航 空 航 天

CHINA AEROSPACE STUDIES INSTITUTE

TEN TAKEAWAYS FROM THE RUSSIA-UKRAINE WAR AND THEIR IMPLICATIONS FOR A TAIWAN CONFLICT

Kevin Pollpeter

September 2025

Printed in the United States of America by the China Aerospace Studies Institute

To request additional copies, please direct inquiries to:
Director, China Aerospace Studies Institute,
Air University, 55 Lemay Plaza, Montgomery, AL 36112

Cover art is from "Commemorating the 80th Anniversary of the Victory of the War of Resistance Against Japanese Aggression – Xinhua Viewpoint | Nine Highlights of the Military Parade" (纪念抗战胜利 80 周年 • 新华视点丨抗战胜利 80 周年阅兵分列式九大精彩瞬间), Xinhua, September 4, 2025, http://www.news.cn/politics/20250904/e31b269eafc44c6fa0b207789d8188de/c.html.

E-mail: Director@CASI-Research.ORG
Web: http://www.airuniversity.af.mil/CASI
https://twitter.com/CASI_Research @CASI_Research
https://www.facebook.com/CASI.Research.Org
https://www.linkedin.com/company/11049011

CHINA AEROSPACE STUDIES INSTITUTE

The mission of the China Aerospace Studies Institute (CASI) is to advance the understanding of the strategy, doctrine, operating concepts, capabilities, personnel, training, and organization of China's aerospace forces and the civilian and commercial infrastructure that supports them.

CASI supports the Secretary, Chief of Staff of the Air Force, the Chief of Space Operations, and other senior Air and Space leaders. CASI provides expert research and analysis supporting decision and policy makers in the Department of Defense (DoD) and across the U.S. government. CASI can support the full range of units and organizations across the United States Air Force (USAF), U.S. Space Force (USSF), and the DoD. CASI accomplishes its mission through conducting the following activities:

- CASI primarily conducts open-source native-language research supporting its five main topic areas.
- CASI conducts conferences, workshops, roundtables, subject matter expert panels, and senior leader discussions to further its mission. CASI personnel attend such events, government, academic, and public, in support of its research and outreach efforts.
- CASI publishes research findings and papers, journal articles, monographs, and edited volumes for both public and government-only distribution as appropriate.
- CASI establishes and maintains institutional relationships with organizations and institutions in the PLA, the PRC writ large, and with partners and allies involved in the region.
- CASI maintains the ability to support senior leaders and policy decision makers across the full spectrum of topics and projects at all levels, related to Chinese aerospace.

CASI supports the U.S. Defense Department and the China research community writ-large by providing high quality, unclassified research on Chinese aerospace developments in the context of U.S. strategic imperatives in the Asia-Pacific region. Primarily focused on China's military air, space, and missile forces, CASI capitalizes on publicly available native language resources to gain insights as to how the Chinese speak to and among one another on these topics.

TABLE OF CONTENTS

INTRODUCTION[i]

The Russia-Ukraine war has been called the "first drone war,"[1] the "first commercial space war,"[2] and the "first full-scale cyber war."[3] The Russia-Ukraine war, however, defies simple generalizations. Characterized by trench warfare, nearly static front lines, and tank battles where precision artillery duels stymie operational maneuver, the war has also featured rapidly evolving electromagnetic combat, the prominent use of drones, including sea control without crewed warships, and the indispensability of space-based capabilities. It is one part World War I, one part World War II, and one part World War III.

The Russia-Ukraine war is in some ways reminiscent of World War I. That war has been called the "first modern war." It was the first war fought on the land, air, and sea and it launched the widespread use of many now commonplace military technologies, including aircraft, submarines, and tanks. Although airpower, undersea warfare, and armored maneuver would get their start in World War I, their use would be developed to an even greater degree some two decades later in World War II.

Similarly, the Russia-Ukraine war may be a harbinger of wars to come that sits at the intersection of geopolitics, technology, and tactics. The ongoing conflict between Russia and Ukraine occurs at a time of increasing concern in the United States over the rise of China and the potential for war between the two countries over primacy in the Western Pacific. The United States has identified the People's Republic of China (PRC) as the pacing challenge and China's military, the People's Liberation Army (PLA), continues to modernize its capabilities across all domains with the goal of becoming a "world-class" military by mid-century.[4] As part of its modernization process, the PLA has been given the goal of developing the capabilities and being ready to successfully invade Taiwan while deterring or defeating U.S. intervention by 2027.[5]

This paper identifies ten takeaways from the Russia-Ukraine war and applies their implications to a potential conflict between the United States and the PRC over Taiwan. These ten issue areas include strategic issues such as the effects of national will, demographics, protraction, and international support on the ability of a country to sustain the fight and the role of nuclear weapons. They also focus on operational warfighting issues such as logistics, uncrewed systems, space systems, air power, and cyber warfare on the course and conduct of future warfare.

In conducting this research, it is acknowledged that the lessons learned from any war are contextual and that the lessons from one war must be carefully applied to other conflicts. The Russia-Ukraine war is primarily a land war while a conflict over Taiwan for the U.S military would primarily be fought on the seas and in the air. Moreover, the war in Europe continues and its full lessons may not be fully understood or realized for years to come. Both Ukraine and Russia have been highly adaptable in their response to challenges, suggesting that new lessons will be learned and old lessons unlearned. Nevertheless, the study of an ongoing conflict like the Russia-Ukraine

[i] The author would like to thank Jeffrey Becker, Derek Ecklebe, John Garrison, Brendan Mulvaney, Steven Smith, and Andrew Taffer for their feedback.

war can offer guideposts about how warfare is changing, even if its exact destination is not completely known.

Each of the takeaways presented here is intended to provide a vignette of a larger issue. Whole studies can and have been written about most of the topics. Taken in their totality, these takeaways indicate that fighting and winning a potential war with China have far-reaching implications for the United States and its military. For the past three decades, the United States has fought wars with lesser powers. A war with a peer competitor like China, on the other hand, requires the United States to take a Cold War-era focus on the China military challenge in such a way that enables it to achieve a military edge and translate that edge into effective deterrence, and if necessary, strategic victory.

The overarching takeaway of this report is that wars between peer competitors can be both intense and protracted and that intense and protracted wars can challenge national will and the ability of militaries to sustain operations. The potential for a conflict between the United States and China to be intense and protracted means that the U.S. military will need to develop new technologies and concepts of operation and that the defense industrial base will need to be more responsive and productive in order to keep pace with high rates of fire and combat losses that could be the result of a high end war with China. A war with China will also involve the United States facing a nuclear-armed adversary whose operations could blur the lines between nuclear and conventional conflict that require new approaches to deterrence and de-escalation. The United States will also need to maintain and deepen its relationships with allies and partners. Taiwan, in particular, will need to deepen its military preparations, including developing the national will and military capabilities to defend itself during an extended conflict.

