest navy in terms of fleet displacement, owing to its focus on aircraft carriers, amphibious ships, and large surface combatants. China's PLAN is also developing towards this direction, although still demanding large quantities of smaller surface combatants for its coastal patrol and near seas operations. See, for example, Ronald O'Rourke, *China Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress* (Congressional Research Service, updated January 2024), 6. Available in electronic format at https://crsreports.congress.gov/product/details?prodcode=RL 33153.

[16] U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023), 63.

[17] See, for example, Defense Intelligence Agency (DIA), *China Military Power: Modernizing a Force to Fight and Win* (2019). https://www.dia.mil/Military-Power-Publications/; or, U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023).

(e.g., LHD and LPD class), 30 primary surface combatants (e.g., CG, DDG, and FFG class), and 23 submarines.[18, 19]

Table 1. The PLAN's South Sea Fleet[20]

Type:[21]	Quantity:
CV	1
LHD	1-2
LPD	5
LST/M	21
CG	4
DDG	14
FFG	12
FFL	21
FACM	30
SSBN	6
SSN	2
SSK	15
Total:	149

To better appreciate the impressive growth of the SSF's capability, just 20 years ago, the fleet operated only four DDGs (Type 052B/C) and a force that amounted to a coastal defense force only. The modern SSF can operate outside shore-based air defenses due to the new ships' organic layered air defense systems, capable of point air defense and area or fleet defense.[22] The PLAN ships have powerful antiship capabilities with a range of subsonic to supersonic antiship cruise missiles, like the YJ-83, YJ-12, and YJ-18. Notably, the SCSF's 30 primary surface combatants are fitted with some 1,900 vertical launch tubes (VLS), which can launch a wide variety of medium- to long-range surface-to-air missiles, long-range subsonic and supersonic anti-ship missiles (and even ballistic anti-ship missiles in the case of Type 055 CG), and anti-submarine rockets.[23]

Due to its inherent "stealth" and ability to pose substantial problems to any navy even if deployed in small numbers, the PLAN's submarine fleet is a core element of the PLA's A2/AD system. The SSF operates a fleet of at least 23 submarines, including all six of China's Type 094 nuclear-powered ballistic missile submarines (SSBN) that forms the sea-based leg of Beijing's nuclear deterrence, 2 SSN, and 15 SSK boats.[24] The SSBNs are home-based at Sanya Naval Base at the southern tip of Hainan Island, with easy access to the relatively deep waters of the South China Sea. Based at Sanya and Zhanjiang Naval Bases are 15 Type 039A *Yan*-class diesel-electric submarines (SSK). These boats are increasingly modern types, equipped with air-independent propulsion (AIP) and capable of launching long-range antiship cruise missiles.[25] The SSF can use SSK boats to close access points to the South China Sea and protect the SSBN force in the South China Sea "bastion". Armed with long-range land-attack cruise missiles, SSF's submarine fleet can also provide a clandestine land-attack option.[26]

The PLAN's amphibious capabilities have evolved and grown significantly over the past decade. Roughly half of the PLAN's entire amphibious fleet is placed under the SSF command.[27, 28] The SSF's amphibious capabilities have grown from small and medium landing ships (LSM and LST classes) to a force build around much larger more capable amphibious ships (Type 071 LPD and Type 075 LHD/LHA), which can support both rigid-hulled landing craft and several helicopters for amphibious operations. In addition, tripling the size of PLAN's Marine Corps (PLANMC) from 10,000 to 35,000 troops corresponds with Beijing's emphasis on rapidly growing the PLA's amphibious capabilities.[29] The PLANMC is equipped and trained to conduct amphibious operations to seize and defend China's artificial islands and outposts in the South China Sea, making it a force that requires a close attention in the future.[30]

In addition, the PLAN deploys a range of long-range anti-ship cruise missiles, including the truck-mounted YJ-62 and YJ-12 missiles, along its coastline to protect naval bases from seaborne attack and to deny access to sea areas extending hundreds of kilometers from China's coastline.[31] To further extend its coastal defense missile force's reach, China deploys supersonic YJ-12 anti-ship missile systems on its artificial islands in the Spratlys, capable of creating large maritime exclusion zones in time of conflict.

PLA Air Force

The PLA Air Force (PLAAF) constitutes the largest air force in the Indo-Pacific region, with more than 1,700 combat aircraft in its inventory.[32] The PLAAF is transforming into a fully multirole-capable force with all primary combat aircraft types, including the Russian-origin Su-30MKK and Su-35, and indigenous J-10C, J-16, and J-20. The Chinese air-to-air missiles, such as the PL-10 within-visual-range and the PL-15 beyond visual range missiles are thought to be on par if not in some respects superior to