Taken together, the ten takeaways presented here indicate that China has positioned itself favorably for conflict with the United States and that the potential for war between the United States and China will likely exact high costs on the United States, increasing the risk of intervening in a Taiwan conflict. The potential for war between the United States and China suggests that defense budgets may be higher than during the previous three decades as the U.S. military retools to meet new threats. Additionally, a potential war between the United States and China could involve larger expenditures of weapons and equipment and its attendant loss of life than U.S. wars fought since the Vietnam conflict. These potential higher costs suggest that at the national level, the U.S. government will need to sensitize the American public to the possible costs and risks of peacetime competition and wartime conflict with China. At the operational level, it will need to think differently about how it constructs and operates its forces to succeed in the environment foreshadowed by the Russia-Ukraine war.

1. In War, the Moral is to Physical as Three is to One

The failure of Russia to achieve the initial objectives of its 2022 invasion of Ukraine demonstrates how a smaller military can effectively resist a larger and better equipped adversary. Although many factors contributed to Ukraine's roll back of the initial Russian offensive, one important factor was the Ukrainian forces' greater willingness to fight.[6] Indeed, the Ukrainian military's performance since the 2022 invasion is in stark contrast to its response to the 2014 annexation of Crimea in which Russian forces easily overwhelmed Ukrainian defenses.

Similarly, Taiwan's will to fight has also been identified as a critical factor in its ability to defend against a PRC attack.[7] Unlike the PRC, Taiwan is a democracy where people can freely express their minds and it does not have the internal security apparatus to stifle public dissent that the Chinese Communist Party (CCP) maintains.[8] But determining Taiwan's or any population's will to fight is difficult.[9] Public opinion polls in Taiwan gauging the willingness of Taiwanese to fight range anywhere from 15 percent to 80 percent.[10] Nevertheless, doubt remains about Taiwanese fortitude. According to Lung Yingtai, the former Taiwan Minister of Culture under the Kuomintang Party President Ma Ying-jeou administration, "it's not that the common folk believe resisting China is futile but that Taiwan will always be within China's immense gravitational pull and that pragmatism, even accommodation with China, might be preferable to war."[11]

One important factor affecting national will is attitudes towards the military. Taiwanese have traditionally viewed their military negatively.[12] Attitudes on Taiwan are changing, however, as Russia's invasion of Ukraine and PRC saber rattling have highlighted the potential for PRC aggression against Taiwan. Many Taiwanese of conscription age now express a willingness to join the military—if their service can be meaningful. Prior to 2024, Taiwanese conscripts served a four-month tour that primarily involved administrative tasks and menial jobs.[13] With the one-year service requirement, conscript training is now intended to be more relevant to combat operations.[14] Individual private citizens have also become more involved in preparing for their country's defense by establishing organizations to teach emergency preparedness and firearm familiarity by attending gun ranges.[15] Nevertheless, these reforms have yet to demonstrate their intended effectiveness. Conscripts refer to themselves as "cannon fodder" and the Taiwan Ministry of National Defense has admitted that it has fallen behind training conscripts in the new system.[16]

National will can be tested, however. A grinding war with heavy casualties and little or no progress can sap the will to fight, even if it was initially high.[17] After more than two years of heavy fighting and a largely static frontline, Ukrainians under the age of 25 have yet to be drafted and even Russia has balked at conducting a second round of mobilization that would likely affect ethnic Russian populations in more politically sensitive urban areas.[18] Taiwanese public support for the war could be further eroded if U.S. assistance were withheld or could not make it to the island.[19] On the other hand, national will could also be buoyed by early successes, such as how the Ukrainian victory over Russian air assault forces at Hostomel in the early hours of the Russian invasion boosted Ukrainian morale.

2. Demographics Is Not Destiny

Russia's invasion of Ukraine has shown that demographic decline does not necessarily deter a determined invader. Since 1992, Russia's population has dropped from 148.5 million to a little under 144 million in 2023, buoyed only by immigration.[20] Despite demographic decline, Russian president Vladimir Putin has been able to sustain the war effort in the face of mounting casualties. Russia has sustained an estimated 790,000 casualties in its war against Ukraine and during some time periods was suffering losses of more than 1,000 personnel per day.[21]

China is also in demographic decline with trend lines more serious than Russia's. In 2024, China's population decreased for a third year in a row by 1.39 million people to 1.408 billion people and is expected to shrink by 109 million by 2050.[22] China's shrinking population coupled with the effects of its now abandoned one-child policy have also called into question whether PRC citizens will be less supportive of a war in which their only children are expected to fight.

Estimates of Russian causalities indicate that approximately 0.54 percent of Russia's total population and approximately 2.2 percent of the militarily important age group of 20–40-year-olds have become casualties of the war since the February 2022 invasion. Moreover, although Russia's birth rate of 1.4 births per woman is not as low as China's birth rate of 1.18, this number indicates that, as in China, most Russian women give birth to just one child.

A similar number of casualties would likely be less politically significant for China. A total of 790,000 casualties would constitute just 0.056 percent of China's total population and approximately 0.19 percent of China's 20-40-year-old population of 387 million.[23] Although each individual loss would be tragic for the families involved, taken in aggregate, these losses may not have a meaningful impact on the ability of the CCP to sustain national support for a military campaign against Taiwan, especially given the intense CCP public messaging that would accompany a military campaign and the effectiveness of the its national security apparatus to quash public dissent.

The Russian-Ukraine war has also demonstrated, however, that countries are not completely insensitive to casualties. President Putin has avoided a second mobilization like the one conducted in 2022 that sought 300,000 new recruits and has pledged that conscripts—poorly paid and trained personnel who serve a year of mandatory service—will not be sent into combat.[24] Instead, Russia has relied on recruits from Russia's Far East and Siberia, as well as convicts, rather than the more politically sensitive cities of Moscow and St. Petersburg.[25] Most notably, Russia has resorted to using North Korean troops to offset its losses.

Demographics, however, can become a critical factor. Ukraine has the lowest birthrate in Europe with a mortality rate three times higher than its birthrate.[26] Reflecting this, Ukraine did not lower its conscription age from 27 to 25 until 2024 and has resisted lowering the conscription age even further to 18 due to its demographic crisis.[27] As one retired Australian military officer has commented, Ukraine's perspective is "we understand we need young men to fight, but we also need young men to have kids."[28]

3. Quantity has a Quality of its Own

The Russia-Ukraine War reinforces the idea that conflicts usually take longer than their initiators expect, and frequently become protracted wars of attrition, even if one side possesses an initially larger force.[29] Russia committed to its invasion of Ukraine believing that Ukrainian forces would quickly fold under its swift movement on key strategic locations, including the capital. Instead, more than three years later the Russia-Ukraine war has evolved from a fast paced and dynamic operation featuring dramatic shifts in territory to grinding positional warfare featuring intense, pitched battles for little or no territorial gain.

Wars of attrition place greater emphasis on the size of a force as a war winning factor. The reemergence of force size as a war-winning factor suggests that militaries will improve their odds of winning by having the ability to inflict attrition through mass attacks on an adversary—both rapidly and over the long term. In attrition warfare, defenses often take precedence over offensive action and victory depends on the ability to inflict massive losses on an opponent. Maneuver warfare, on the other hand, can expose an attacking force to deadly defensive fires that inflict large numbers of casualties.[30] At the strategic level, wars of attrition will be won by the ability to mobilize personnel, industrial capacity that can replace materiel losses, geographical depth to absorb defeats, and technologies that prevent rapid gains. In short, "in attritional wars, military operations are shaped by a state's ability to replace losses and generate new formations, not tactical and operational maneuvers."[31]

Future wars of attrition may also involve precision strikes that could lead to a significant increase in battlefield losses for both sides. Drawing, in part, on the lessons of the Russia-Ukraine war, University of Pennsylvania professor Michael Horowitz argues that future wars will be characterized by "precise mass." Horowitz argues that relying on either large numbers or precision to fight wars was once thought to be mutually exclusive. However, recent conflicts have shown that the use of large numbers of uncrewed systems has resulted in adversaries on both sides of a conflict being able to deploy large numbers of forces capable of conducting precision strikes and that this combination of both precision and mass lead to a significant increase in battlefield losses for both sides.[32]

The recent scholarship on attrition warfare suggests that three factors could become militarily decisive in a protracted conflict between the United States and the PRC: the ability to deliver precision strikes against the entirety of a critical enemy system, the size of the respective forces, and the ability to replace losses. Once the global leader, the U.S. military can no longer assume it will have a decisive edge in precision strike. The PLA has also invested heavily in precision guided munitions, resulting in the world's largest and most diverse inventory of ballistic missiles, long-range antiship missiles, and other precision munitions. In addition, uncrewed systems are playing an increasingly prominent role in how the PLA plans to fight future wars. In 2020, the CCP ordered the PLA to accelerate its transition to become an "intelligentized" force focusing on artificial intelligence and uncrewed systems.[33] Reflecting this, the PLA is developing a wide variety of highly capable uncrewed aerial vehicles (UAVs).[34]

The PLA is also a peer competitor of the U.S. military not only in quantity of personnel and weapon systems but also in technological sophistication. The United States has a large, professional, and modern military made up of 2.1 million active duty, reserve, and National Guard service members. The PLA is the world's largest active-duty military with around two million personnel. Unlike the U.S. military, however, the PLA's main focus is on Taiwan, just 100 miles from the PRC coast. The U.S. military's global mission set, on the other hand, requires its forces to be deployed around the world to be able to respond to a variety of contingencies that may make them unavailable or at least not immediately available for a Taiwan conflict. As a result, even if its overall force is less capable than the U.S. military, the PLA may still be able to achieve a localized advantage over the U.S. military in the Western Pacific, and concentrate its forces at what is for the CCP, the decisive point.

For the United States, the Joint Force may be challenged to provide war-winning mass in a fight with China, neither generating overwhelming force regionally, nor concentrating and replenishing its forces in combat. According to the now retired commander of Indo-Pacific Command, Admiral John Aquilino, the inability of the U.S. military to achieve numerical superiority over the PLA in the Western Pacific means that the U.S. military's ability to deter and defeat the PLA is at "high risk" and "trending in the wrong direction" due to "delayed delivery of military construction, advanced capabilities, and resources to persistently project and maintain forces west of the International Date Line."[35]

A quick look at the numbers reveals how this may be possible. The U.S. Air Force, Navy, and Marine Corps maintain the world's largest military aviation force with a combined total of approximately 5,200 fixed wing assets (not including UAVs and trainers).[36] Around 2,200 of these aircraft are based in the Indo-Pacific region.[37]

In comparison, the combined aviation assets of the PLA Air Force and Navy constitute the largest air force in the Indo-Pacific with 3,150 aircraft, of which 2,400 are combat aircraft that are "rapidly approaching" U.S. technology levels.[38] Numerically, China has the largest navy in the world with more than 370 ships and submarines, including more than 140 major surface combatants.[39] The U.S. Navy, on the other hand, is numerically the second largest with 297 deployable ships.[40]

According to a series of war games conducted by the Center for Strategic and International Studies (CSIS) involving a Taiwan conflict, the size of the opposing forces and their ability to fire large numbers of munitions figured prominently in the outcome of the war. Even though the PRC was not able to successfully take Taiwan, the U.S. military lost an average of 283 aircraft and in its base scenario lost two aircraft carriers and between 7 and 20 other warships compared to the PLA losing 155 aircraft and 138 ships.[41] In order to achieve this victory, the U.S. military expended more than 5,000 missiles in three weeks of conflict and depleted its entire inventory of 450 Long-range Anti-ship Missile (LRASM) within the first week of the war.[42]

In such a scenario, the ability to reconstitute forces through industrial production will be key. But here China may also have an advantage. The PRC military industrial base has been described as being on a "war footing."[43] According to Admiral Aquilino, during his three years as

commander of Indo-Pacific Command, the PRC's official defense budget increased by 16 percent and added over 400 fighter aircraft and more than 20 major surface combatants. It more than doubled its inventory of ballistic and cruise missiles and nuclear warheads and increased the number of satellites launched by 50 percent.[44] PRC industrial capacity is especially telling in regard to shipbuilding. The U.S. Navy estimates that a single PRC shipyard has more capacity than all U.S. shipyards combined.[45] According to then Under Secretary of Defense for Acquisition and Sustainment William LaPlante, China's progress in fielding weapon systems is "really impressive" and adds that China has "developed . . . really good high-end capability in numbers. So, they've done the development, and the development has been pretty continuous and not just one thing."[46]

The U.S. defense industrial base, on the other hand, may not be able to match this production level. According to one 2017 analysis, "between 1946 and 1965, the Air Force deployed 15 different types of fighter and attack aircraft. By comparison, between 1966 and 1985 it introduced only five new aircraft of these types. And in roughly the 30 years since, it has introduced only two new designs—the F-22 and F-35."[47]

Moreover, a study by CSIS found that it would take 8.4 years at surge production rates for the U.S. military to replace Major Defense Acquisition Program inventories that include platforms such as the F-35, F-22, and large surface combatants as well as weapons systems such as the Joint Air-to Surface Standoff Missile (JASSM), the AIM-120 Advanced Medium Range Air-to-Air Missile, and Sidewinder missiles.[48] CSIS notes, for example, that it takes nearly two years to manufacture just one LRASM.[49]