[18] See footnote number 27.
[19] The International Institute for Strategic Studies (IISS), *Military Balance 2023* (London: Routledge, 2023), 239-241.
[20] Source: Adapted from IISS Military Balance, 2023.
[21] Conventionally powered aircraft carrier (CV), landing helicopter dock (LHD), landing platform dock (LPD), landing ship tank (LST), guided missile cruiser (CG), guided missile destroyer (DDG), guided missile frigate (FFG), guided missile corvette (FFL), missile-armed fast-attack craft (FAC-M), nuclear-powered ballistic missile submarine (SSBN), nuclear-powered submarine (SSN), and diesel-electric submarine (SSK).
[22] Defense Intelligence Agency, 70.
[23] Congressional Research Service (CRS), *China Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress* (CRS, updated 30 January 2024). http://www.sgp.fas.org/crs/row/RL331 53.pdf. Accessed March 15, 2024.
[24] IISS Military Balance 2023, 239-241.
[25] Ibid.
[26] U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023, p. 56).
[27] Ronald O'Rourke, 9-11.
[28] This force can be supplemented with civilian roll-on/roll-off ships to rapidly move large quantities of supplies.
[29] David Lague, "Special Report: China Expands Amphibious Forces in Challenge to U.S. Beyond Asia" (*The Reuters,* 20 July 2020). https://www.reuters.com/article/idUSKCN24L17A/.
[30] Ibid.
[31] For more information on the PLA Navy's coastal defense missile forces, see, Daniel C. Rise, *The PLA Navy Coastal Defense Missile Force* (Montgomery: Air University: China Aerospace Studies Institute, 2024).
[32] Defense Intelligence Agency (p. 83). The number includes fighters, strategic bombers, tactical bombers, and multi-mission tactical combat aircraft.

their Russian and Western counterparts.[33] Moreover, modern Chinese combat aircraft are equipped with the latest active electronically scanned array (AESA) radar, advanced avionics and communication systems, and advanced electronic countermeasures and targeting pods.

The multirole combat aircraft are equipped with powered long-range precision-guided weapons, capable of striking ground targets at great standoff ranges. Air attacks are supported by aircraft tasked with the suppression of enemy air defenses armed with the help of YJ-91 anti-radiation missiles. In addition, the STC was the first Theatre Command to receive the J-16D, a dedicated electronic attack aircraft, boosting the PLAAF's electronic warfare capability against early-warning radars, communications, and air-defense systems. These aircraft are aided by PLAAF's critical enablers like the KJ-500 AEW&C and Y-8G to help build shared aerial picture and provide standoff jamming effects.

The PLAAF units under the STC are transitioning from earlier generation combat aircraft, such as the J-7E/G and J-8II, to new types, including the J-10C, J-16, Su-35, and J-20. In addition, older aircraft like J-11B, J-10A/AS, JH-7A, and Su-30MKK have received major upgrades to their sensors, electronic warfare, and weapons systems to keep them up to date.[34] The STC commands two bomber regiments, which operate the H-6K bomber, capable of carrying a range of long-range precision-guided land-attack and anti-ship cruise missiles, including the YJ/KD-63, CJ-20, and YJ-12.[35] To increase the reach of the STC's combat air power, fighters and bombers can deploy to forward operating locations in the Paracel and the Spratly groups. For example, operating from China's Spratly outposts, H-6K bombers can hold at risk the whole of South East Asia and reach targets up to northern Australia and Guam.

In addition to its combat aircraft, the PLAAF operates a large complement of Russian and Chinese made ground-based air defense systems (GBAD) which protect PLA bases, critical infrastructure, and major population centers. The PLAAF has acquired the Russian S-300 and S-400 GBADs, which can threaten aircraft up to 400 km from China's coastline. China has also deployed indigenous HQ-9 long range GBAD systems, with reported range up to 200 km, to the Paracel and Spratly islands to provide air defense cover against aerial threats.[36]

PLA Rocket Force

One of the quintessential efforts in China's military modernization over the past two decades has been the development and diversification of the PLA's long-range fires, including ballistic and cruise missile programs. China has developed "the largest and most capable theatre-range ballistic and cruise-missile inventory" in the Indo-Pacific, with a particular focus on improving the quantitative and qualitative edge of the PLA Rocket Force's (PLARF) medium- (MRBM) and intermediate-range ballistic missile (IRBM) arsenals.[37, 38]

In the context of the South China Sea area of operations, the PLA has significant offensive missile capability at its disposal. The STC is thought to employ more than 670 conventional ballistic and cruise missiles with thirteen Missile Brigades and two Bases.[39, 40] These brigades employ a variety of nuclear and conventional missiles, including the DF-5 and DF-31A/AG intercontinental-range ballistic missiles (ICBM) and the DF-16 short-range ballistic missile (SRBM), the DF-21D and DF-26 antiship ballistic missiles (ASBM), the DF-17 hypersonic glide-vehicle (HGV), and the CJ-10/A ground-launched cruise missile (GLCM).[41]

Table 2. PLA Rocket Forces in the Southern Theatre Command:[42]

System	Type	Range (km)
DF-16	SRBM	800-1,000
DF-21D	MRBM/ASBM	1,500+
DF-26/B	IRBM/ASBM	3,000-4,000
DF-17	MRBM/HGV	1,800-2,500
CJ-10/A	GLCM	1,500+

To penetrate adversary's missile defenses, the PLA relies more on quantitative factors to overwhelm enemy defense rather than qualitative ones.[43] Nevertheless, the PLA has also focused on improving the survivability of its missiles through the development of hypersonic missiles, maneuvering warheads, and use of advanced decoys.[44] The PLARF can hold targets at risk with simultaneous attacks by multiple systems on land, at sea, or from air, with missiles coming in at various speed, altitude, and flight profiles.[45]

In addition to its standoff ground-strike capability, the PLARF units under the STC are also equipped with the much-vaunted DF-21D and DF-26 anti-ship ballistic