4. The World is Flat

The Russia-Ukraine War demonstrates the interconnectedness of the world's military industrial complex and the challenges in making sanctions effective. Despite having an economy roughly equivalent to Canada's, Russia has been able to maintain its warfighting capabilities by focusing its economy on supporting the war effort.[50] Reminiscent of what *New York Times* columnist Thomas Friedman described as the "flattening" of the Earth, an essential aspect of Russia's ability to maintain its warfighting capacity has been its ability to defy international sanctions and maintain its military and military industry connections with the outside world.[51]

International assistance has enabled Russia to establish an increasingly complex human and industrial supply chain to support its war effort. This is despite the imposition of more than 16,500 international sanctions restricting the movement of imports and exports, people, organizations, and financial transactions as well as the departure of multinational corporations.[52] Buoyed by exports of oil to China and India, Russia has continued to access goods and services from abroad to maintain economic growth. In September 2024, Russia announced a 24 percent increase in defense spending, which accounts for 6.3 percent of its gross domestic product and 40 percent of its government expenditures.[53] And while inflation runs high and unemployment remains low, its defense industry continues to produce the weapons and equipment necessary to prosecute the war.[54]

Although sanctions have harmed the Russian economy, the United States and Europe have not been able to impose the type of isolation on Russia that has critically impaired its ability to wage war. Russia's ability to continue the fight is in large part due to the assistance of China, North Korea, and Iran. Of these, China remains by far the largest supporter of Russia. In fact, PRC support to Russia is so key that NATO leaders have called China the "decisive enabler" of Russia in its war against Ukraine.[55]

Despite wide-ranging sanctions, total trade between the PRC and Russia in 2024 reached $244.8 billion, up from $146.9 billion in 2021.[56] Even though China's exports to Russia have not involved complete weapons systems and ammunition, China has provided essential support to Russian defense industries.[57] According to the then Director of National Intelligence Avril Haines, "China's provision of dual use components and material to Russia's defense industry is one of several factors that tilted the momentum on the battlefield in Ukraine in Moscow's favor, while also accelerating a reconstitution of Russia's military strength after their extraordinarily costly invasion."[58]

According to Haines, "China is supplying Russia with dual-use drone and rocket technology, satellite imagery and machine tools needed for its defense production."[59] In 2023, China supplied 90 percent of the microelectronics needed for the production of missiles, tanks, and aircraft and has supplied optics for tanks and turbojet engines for cruise missiles. China has also provided chemicals for the manufacture of ammunition and rocket fuel, and Chinese and Russian companies are jointly producing drones in Russia.[60] The PRC company Spacety has been sanctioned for supplying satellite imagery to Russia.[61]

And China is not alone in its support to Russia. Most notably, 12,000 North Korean troops fought in the Kursk region for Russia[62] and North Korea has also supplied weapons, including self-propelled guns and rocket systems, and millions of artillery rounds.[63] According to the Ukrainian military, 60 percent of artillery and mortar rounds and nearly a third of the ballistic missiles launched against Ukraine are of North Korean origin.[64]

Iran is also assisting Russia. According to the Ukrainian military, by September 2024 Russia had launched more than 8,000 Iranian Shahed drones against Ukraine.[65] In 2022, Iran and Russia entered into an agreement to build a drone factory capable of producing 6,000 drones a year.[66] The drone factory is emblematic of the "flattening" of the international arms industry supporting Russia. According to the *Wall Street Journal*, the factory manufactures Iranian drones built with Chinese optics, microelectronics, engines, and other dual-use components, and built by Africans who receive free airfare and accommodations and can earn three times their wage at home.[67]

Although international support for the invasion has not been reflected in the United Nations—a February 2023 United Nations resolution calling for an end to the war and for Russia to pull its troops out of Ukraine received 141 votes in favor, seven votes against, and 32 abstentions—more substantive support for Ukraine beyond that provided by the West has been inconsistent among countries in the Global South.[68]

India, for example, who sees itself as the leader of the nonaligned movement, is a major purchaser of Russian oil and has pursued "a largely neutral stance…abstaining from most UN resolutions condemning Russia's actions and emphasizing dialogue and diplomacy."[69] South Africa has also claimed neutrality in the war and has hosted the 2023 BRICS summit, which Russia attended, and joined a joint naval exercise with Russia and China in February 2023.[70]

The inability of the West to collapse the Russian economy and isolate its military raises questions about the challenges the United States will face in trying to both isolate China and to generate international support for Taiwan during a conflict. At nearly $18 trillion, China's economy is around nine times larger than Russia's, and with the capability to manufacture a wide-range of technologies from basic components to high-end platforms and a forecasted capability to manufacture as much as America and all of its democratic allies combined, China will likely be far better insulated from international sanctions.[71]

For example, China is the largest trading partner of the Association of Southeast Asian Nations countries, Africa, and South America[72] and is the European Union's second largest trading partner for goods.[73] China's trade relations and the economic leverage that it brings will likely give it numerous options to circumvent trade sanctions. Although oil imports will always be critical for China, its long land borders with Russia, Southeast Asia, and North Korea indicate that physically isolating China from the world economy would require a significant investment in physical and diplomatic resources.

Isolating China economically would be further complicated by the likely inability to isolate China politically, not only because of its economic leverage but also because of the support it has received over its position on Taiwan, differing views of the Western-led international system in

the developing world, and international apathy. Taiwan's political isolation set against the diplomatic and economic strength of the PRC suggest that the type of international support garnered for Ukraine will be more difficult in the Taiwan case. A major factor aiding the PRC will be the question of Taiwan sovereignty. With the notable exception of Russia, the international community appears to accept Ukrainian sovereignty. Taiwan, on the other hand, maintains official relations with just 12 small countries compared to the 183 countries that have official relations with the PRC.[74] Moreover, China does not necessarily need to enlist international support for its actions against Taiwan. For countries uncomfortable with PRC actions but concerned about getting drawn into a war or fearful of retribution, acquiescence may seem like a safer option.[75]

A series of workshops conducted by CSIS highlight the difficulty of isolating China. The workshops found that the United States is seen by some countries as contributing to escalating tensions over Taiwan and some countries share PRC-fueled concerns over the creation of a NATO-like alliance system in Asia. Moreover, some countries base their positions on Taiwan on economic interests instead of democratic values, suggesting that economic ties with the PRC may outweigh other considerations.[76]

In this regard, Southeast Asian countries' attitudes toward the Russian invasion of Ukraine may be instructive. According to one study, Southeast Asian countries "are less willing to act as proxies for great power conflict than they did during the Cold War and more willing to take positions on foreign and security affairs that run counter to great-power priorities."[77] Statements by the leaders of Cambodia, Indonesia, Laos, Malaysia, Myanmar, and Thailand, for example, "are either ambiguous about or oppositional to Western narratives of Russian aggression" and instead focus "on the need for a negotiated outcome to the war that recognizes both Russia's and Ukraine's national security interests."[78] Moreover, ambiguity and opposition to Western narratives is reflected at the grassroots level by apathy. Majorities or large percentages of the public in Thailand, Malaysia, Singapore, and Indonesia believe that the war in Ukraine "is not their business and that their states should not interfere."[79]

5. How I Stopped Worrying and Learned to Love the Bomb

The Russia-Ukraine War has demonstrated that nuclear messaging, once thought a relic of the Cold War, has returned to superpower politics. Since its invasion of Ukraine in 2022, Russia has resorted to nuclear saber rattling on multiple occasions. In late summer to fall 2022, the United States picked up intelligence that Russia was discussing the use of tactical nuclear weapons after Ukrainian forces began pushing the Russian military out of the strategically important city of Kherson.[80] More recently in May 2024, the Russian military rehearsed deploying tactical nuclear weapons after French President Emmanuel Macron stated that he did not rule out sending Western troops to Ukraine.[81] These incidents suggest that Russian performance on the battlefield puts the United States in a quandary: Russia is less likely to use nuclear weapons the better it does on the battlefield. Conversely, the threat of Russian nuclear weapons may increase when the Russian military does poorly.[82]

Just as Russia's failure on the battlefield may increase the likelihood of nuclear threats, the U.S. Defense Department has assessed that "Beijing probably would also consider nuclear use to restore deterrence if a conventional military defeat in Taiwan gravely threatened CCP regime survival."[83] For decades, China maintained a small nuclear arsenal and it continues to profess a no first use policy in which it has unilaterally pledged that it will not be the first to use a nuclear weapon in a conflict.[84] Recent PRC actions, however, have generated concern over whether it is changing to a more offensive nuclear doctrine as it vastly increases both the size and quality of its nuclear arsenal.

In 2024, the Defense Department reported that China increased its nuclear warhead stockpile to more than 600 warheads—up from the low 200s reported in 2020—and estimates that China will likely increase its nuclear missile arsenal to more than 1,000 warheads by 2030.[85] China is also seeking low-yield nuclear precision strike missiles that could give it more flexibility in tailoring nuclear threats to specific circumstances and the PLA's DF-26 intermediate range ballistic missile, capable of carrying both nuclear and conventional warheads, raises the possibility that nuclear weapons could be used against targets in the Pacific.[86] In July 2024, China announced that it halted nuclear arms discussions with the United States to protest U.S. arms sales to Taiwan.[87]

PLA officials have made nuclear threats in the past. In 2005, Major General Zhu Chenghu, then dean of the PLA's National Defense University, stated that the PRC government was "under internal pressure to change its 'no first use' policy and to make clear that it would employ the most powerful weapons at its disposal to defend its claim over Taiwan."[88] According to Major General Zhu, "If the Americans draw their missiles and position-guided ammunition on to the target zone on China's territory, I think we have to respond with nuclear weapons."[89]

The war in Ukraine has also shown that the mere possession of nuclear weapons by an adversary can influence U.S. policy, even without an explicit threat. Ukrainian requests for support have been denied or delayed due to concerns of crossing Russian red lines, only to be approved after Russia failed to carry through on threats.[90] U.S. support to Taiwan has been similarly limited due to U.S. policy towards the PRC and Taiwan. Although U.S. military support for Taiwan in the

form of arms sales has been increasing in recent years, the United States does not maintain official relations with Taiwan and does not engage in the types of military-to-military activities that it conducts with other militaries, such as joint exercises. The Ukrainian experience suggests that U.S. military options in a Taiwan conflict could also be restricted by concerns that certain types of activities could cross PRC nuclear redlines. These PRC nuclear redlines could effectively deter U.S. deployments to certain locations and keep it from striking certain targets that would be viewed as too provocative by the PRC.

6. Amateurs Talk Strategy, Professionals Talk Logistics

The Russian invasion of Ukraine revealed severe deficiencies with the Russian military's logistics system. The Russian military planned for a quick victory but its military, lacking sufficient staffing and equipment, was not set up for sustained operations.[91] The Russian military lacked sufficient truck transportation, for example, which became more of a problem the farther its forces operated from railheads. According to CNA, these deficiencies, coupled with the complexity of the operation, caused "severe shortages of food, fuel, ammunition, and other resources" for the Russian military.[92]

Deficiencies in Russian logistics were exacerbated by Ukrainian resistance. As Russian forces penetrated deeper into Ukrainian territory, its supply lines became more exposed to Ukrainian attack. Although Russia's retreat later in 2022 shortened supply lines, the Ukrainian deployment of long-range artillery like the M142 High Mobility Artillery Rocket Systems with its 300 kilometer range and precision fires capability exposed Russian logistics hubs to indirect fire and forced the Russian military to move depots even farther to the rear.[93] Despite these initial challenges, the Russian military has adapted its operations to become more sustainable, aided by its logistics tail into Russian territory and a static frontline.[94]

A conflict over Taiwan would present even greater logistical challenges for the United States and Taiwan. Unlike Ukraine, Taiwan is an island that could be enveloped by an air and sea blockade intended to isolate it from outside support. Indeed, PLA forces have exercised encircling Taiwan.[95] PLA exercises in May 2024, for example, were described by the PLA as "a strong punishment for the separatist acts of Taiwan independence forces and a serious warning against interference and provocation by external forces."[96]

Whereas Ukraine receives 90 percent of its military aid by road and rail from the relatively safety of logistics hubs in Poland, Taiwan would likely not have the luxury of unimpeded resupply.[97] Aircraft and ships trying to run a blockade would risk interception and possible shoot down or sinking, likely making commercial carriers reluctant to participate in resupply missions. In the event of war, it is also likely that airports and ports would be struck, further hindering the capacity of Taiwan to offload and distribute supplies. Moreover, military resupply would be furthered limited by the necessity to bring in goods for civilian needs. Of these, energy supplies would be critical. Taiwan, for example, imports most of its energy and according to a CSIS report, Taiwan has just a 10-day reserve of natural gas, a 7-week reserve of coal, and a 20-week reserve of oil.[98]

U.S. logistics would also be challenged by the extreme distances involved in transporting supplies across the Pacific Ocean.[99] Taiwan is nearly 7,000 miles from the continental United States. Even Guam, a U.S. hub for military operations, is 6,000 miles from the continental United States while Japan is more than 5,500 miles away. Longer distances require more forces dedicated to support roles and require US forces to be out of action for longer periods of time as they travel to and from resupply points and maintenance facilities.[100]

Added to this combination of challenges is the likelihood that the PLA will target U.S. logistics centers during a Taiwan contingency. During a war game conducted by the Center for New American Security, PRC air and missile strikes against U.S. bases in the Pacific critically delayed the flow of forces to the region and degraded operations.[101]

The likelihood that the PLA would target the U.S. logistics system means that U.S. military supply depots will have to be dispersed across a limited number of islands or stored on ships. Unlike Russia, which could move their supply depots closer to the Russian/Ukrainian border or into Russian territory, depots on islands have limited mobility, exposing them to attack. While ships can move, they can also be sunk. The limited number of options for depots also affects basing that limits the ability of tankers to refuel fighter and strike aircraft.