[33] See, for example, Douglas Barrie, "Air-to-Air Warfare: Speed Kills" (*International Institute for Strategic Studies, Military Balance Blog,* 09 September 2022). http://www.iiss.org/online-analysis/military-balance/2022/ 09/analysis-air-to-air-warfare-speed-kills/. Accessed March 15, 2024.
[34] Andreas Rupprecht (2018), 31-35, 36-39, 53-56, 56-59.
[35] Yefim Gordon and Dmitry Komissarov (2021), *Chinese Air Power* (Hikoki Publications: Manchester), 105-115.
[36] J. Michael Dahm, *Offensive and Defensive Strike* (The John Hopkins University Applied Physics Laboratory LLC: South China Sea Military Capability Series – A Survey of Technology and Capabilities on China's Military Outposts in the South China Sea, 2021).
[37] Ibid.
[38] Veerle Nouwens, Timothy Wright, Euan Graham, and Blake Herzinger, *Long-Range Strike Capabilities in the Asia-Pacific: Implications for Regional Security* (London: The IISS, 2024), 8-9. https://www.iiss.org/research-paper/2024/01/long-range-strike-capabilities-in-the--asia-pacific-implications-for-regional-stability/.
[39] Lawrence Trevethan, "The PLA Rocket Force's Conventional Missiles" (The Proceedings, vol. 149/4, April 2023). https://www.usni.org/magazines/proceedings/2023/april/pla-rocket-forces-conventional-missiles.
[40] Ma Xiu, "PLA Rocket Force Organization: Executive Summary" (China Aerospace Studies Institute, 2022).
[41] Graphic (Map 5.2) by Decker Eleveth in Jeffrey G. Lewis, "Sino-American Security Relations: The Nuclear Dynamics", *Asia-Pacific Regional Security Assessment 2022* (The International Institute for Strategic Studies, 2022), 117.
[42] Source: Author's compilation from various sources.
[43] Ibid.
[44] See, for example, Defense Intelligence Ballistic Missile Analysis Committee, *Ballistic and Cruise Missile Threat 2017* (NASIC-1031-0985-17, June 2017). http://www.nasic.af.mil/LinkClick.aspx?fileticket=F2VLc KmCTE%3D&portalid=19. Accessed March 15, 2024.
[45] Veerle Nouwens, Timothy Wright, et al., 9.

missiles (ASBM), also known as "carrier killers". The STC is also the first Theatre Command to receive the new hypersonic DF-17 missile, which can reportedly be employed against both land and surface targets. The ASBMs are thought to be a critical tool in China's A2/AD toolbox in denying the U.S. Navy's carrier strike groups access to the South China Sea and challenging the USN in the West Philippine Sea.

However, the PLA is still likely struggling to develop the required targeting infrastructure to reliably close the 'kill chain' for the ASBMs, including finding, identifying, tracking, and targeting a moving ship at sea, for a medium- to intermediate-range ASBM strike. Nevertheless, within First Island Chain, the PLA is likely able to utilize its information dominance to close the 'kill chain' rapidly and reliably enough for ASBM employment.[46]

As part of the PLA's A2/AD capability, is also important to highlight Chinese maturing counter-space capabilities. Understanding the importance of space-based ISTAR, navigation, and communications to the U.S.'s military, the PLA has invested heavily on its ability to counter the U.S.'s space advantage/dependence. The PLA's counter-space capabilities consist of direct ascent anti-satellite (ASAT) missiles, co-orbital, electronic warfare, and directed energy systems, which help "blind" and "deafen" adversary in conflict as a crucial pre-requisite for a successful operation.[47]

FEASIBILITY OF PLA'S USE OF WMDS IN THE SOUTH CHINA SEA

It is notable that debates on China's A2/AD capabilities rarely extend to the threat or use of weapons of mass destruction (WMD), comprising of biological, chemical, and nuclear weapons. Notably, lack of transparency over Beijing's WMD programs make a realistic debate difficult.

In the past, China is known to have run chemical and biological weapons programs, but little is known of their status.[48] Nevertheless, China is known to have sufficient chemical and biotechnology research, development, and production capability to weaponize the technology.[49] Despite having dismantled all agents and munitions as it ratified the Biological Weapons Convention (BWC) in 1997, concerns over China's dual-use biological activities involving toxins and compliance with the BWC remain high.[50] However, there is little concrete evidence that would suggest that either chemical or biological weapons play a role in PLA's military planning.

The PLA continues to modernize, expand, and diversify its nuclear forces at a rapid pace and at large scale. China's nuclear warhead stockpile is estimated to exceed 1,000 warheads by 20230.[51] Despite the fast modernization and expansion of Chinese nuclear weapons and delivery platforms, the PLA's focus remains "strategic deterrence" and build-up of a reliable counter-strike capability.[52] Nevertheless, Chinese use of nuclear weapons in a South China Sea scenario is unlikely due to the strategic deterrence nature of its arsenal and Beijing's "no first use" policy.

Significantly, the PLA is not known to employ tactical nuclear weapons for battlefield effect. Chinese writings, however, have emphasized interest in developing a low-yield nuclear weapon option for flexible response, since at least 2017.[53] Therefore, Beijing's use of low-yield nuclear weapons against U.S. bases or aircraft carrier strike groups in the region cannot be entirely ruled out.

Despite the rapidly expanding nuclear capability, the PLA's confidence on its growing arsenal of increasingly sophisticated ballistic and cruise missiles to reliably destroy enemy targets and at a significantly reduced risk of nuclear escalation. This would likely continue to be the case even if the PLA adopts low-yield nuclear weapons in its A2/AD strategy in the future. This is because China's advanced ballistic and cruise missiles are better suited to destroy well-dispersed and hardened targets today than a low-yield nuclear warhead, which is more suitable against area targets.