Finally, the size and complexity of supporting an operation the size needed for a Taiwan contingency would stress any military. One U.S. Army officer points out that Army operations in the Southwest Pacific during World War II were supported by a fleet of nearly 130,000 small ships to supply its forces.[102] Although that large of fleet is not needed for a Taiwan conflict, the U.S. military and sealift capacity is likely insufficient to meet the needs of a prolonged conflict. The U.S. Navy's Military Sealift Command has just "125 civilian-crewed ships that replenish U.S. Navy ships, conduct specialized missions, strategically preposition combat cargo at sea around the world and move military cargo and supplies used by deployed U.S. forces and coalition partners."[103] Moreover, the U.S. Merchant Marine fleet, an important element for transporting supplies during World War II, has shrunk from nearly 3,000 ships over 1,000 deadweight tons in 1960 to just 185 today.[104]

7. Rise of the Machines

One of the hallmark features of the Russia-Ukraine war has been the use of uncrewed systems. Videos of drones descending to attack vehicles and individual personnel are ubiquitous on social media while uncrewed surface vessels have helped Ukraine sink as many as 11 Russian naval vessels.[105] UAVs have also featured prominently in Russian targeting of Ukrainian civilians and the Ukrainian power grid. In one August 2024 attack, Russia launched around 100 missiles and a comparable number of UAVs against Ukraine's energy infrastructure.[106] Moreover, the June 2025 Ukrainian drone attacks launched from shipping containers against Russian strategic bombers at multiple Russian air bases demonstrated the strategic effectiveness of employing these inexpensive weapons against expensive military targets.[107]

Eric Schmidt, the former chief executive of Google, has called Ukraine "the best laboratory in the world on drones."[108] According to a Council on Foreign Relations (CFR) report, the Ukrainian conflict "has demonstrated the battlefield advantages of drones, which have become smaller, more lethal, easier to operate, and available to almost anyone."[109] Although the UAVs used in Ukraine come in a variety of sizes, ranges and capabilities, the vast majority are small quadcopter drones made popular by the PRC company DJI. The use of easy to operate inexpensive drones has led to an emphasis on fielding attritable capabilities that can be easily replaced rather than higher end drones that offer better capabilities. According to a 2023 estimate by the British Royal United Services Institute, Ukraine was losing 10,000 UAVs per month.[110] Signifying the importance of drone warfare, Ukrainian President Volodymyr Zelenskyy in 2023 announced a goal of building one million drones in 2024 and announced the establishment of the Unmanned Systems Force as a new branch of the Ukrainian military in February 2024.[111]

While videos of drones taking out Russian vehicles and personnel are ubiquitous, the most common use of uncrewed systems on the Ukrainian battlefield is for intelligence, surveillance, and reconnaissance (ISR).[112] According to the CFR report, uncrewed systems have shortened the sensor-to-shooter kill chain and have improved the ability "to reconnoiter the forward edge of the battlefield" while reducing the exposure of troops to enemy fire.[113]

A potential conflict between the United States, China, and Taiwan could potentially accelerate and deepen the use of uncrewed systems. The United States, Taiwan, and the PRC are all working to increase the use of uncrewed systems, driven by the long distances involved in a war in the Pacific and the numerical imbalance of forces between the U.S. military and Taiwan and the larger PLA. The involvement of the world's top two artificial intelligence innovators—the United States and China—in a conflict also suggests that increasingly sophisticated autonomous systems with the ability to independently maneuver to attack the adversary will become more prevalent. And while the conflict in Ukraine has seen the widespread use of small quadcopters, the longer distances the United States needs to travel to engage PRC forces means that larger uncrewed systems will be more suitable for a Taiwan conflict.[114]

Reflecting the importance of uncrewed systems, the United States announced in 2023 that the military would acquire thousands of attritable autonomous systems by 2025 that would enable

it to deploy thousands of UAVs, uncrewed surface vessels and uncrewed underwater vessels around Taiwan in a strategy called "Hellscape" that is intended to make the PLA "utterly miserable."[115]

Taiwan has also increased its emphasis on acquiring uncrewed systems through its "Drone National Team" program that established the goal of acquiring thousands of drones ranging in size from under two kilograms to large reconnaissance aircraft.[116] According to the Taiwan Ministry of National Defense's *National Defense Report*, 700 military grade UAVs will be built between 2022-2028 and more than 7,000 commercial grade UAVs will be built between 2024-2028.[117]

The PLA is also emphasizing uncrewed systems and is moving in the direction of what it calls "intelligentized warfare" emphasizing autonomous systems.[118] According to the Defense Department, the PLA has a "comprehensive modernization effort highlighted by the routine appearance of increasingly sophisticated [uncrewed] systems across theater and echelon levels."[119] The Defense Department also assesses that the PLA "considers unmanned systems to be critical intelligentized technology, and is pursuing greater autonomy for unmanned aerial, surface, and underwater vehicles to enable manned and unmanned teaming, swarm attacks, optimized logistic support, and distributed ISR, among other capabilities."[120] In 2024 it was reported that a representative of a prominent PRC defense contractor, Poly Technologies, stated that the company had a contract to provide nearly one million drones to the PRC government by 2026.[121]

8. One Small Step…

Russia's war on Ukraine has been called the "first commercial space war."[122] The satellite internet constellation Starlink has proved to be a game changing capability for Ukraine that has been called the "essential backbone" for Ukraine's military communication network.[123] Prior to the start of the invasion of Ukraine, Russian computer network attacks against satellite communications provider Viasat resulted in widespread internet blackouts in Ukraine and impaired the communications capabilities of the Ukrainian government and military.[124] After an online request from the Ukrainian government via Twitter, Starlink founder Elon Musk agreed to support Ukraine and within a week provided Ukraine with 500 Starlink terminals.[125]