GROWING REGIONAL MILITARY (IM)BALANCE

Beijing can already claim an effective control over the South China Sea without the need to use outright military force. This control is achieved with flexible use of military, quasi-military, and civilian maritime agencies. The PLAN, the China Coast Guard (CCG) and the People's Armed Forces Maritime Militia (PAFMM) have established a near-constant presence around almost all contested maritime features in the South China Sea.[54] No South East Asian claimant state to the South China Sea can hope to match Chinese presence. China's ability to hold 'ground' in the waters was greatly improved by the construction of the seven artificial island outposts in the Spratlys, in the southern part of the South China Sea.[55] This competitive presence should be viewed as part of China's A2/AD network for peace-time control of the Sea.[56] Beijing can flexibly establish and adjust the level of control it asserts in the South China Sea, spanning both peace and wartime.

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[46] For a good discussion on the U.S. Navy's ability to counter China's ASBMs, see, for example, Ronald O'Rourke, "Appendix B. U.S. Navy's Ability to Counter Chinese ASBMs and Hypersonic Weapons" in *China Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress* (Congressional Research Service Report, 30 January 2024), 62.

[47] U.S. Department of Defense (2023), 98, 102-103.

[48] U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China: 2023* (2023), 114-115.

[49] U.S. Department of Defense, 115.

[50] Ibid., pp. 114-115.

[51] U.S. Department of Defense, VIII and 104.

[52] Ibid., 105.

[53] Ibid., 111-112.

[54] See, for example, Asia Maritime Transparency Initiative (AMTI), *Flooding the Zone: China Coast Guard Patrols in 2022* (30 January 2023). Available at http://www.amti.csis.org/flooding-the-zone-china-coast-guard-patrols-in-2022/. Accessed March 15, 2024; and, Asia Maritime Transparency Initiative (AMTI), *Wherever They May Roam: China's Militia in 2023* (28 February 2024). Available at http://www.amti.csis.org/wherever-they-may-roam-chinas-militia-in-2023/. Accessed March 15, 2024.

[55] Olli Pekka Suorsa, *China's Artificial Islands in South China Sea: Extended Forward Presence* (S. Rajaratnam School of International Studies Commentary, CO20042, 19 March 2020). Available at http://www.rsis.edu.sg/ rsis-publication/idss/chinas-artificial-islands-in-south-china-sea-extended-forward-presence/. Accessed on March 14, 2024.

[56] The word control here does not refer to a "total" control but signifies a potential that can be exploited against other South China Sea claimant states in the "gray zone" or below the threshold of war in the conflict spectrum.

Responding to the Threat: Military Modernization in Southeast Asia

Military modernization in South East Asia has produced some tangible results with new surface combatants, combat aircraft, and antiship and surface to air missile systems ordered and introduced into service during the last decade. However, military procurement remains piecemeal with new capabilities often acquired in limited quantities in small batches, and with acquisition programs extended over several years. In addition, many procurement programs over the past decade have suffered from financial difficulties and political indecision, causing major delays if not cancellations in much needed acquisition plans. Moreover, traditional emphasis of armies over air or naval forces has skewed South East Asian militaries towards counterinsurgency and internal security operations instead of developing capabilities for external deterrence and defense.

To address the growing capability asymmetry in the South China Sea, South East Asian South China Sea claimant states—including Vietnam, the Philippines, Brunei, and Malaysia—as well as Indonesia, which is tnot a claimant state to the South China Sea but faces Chinese maritime encroachments in its resource-rich Northern Natuna waters, have engaged in moderate military modernization of their own.[57] Vietnam, Indonesia, and the Philippines are developing a level of A2/AD capabilities of their own to deter Chinese military adventurism across the South China Sea. However, despite slowly reaping rewards of often multi-decade long military modernization programs, these efforts remain largely insufficient in the face of the unsurmountable military imbalance between China and its South East Asian neighbors.

Vietnam has steadily modernized its naval and air capabilities over the past two decades procuring diesel-electric submarines, guided missile frigates and fast-attack missile craft, equipped with modern Russian made antiship missiles.[58] Vietnam's coastal defense has also seen a transformation with the introduction of the Russian build Bastion-P and BAL-E antiship missile systems into service. In addition, Vietnam is slowly re-equipping its air force with Russian built multirole fighters and Israeli surface to air missile systems and early-warning radars. Hanoi is also replacing some of its ageing artillery systems in its Spratly holdings with Israeli-made precision-guided rockets with sufficient range to hold Chinese artificial island outposts at risk.[59] Hanoi's answer to China's A2/AD threat has been to erect an A2/AD system of its own.

Like Vietnam, the Philippines is building up a nascent anti-access capability based on the Indian-Russian BrahMos supersonic antiship missile system.[60] Manila will deploy three BrahMos systems throughout the archipelago with suspected basing in the Palawan Island, which is in close geographic proximity with the Philippine occupied maritime features in the Spratlys, and in the Luzon Island, opposite to the contested Scarborough Shoal.[61] Moreover, the Philippine's staged military modernization, known as the "Horizon", has already generated new capabilities for the Philippine Navy and Air Force, including the two *Jose Rizal*-class guided-missile frigates and 12 FA-50 light combat aircraft from South Korea, and air defense systems and early-warning radars from Israel.[62] Manila is set to acquire further naval and air assets from Seoul, while looking to procure its first multirole fighter squadron from either the U.S. or Sweden.[63]

Malaysia's military modernization has been hampered by several delays caused by political indecision and fiscal difficulties. Many critical acquisition projects, including the procurement of six French Govind-class Littoral Combat Ships and multirole fighter acquisition program are mired by continuous delays. Nevertheless, Malaysia has closed a deal for light combat aircraft from South Korea and long-endurance uncrewed aircraft from Turkey, while attempting to strike a deal for second-hand combat aircraft from Kuwait.

Although not a claimant state to the South China Sea, Jakarta has grown wary of China's paramilitary, coast guard and naval presence near the strategic Natunas in the southern stretch of the South China Sea.[64] Indonesia has put a lot of resources on military modernization during Joko Widodo's presidency and the stewardship of the Minister of Defense (now President) Prabowo Subianto. As part of Indonesia's Minimum Essential Force plan, Prabowo has signed several major arms acquisition deals in the last few years to build up a 274-ship green-water navy, ten fighter squadron air force, and twelve new submarines.[65] So far, however, only part of the plan has been realized, including the purchase of up to 42 Dassault Rafale and 24 Boeing F-15ID multirole fighters from France

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[57] See, for example, Shang-Su Wu, *Military Modernisation in Southeast Asia After the Cold War: Acquisition, Retention, and Geostrategic Impacts* (Routledge: Milton Park, Oxon, 2024).

[58] Bich T. Tran, *Understanding Vietnam's Military Modernization Efforts* (The Diplomat, 25 November 2020). Available at http://www.thediplomat.com/2020/11/understanding-vietnams-military-modernization-efforts/. Accessed March 15, 2024.

[59] Op.cit. Olli Pekka Suorsa in Asia Maritime Transparency Initiative (AMTI), *Vietnam Shores Up Its Spratly Defenses* (19 February 2021). Available at http://www.amti.csis.org/vietnam-shores-up-its-spratly-defenses/. Accessed March 15, 2024.

[60] Department of National Defense (Philippines), *Shore-Based Anti-Ship Missile System Contract Signed* (26 February 2024). Available at http://www.dnd.gov.ph/Postings/Post/Shore-based%20anti%-ship%20missile%20 system%20contract%20signed. Accessed March 15, 2024.

[61] Bea Cupin, *Explainer: Philippines to Finally Get India-Made BrahMos Missiles – What Does It Mean?* (Rappler, 03 February 2024). Available at http://www.rappler.com/newsbreak/explainers/philippines-finally-get-india-made-cruise-missiles/. Accessed March 15, 2024.

[62] See, for example, Aaron-Matthew Lariosa, *Philippines Starts Latest Naval Modernization Attempt Amid South China Sea Tensions* (USNI News, 28 February 2024). Available at http://www.news.usni.org/2024/02/28/ philippines-starts-latest-naval-modernization-attempt-amid-south-china-sea-tension. Accessed March 15, 2024.

[63] Olli Pekka Suorsa, *Philippines' Fighter Decision Edges Closer: Important Considerations* (FACTS Asia, 22 June 2023). Available at http://www.factsasia.org/blog/philippines-fighter-decision-edges-closer-important-considerations. Accessed March 15, 2024.

[64] See, for example, Sebastian Strangio, *Indonesia Seeking Southeast Asian Coordination on South China Sea Disputes* (The Diplomat, 29 December 2021). Available at http://www.thediplomat.com/2021/12/indonesia-seeking-southeast-asian-coordination-on-south-china-sea-disputes/. Accessed March 15, 2024; and, Beni Sukadis, *Protecting Indonesia's Sovereignty in the North Natuna Sea* (The Diplomat, 23 September 2021). Available at http://www.thediplomat.com/2021/09/protecting-indonesias-sovereignty-in-the-natuna-sea/. Accessed March 15, 2024.

[65] Mike Yeo, *'Hodgepodge of Tech': What Makes Indonesia's Naval Buildup Vulnerable?* (Defense News, 13 February 2023). Available at http://www.defensenews.com/smr/defending-the-pacific/2023/02/13/hodgepordge-of-tech-what-makes-indonesias-naval-buildup-vulnerable/. Accessed March 15, 2024.

and U.S. respectively, and the acquisition of FREMM and Arrowhead 140 frigates.[66]

Access denied? The Chinese A2/AD Challenge to the U.S. Military in the Region

The U.S. must acknowledge the fact that the PLA's A2/AD system-of-systems has become a significant obstacle to U.S. military's access to the South China Sea. Notably, the PLA's A2/AD challenge becomes increasingly more formidable closer one gets to China's coastline. In an all-out conflict, the U.S. military will have to fight its way into the theatre and to operate inside the PLA's A2/AD network.[67]

Nevertheless, the U.S. still has the means to fight its way into the South China Sea if necessary.[68] The U.S.'s Navy and Air Force are still amongst the best trained and equipped forces in the world. It is steadily fielding new generation combat aircraft in large numbers, including the 5th generation F-35, and rolling upgrades on the Navy's *Arleigh Burke*-class guided-missile destroyers and nuclear-powered *Virginia*-class submarines while progressing towards serial manufacturing of the next generation stealth bomber (B-21 Raider), accelerating the introduction of the uncrewed collaborative combat aircraft (CCA), the *Constellation*-class guided-missile frigates, large uncrewed underwater vehicles, and hypersonic boost-glide vehicles, among others.[69] Many of these new capabilities will find their way to the Indo-Pacific theatre first.