Ukraine now operates 42,000 Starlink terminals for a variety of applications and they are so fundamental to Ukraine that it has been called the "blood" of Ukraine's communication infrastructure.[126] Starlink enables portable communications between units and is used to connect drone feeds to command posts and drone teams to artillery units.[127] Starlink allows commanders to communicate with troops in group chats to maintain better situational awareness and enables apps that compute targeting information for artillery strikes.[128]

One important feature of Starlink has been its resiliency against Russian attack. Starlink terminals in Ukraine were initially jammed for "hours at a time" but the company's engineers were able to quickly update the system's software to recover from attacks with what one Defense Department official called "eye watering" speed.[129] Starlink's built-in features also inhibit interference. Starlink satellites broadcast in the narrow beam of the Ku and Ka bands and its use of small antennas means that jammers need to be in visual range of the antenna to be effective.[130]

More recently, however, Starlink has been more susceptible to Russian jamming. According to one Ukrainian soldier speaking in 2024, Ukraine was "losing the electronic warfare fight" with Russia.[131] According to the *New York Times*, the success of Russian hacking "raise(s) broader questions about Starlink's reliability against a technically sophisticated adversary."[132]

The use of proliferated low Earth orbit constellations like Starlink by the United States, China, and Taiwan suggests that a future conflict involving all three will be, in part, characterized by space systems whose numbers, low cost, and technological sophistication will make them resistant to attack. These factors will inhibit one party from easily defeating the command-and-control capabilities of the other and enable persistent communications and intelligence, surveillance, and reconnaissance capabilities that will make the battlefield more transparent and facilitate the targeting of the adversary.

In August 2024, the PRC company Shanghai Spacecom Satellite Technology launched the first 18 satellites of a planned 14,000 satellite constellation called Qianfan.[133] Another company, Shanghai Landspace Hongqing Technology Co, Ltd. is reportedly planning a constellation of 10,000 satellites.[134] China has also planned another megaconstellation called SatNet that envisions a 13,000 satellite constellation.[135]

Taiwan, for its part, has looked to international satellite communication providers. In 2023, the Taiwan government signed an agreement with the Luxembourg company SES for satellite services and ground infrastructure while Chunghwa Telecom, the largest integrated telecommunications service provider in Taiwan, signed an agreement with London-based Eutelsat OneWeb.[136] Taiwan also intends to launch its own constellation of communication satellites made up of 120 to 150 satellites.[137]

9. Superiority, Complex

For decades, U.S. military operations have been predicated on air supremacy. The inability to achieve air superiority by either side is one important factor that has led to the relative stalemate of the war.[138] The ineffective use of the Russian air force coupled with the effective use of multilayered ground air defense systems by Ukraine has negated the numerical and technical advantage of the Russian military in aircraft. According to one analysis, the Russia-Ukraine war "underscores that in the missile era, ground-based air defense, employed effectively by a maneuver force using mission command and a strong will to fight, can have decisive effects on an overall campaign against a numerically superior force."[139]

At the beginning of the war, Russia had more than ten times the number of combat aircraft than Ukraine and deployed 350 of them in operations against Ukraine.[140] In contrast, Ukraine had just 120 combat aircraft at the start of the war and only a third of them were mission capable.[141] Ukraine, however, has been able to deny the much larger Russian air force air superiority by employing a strategy of "volumetric defense." Volumetric defense involves employing a defense in depth that is both vertical and horizontal, consisting of overlapping air defense systems that integrates effects from low to high altitudes.[142] According to Maximilian Bremer and Kelly Grieco, "volumetric defense aims to push the attacking air forces outside their combat effective ranges, both laterally and vertically.[143]

In carrying out volumetric defense, the Ukrainian military has employed a mix of long-range, medium-range, and short-range mobile surface-to-air missile systems using dispersion and "shoot and scoot" tactics involving firing missiles and then rapidly moving to a new location.[144] The result is that the Russian air force has curtailed operations over Ukrainian-controlled territory, relying instead on standoff strikes launched from behind the front lines.[145]

The PLA can also deploy a multi-faceted integrated air defense system (IADS) capable of countering a wide range of threats. According to the Defense Department, "the PRC has a robust and redundant IADS architecture over land areas and within 300 nm (556 km) of its coast that relies on an extensive early warning radar network, fighter aircraft, and a variety of SAM systems."[146] PLA air defense will also be aided by having both the largest air force in the Indo-Pacific and the close proximity of Taiwan to China. The U.S. military, on the hand, will need to travel hundreds of miles to reach Taiwan, placing a premium on employing and protecting valuable tanker aircraft. As a result, the PLA will likely be able to generate more fighter sorties for longer periods of time in areas around Taiwan than the U.S. military.

The PLA can also employ a mix of domestic and Russian air defense systems that include the SA-21 (S-400) that can engage targets up to 400 km away, the SA-20 (S-300) with a range up to 150 km, and the domestically produced HQ-9 with a range of 200 km.[147] The PLA is also researching converting the DF-17 ballistic missile with a range of up to 2,500 km into an air defense missile.[148] The PLA also operates radars and air defense weapons on outposts in the South China Sea, further extending the range of its IADS."[149] In addition, PLA Navy vessels with their increasingly capable air defense systems would be expected to contribute to the PLA IADS in

terms of both extending its maritime range as well as contributing to its sensor network. PLA Army units can also field a range of air defense systems against low and slow threats. These include self-propelled air defense artillery systems, gun air defense artillery, man-portable air defense systems, and electronic warfare systems.[150]

10. Cybersecurity is Much More Than a Matter of IT

Cyber warfare has often been described as a decisive component of future conflicts.[151] The large number of attack surfaces, the ability to preposition malware in advance of a conflict, and the increasing reliance of weapon systems, information systems, and civilian infrastructure on software suggest that cyber-attacks during a conflict could be widespread and catastrophic.[152]

Russia has employed advanced cyber capabilities against Ukraine in a manner that has been both disruptive and destructive.[153] The "NotPetya" attack in 2017, for example, has been described as the "most devastating cyber attack in history."[154] That Russian attack affected a variety of targets, including at least four hospitals, six power companies, two airports, and more than 22 banks in Ukraine alone.