In addition, the U.S. military is changing its operational mindset in the Pacific from the post-Cold War era's heavy emphasis on a few large bases to many 'places', distributing critical warfighting capabilities to a wider geographic area to prevent them from being taken out in a single "bolt from the blue" strike.[70] This has become especially acute requirement due to PLA's advances in the development of long-range precision fires. In the USAF, USN, and USMC, this concept of operation has gotten many names and practiced under the concepts of 'Agile Combat Employment' (ACE), Distributed Maritime Operations concept (DO), and the Expeditionary Advance Base Operations (EABO).[71]

Due to these efforts, the U.S.'s military will likely retain its ability to fight its way into the South China Sea in times of conflict and, at least, partially roll back the PLA's A2/AD system-of-systems.[72] Nevertheless, this proposition has become an increasingly costly proposition in terms of lives, equipment, and resources. Important question becomes, how would the U.S. military exploit the access and presence in the South China Sea and to what strategic end.

POLICY RECOMMENDATIONS

This author advances four actionable policy recommendations in line with improving the U.S.'s military's forward posture and its resilience against PLA's missile strikes—whether conventional or WMD. Many of the actions proposed below are not entirely new but highlight areas of forgotten or otherwise neglected competences, requiring accelerated and wide-scale reintroduction across the U.S. forces in the theatre:

1. Distributed operational footprint,
2. Active and passive defenses,
3. CBRN protection,
4. Non-U.S.-centered partner capacity building framework.

First, the U.S. military needs to accelerate infrastructure buildup for a more distributed operational footprint throughout the region. The requirement for

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[66] Ibid.; and, Olli Pekka Suorsa, *Air Force Modernisation: Indonesia's Troubled Acquisition* (RSIS Commentary, CO21048, 18 March 2021). Available at http://www.rsis.edu.sg/rsis-publication/idss/air-force-modernisation-indonesias-troubled-acquisition/. Accessed March 15, 2024.

[67] To better understand the idea of operating within an adversary's A2/AD system, see, for example, Thomas G. Mahnaken, Travis Sharp, Billy Fabian, and Peter Kouretsos, *Tightening the Chain: Implementing a Strategy of Maritime Pressure in the Western Pacific* (Center for Strategic and Budgetary Assessments, 2019). Available at http://www.csbonline.org/research/publications/implementing-a-strategy-of-maritime-pressure-in-the-western-pacific/publications/1. Accessed March 15, 2024; and, Mark Gunzinger, Bryan Clark, David E. Johnson, and Jesse Sloman, *Force Planning for the Era of Great Power Competition* (Center for Strategic and Budgetary Assessment, 2017). Available at http://www.csbaonline.org/research/publications/force-planning-for-the-era-of-great-power-competition/publication/1. Accessed March 15, 2024.

[68] Olli Pekka Suorsa, *The Conventional Wisdom Still Stands: America Can Deal with China's Artificial Island Bases* (War on the Rocks, February 06, 2020). Available at http://www.warontherocks.com/2020/02/the-conventional-wisdom-still-stands-america-can-deal-with-chinas-artificial-island-bases/. Accessed on March 14, 2024.

[69] On F-35, see, U.S. Department of Defense, *F-35 Program Achieves Milestone C and Full Rate Production* (12 March 2024). Available at http://www.defense.gov/News/Releases/Article/3704808/f-35-program-achieves-milestone-c-and-full-rate-production/. Accessed March 15, 2024; On B-21 Raider, see, U.S. Department of Defense, *World Gets First Look at B-21 Raider* (03 December 2022). Available at http://www.defense.gov/News/News-Stories/Article/Article/3235326/world-gets-first-look-at-b-21-raider/. Accessed March 15, 2024; On USAF's CCA program, see, Airforce Technology, *Collaborative Combat Aircraft (CCA), USA* (17 July 2023). Available at http://www.airforce-technology.com/projects/collaborative-combat-aircraft-cca-usa/?cf-view. Accessed March 15, 2024; *Arleigh Burke*-class DDGs, see, Congressional Research Service (CRS), *Navy DDG-51 and DDG-1000 Destroyer Programs: Background and Issues for Congress* (RL32109, updated 06 February 2024). Available at http://www.sgp.fas.org/crs/weapons/RL32109.pdf. Accessed March 15, 2024; On *Constellation*-class SSN, see, Congressional Research Service (CRS), *Navy Constellation (FFG-62) Class Frigate Program: Background and Issues for Congress* (R44972, updated 06 February 2024). Available at http://www.sgp.fas.org/crs/weapons/ R44972.pdf. Accessed March 15, 2024; On *Virginia*-class, see, Congressional Research Service (CRS), *Navy Virginia-Class Submarine Program and AUKUS Submarine Proposal: Background and Issues for Congress* (RL32418, 14 February 2024). Available at http://www.crsreports.congress.gov/product/pdf/RL/RL32418. Accessed March 15, 2024; On the Navy's large uncrewed surface and subsurface vehicle programs, see, Congressional Research Service (CRS), *Navy's Large Unmanned Surface and Undersea Vehicles: Background and Issues for Congress* (R45757, 20 December 2023). Available at http://www.crsreports.congress.gov/product/ pdf/R/R45757. Accessed March 15, 2024; and, on hypersonic weapons, see, Congressional Research Service (CRS), *Hypersonic Weapons: Background and Issues for Congress* (R45811, 09 February 2024). Available at http://www.crsreports.congress.gov/product/pdf/R/ R45811. Accessed March 15, 2024.

[70] Maj. Scott D. Adamson and Maj. Shane Praiswater, *With Air Bases at Risk, Agile Combat Employment Must Mature* (Defense News, 12 November 2020). Available at http://www.defensenews.com/opinion/commentary/ 2020/11/12/air-bases-are-at-risk-without-the-agile-combat-employment-approach/. Accessed March 15, 2024.

[71] On the USAF's ACE concept, see, USAF, *Air Force Operationalizes ACE Concept, Addresses Today's Changing Threat Environment* (23 June2022). Available at http://www.af.mil/News/Article-Display/Article/ 3072831/air-force-operationalizes-ace-concept-addresses-todays-changing-threat-environm/. Accessed March 15, 2024; on the USMC's EABO concept, USMC, *Expeditionary Advanced Base Operations (EABO)* (02 August 2021). Available at http://www.marines.mil/News/News-Display/Article/2708120/ expeditionary-advanced-base-operations-eabo/. Accessed March 15, 2024; and, for the USN, Congressional Research Service (CRS), *Defense Primer: Navy Distributed Maritime Operations (DMO) Concept* (IF12599, 27 February 2024). http://www.sgp.fas.org/crs/natsec/IF12599.pdf. Accessed March 15, 2024.

[72] Olli Pekka Suorsa (06 February 2020).

distributed footprint and operations is very clear. The post-Cold War U.S. military posture in East Asia became too focused on a few very large bases, located primarily in Japan, South Korea, Australia, and Guam. Due to the advances in Chinese missile technology, the PLA can hold any U.S.'s base in the region at risk. Moreover, majority of the U.S.'s military installations in the region lack sufficient hardening to withstand a concerted attack. To avoid creating lucrative high-return targets, including for the use of WMDs, plans to rapidly distribute assets within a base and across other military and civilian infrastructure need to be pre-planned and practiced.

Although challenging to execute in normal times due to issues with alliance politics, popular acceptance, legal permissions, and disruptions to regular air traffic, utilization of civilian airports would increase the number of useable runways and available ramp-space substantially. Operating from many spread-out runways minimizes the chance for major losses in case of a successful missile strike against a single large air base or naval base. The USAF and Marines practice Agile Combat Employment (ACE), which sees fighter elements deployed to other military airfields as a contingency exercise. Such exercises need to be carried out within the large bases themselves, benefitting from the bases' large scale to distribute assets more widely and practice short-notice deployment of combat aircraft to civilian airfields. Importantly, amendments to basing allocation and legal permissions for access to civilian airports and harbors need to be included. Processes for close coordination with local civilian authorities is also a must to facilitate airspace deconfliction in civilian airspace near major airports and to minimize obstruction to civilian air traffic during exercises.

Second, the U.S. must increase both passive and active defenses of its military installations in the region against concentrated air and missile attacks. The need for robust layered air defenses around key military bases is well covered elsewhere. Within the FIC, the U.S. can work with its key allies, such as Japan and South Korea, to develop strong integrated air defense of critical military and civilian infrastructure on the ally soil. The U.S. already deploys PAC-3 air and missile defense batteries in Japan and South Korea to protect U.S. military bases. In addition, in response to increased pace of North Korean missile tests in 2017, the U.S. deployed a THAAD (Terminal High-Altitude Anti-Air Defense) battery to South Korea to strengthen early-warning against North Korean aggression. In a similar fashion, the U.S. could make several THAAD (and additional PAC-3) batteries available for expeditionary deployments to rapidly reinforce air and missile defenses were needed. For example, the U.S. Army has practiced moving a PAC-3 system to the Philippines to establish air base air and missile defenses in an exercise environment. In addition, far cheaper medium-range air defense systems should also be considered as the PLA's long-range fires pose both ballistic and cruise missile threat to U.S. and its allies and partners in the FIC.

In addition to the active defenses, the U.S. should quickly relearn the art of passive defenses. Calls to harden U.S. air bases in the region have started to heed results. Modern hardened aircraft shelters will gradually replace old shelters in U.S.'s air bases in Okinawa and Guam. Importantly, new infrastructure and upgrades to existing ones are needed to accommodate the U.S. military's latest capabilities, such as the F-35 Lightning II. The U.S. should also reintroduce mock or fake targets to confuse enemy's targeting as part of a broader concealment and deception operation. During the Second World War, the U.S. employed a range of fake targets to a great effect. The war in Ukraine demonstrates that fake targets is potentially a cost-effective way to attract enemy fire away from real targets.

Moreover, the U.S. should avoid creating unrealistic expectations of 100 percent effectiveness of base defenses and, instead, expect "leakers" (i.e. a proportion of missiles getting through the active air defenses and successfully hitting their targets). Well-rehearsed rapid runway repair (R3) capabilities will once again become essential. Prepositioning of new advanced R3 solutions and materiel in allies' soil will be critical. Moreover, training and integration with host nation to support R3 tasks help build resilience. For example, the U.S. Navy's "Sea Bees" frequently train and exchange best practices with their Japanese and Korean counterparts. Engaging with Taiwan more frequently would also be beneficial due to Taiwanese world-class R3 capabilities. The overall aim of improving passive defenses is to increase U.S. (and host nations') resilience against PLA's conventional attack. Nevertheless, dispersion, deception, hardening, and a range of active air and missile defenses also help to reduce the impact of any potential use of WMDs against U.S.'s base infrastructure in the region.

Third, chemical, biological, radiological, and nuclear (CBRN) protection and training should be increased to Cold War levels. The U.S. forces in the region need to operate with the mindset that the PLA may opt to use WMDs against its bases, however unlikely. CBRN training and cleaning lines are available in major U.S. military bases but are infrequently practiced or tested. The CBRN protection must be adopted as part of all base operations and logistical functions. Furthermore, the capacity to address a large-scale WMD attack needs to be established to enable survival and rapid restoring of operations. This can be best achieved in partnership with host nations and their respective military and civilian capacities and capabilities.

Fourth, aside of improving the U.S. forces' resilience and survivability against conventional and WMD attack, Washington should take steps to help develop South East Asian ally and partner capabilities to deter military aggression. This can take different forms, including through direct foreign military sales, foreign military financing, and donation of excess defense articles, as well as training and exercises, and sharing of information and intelligence.

However, in terms of technology, the U.S.'s industry may not always have the right answers to its allies and partners' specific capability needs. Therefore, an inclusive ally and partner capacity building program could be established. Moreover, due to several political, organizational, and economic constraints, some of Washington's regional allies and partners may not be able to acquire U.S. weapons for various reasons, such as political access or the sheer cost of American weapon systems. This should not stop Washington from supporting its South East Asian allies and partners from developing asymmetric military capabilities to deter China. Washington could tap into U.S.'s other allies and/or minilateral forums (i.e., South Korea, Japan, India, UK, France, Italy, AUKUS, and "QUAD"), which may be better

positioned to provide certain types of weapon systems required by its South East Asian partners.

This bodes well with several South East Asian states desire to diversify sources of their military equipment, seeking alternatives to both the U.S. and Russian or Chinese weapons. In particular, France and South Korea have risen in prominence in South East Asian arms market in recent years. In addition, India's sale of the capable BrahMos supersonic antiship missile system to the Philippines is likely to attract further interest in the region towards Indian defense industry. At least Vietnam and Indonesia are known to have considered acquisition of the Indian BrahMos system as well. Therefore, Washington should look beyond its own direct industrial interests, in particular in cases where its own industry does not produce required capabilities, and instead facilitate Asian and European allies access to South East Asia's arms market, including through loan arrangements. To goal would be to help allies and partners build asymmetric defensive capabilities based on the combined defense industrial capacities of the U.S. and its European and Asian allies.

CONCLUSION: CHINA'S ALL-DOMAIN CONTROL IN THE SOUTH CHINA SEA

The PLA has benefitted immensely from the more than two-decade-long military modernization that has established the Chinese military second only to the U.S. in overall capability. The PLA today can employ a wide range of long-range precision fires from land, sea, and air. Its navy, the PLAN, has grown into the largest navy in the world equipped with mostly modern multirole vessels, diesel-electric and nuclear-powered submarines, large helicopter-carrying amphibious ships, and aircraft carriers. The PLA Air Force is rapidly transitioning into fourth and fifth generation combat aircraft force and supported by a wide range of critical special mission aircraft. The PLA Rocket Force has gained the status of an independent service and has maintained the pace of modernization, introducing a variety of medium- and intermediate range ballistic missiles and hypersonic glide vehicles, capable of striking targets well beyond the Second Island Chain. In addition, China has increasingly focused on improving the "informatization" of its forces by erecting a robust networked C4ISR system-of-systems to link its "eyes" and "ears" with the command and control, and the "shooters."

Beijing's ability to seize military control over majority of the South China Sea is unrivalled by any South East Asian claimant state. The U.S. maintains some offensive advantages over the PLA in rolling back of China's artificial island bases in the Spratlys, in the South China Sea. However, the closer one gets to the Chinese mainland the more formidable the Chinese A2/AD capabilities become and the more daunting the roll-back of Chinese capabilities becomes. Noticeably, despite rapid advances in multiple fields and in some areas even surpassing the U.S., the U.S. has not laid dormant but has kept moving the goal post further in areas where it enjoys a clear advantage (i.e., accelerated transition from a 4th generation fighter fleet to mostly 5th generation force, the first flight of the 6th generation, or the Next Generation Air Dominance (NGAD), aircraft, early serial production of the 6th generation bomber to name but a few).

Discussion about China's nuclear weapons policy has been elevated once again due to Beijing's policy to rapidly grow and diversify its arsenal and delivery methods. The PLA's nuclear strategy remains based on the "no first use" policy and strategic deterrence. The growing interest to develop a new precise small-yield nuclear weapons, since at least 2017, to improve PLA's nuclear response's flexibility may alter this premise in the future. Concerns over biological and chemical weapons programs are somewhat warranted due to China's ability to weaponize toxins but no hard evidence shows existence of such programs. Moreover, the use of nuclear, biological, and chemical weapons in a regional conflict may be redundant due to advances made in PLA's ability to hit targets reliably and accurately with its conventional missile capabilities.

Finally, this paper proposed four actionable policy recommendations to help improve the U.S. military's resilience and survivability inside China's A2/AD umbrella as well as to build U.S.'s ally and partner capacity in South East Asia. The recommendations underscored the U.S. forces' ability to disperse its forces to several smaller operating locations, increasing active and passive defenses, and reintroduction of CBRN protection training and preparations. Such actions do not just help improve the U.S. forces' survival inside China's A2/AD network but also provide actionable techniques to minimize damage if the PLA decides to use WMDs against U.S.'s bases in the region.

In addition, to help U.S.'s South East Asian allies and partners to develop nascent A2/AD capabilities of their own, Washington would have to look at its alliance network more broadly and support defense and industrial cooperation between and amongst allies and partners (i.e., South Korea, Japan, Australia, European powers, and India) with South East Asian states, which may have more fit for purpose capability solutions to specific military problems faced by Washington's allies and partners in the region.

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