But the damage was not limited to Ukraine. According to *Wired*, the malware "crippled multinational companies including Maersk, pharmaceutical giant Merck, FedEx's European subsidiary TNT Express, French construction company Saint-Gobain, food producer Mondelēz, and manufacturer Reckitt Benckiser. In each case, it inflicted nine-figure costs."[155] Altogether, the attacked caused an estimated $10 billion in damages.[156]

Possibly the highest profile Russian attack was against Ukraine's satellite communications provider, the U.S. company Viasat. That attack, codenamed AcidRain, erased modems and routers and disabled communications for thousands of customers in Ukraine and other European countries, forcing the company to send 30,000 replacement modems to customers to recover operations.[157] The attack also spurred the Ukrainian government to reach out to Elon Musk to request the use of Starlink. Other attacks resulted in dozens of Ukrainian government websites being controlled by Russian hackers and the disabling of the websites of the Ukrainian banks Privatbank and Oschadbank.[158]

Despite the theorized potential of cyber warfare and widespread cyber attacks against Ukraine, Russian cyber operations conducted in support of the 2022 invasion have had limited battlefield and strategic effects. Multiple analyses attribute the relative ineffectiveness of Russian cyberattacks against Ukraine since 2022 to a variety of reasons. The focus of the Russian military on cyber espionage and subversion rather than warfighting could have limited the ability of cyber operations to meaningfully contribute to kinetic operations. The poor performance of the Russian military in its kinetic operations, on the other hand, may have also prevented it from capitalizing on any opportunities created by cyber operations.[159]

A major factor limiting the effectiveness of Russian cyber attacks since 2022 appears to be the improved state of Ukrainian cyber defenses, made more effective by international assistance.[160] In December 2021, the United States sent a team of military personnel from the Cyber Command's Cyber National Mission Force to assist Ukraine in improving its cyber defenses.[161] American technology providers Microsoft, Amazon, Cloudflare, and Google also played a vital role in defending Ukraine from Russian cyber attacks. Microsoft migrated critical Ukrainian data and services to the cloud where they were hosted in data centers across Europe, ensuring Ukrainian government network resiliency in the face of the Russian assault.[162] Amazon Web Services backed

up critical data into suitcase-sized hard drives and Cloudflare and Google provided their cybersecurity expertise to help defend Ukrainian networks.[163]

While a combined multinational public-private effort has largely secured Ukrainian networks from the most devastating cyber attacks, the ability of the United States to protect itself from PRC attacks appears to remain in doubt. According to the Defense Department, the PLA seeks to use its cyber capabilities to collect intelligence and, in conjunction with kinetic attacks, to degrade an adversary's warfighting, government, and commercial capabilities and civilian and defense critical infrastructure.[164] In addition, the U.S. intelligence community assesses that "the PRC remains the most active and persistent cyber threat to U.S. government, private-sector, and critical infrastructure networks."[165] Moreover, it has "demonstrated the ability to compromise U.S. infrastructure through formidable cyber capabilities that it could employ during a conflict with the United States."[166]

The most prominent recent PRC cyber attack against the United States has been the advanced persistent threat known as "Volt Typhoon" that has compromised information technology systems in communications, energy, transportation, water, and wastewater systems in the United States and its territories, including Guam.[167] According to the Defense Department, the PRC likely intends to exploit intrusions like Volt Typhoon "to enable disruption or destruction of critical services in the event of increased geopolitical tensions or military conflict with the United States and its allies."[168] According to the U.S. intelligence community, "such strikes would be designed to deter U.S. military action by impeding U.S. decision-making, inducing societal panic, and interfering with the deployment of U.S. forces."[169] According to the Defense Department, the effects of such attacks could last for days or weeks.[170]

CONCLUSIONS

The ten takeaways illustrated here present a complicated picture of the challenges the United States may face in a potential conflict over Taiwan. Although specific recommendations for each of the ten takeaways is beyond the scope of this paper, together, they present a multi-faceted picture of the challenges the United States may face in a potential conflict over Taiwan. These challenges range from the geopolitical to the operational, and from the technological and industrial to the societal. Each presents unique challenges. Nevertheless, these takeaways do pose some broader implications.

WAR CAN BE BOTH INTENSE AND PROTRACTED

The overarching takeaway from the Russia-Ukraine war is that war can be both intense and protracted. The rise of China as a peer competitor raises the possibility that a protracted war of attrition could occur in a Taiwan conflict.[171] According to Hal Brands and Michael Beckley, "most great-power wars since the Industrial Revolution have lasted longer than expected, because modern states have the resources to fight on even when they suffer heavy losses."[172] Wars between great powers can also become protracted because "the future of the international system is at issue," making "the price of defeat…prohibitive."[173]

When applied to a Taiwan scenario, the failure of an initial attempt to take Taiwan might become an existential threat to the rule of the CCP, which has called Taiwan "the core of China's core interests" and has closely associated its political legitimacy with taking control of Taiwan.[174] Similarly, the United States could also become committed to fighting a protracted war if the conflict became associated with maintaining the U.S.'s role as the sole superpower and in preserving its national interests in Asia.[175]

Findings from this report suggest that three factors could lead to a conflict with China becoming protracted: the rise of defensive capabilities, national will, and the potential for the war to become a proxy war.

The rise of the defense

One important factor contributing to the intense and protracted nature of the Russia-Ukraine war has been the rise of the defense. U.S. operations since the end of the Cold War have emphasized rapid offensive maneuver. The Russia-Ukraine war, on the other hand, demonstrates that combat between two more evenly matched competitors can give renewed prominence to defensive operations. The rise of the defense has been demonstrated in multiple ways by the Russia-Ukraine war and is reflected in three of the topics presented in this report: air power, cyber, and space.

Air power

The limitations placed on air power in the Russia-Ukraine war by volumetric air defenses strike at the heart of U.S. military superiority. The more sophisticated and elaborate IADS in the PLA arsenal suggests that the contest for the air domain in a U.S.-China conflict will be even more

intense than in the Russia-Ukraine war. According to now retired U.S. Air Force Lieutenant General S. Clinton Hinote, volumetric air defenses could make achieving air superiority "much more challenging" in a China conflict scenario to the extent that trying to achieve perpetual air dominance is no longer a viable strategy. According to this thinking, the U.S. military will not be able to achieve air dominance in a China conflict scenario like it did in the 1991 Gulf War and the wars in Iraq and Afghanistan.[176] Moreover, the PLA's large and sophisticated IADS suggests that conducting the number of strikes necessary to appreciably degrade PLA air defenses could unacceptably limit the availability of aircraft to strike other targets, such as those belonging to the PLA Army, Navy, and Rocket Force. As a result, the U.S. military will likely not be able to suppress PLA IADS to the extent necessary to achieve air superiority.

The PLA's robust air defense means that the air battle in a Taiwan conflict could be fluid and contested with neither side achieving clear superiority or one side achieving air superiority only to lose it or relinquish it according to mission requirements. According to Hinote, the air defense threats posed by the PLA will require new thinking about how the U.S. Air Force will penetrate into contested areas in order to achieve air superiority.[177] This new thinking could include seeking to exploit windows of short-term superiority to achieve specific effects for the Joint Force according to time or geography instead of trying to maintain prolonged superiority.[178]

Cyber

The prominence of defensive operations has also been demonstrated in the cyber domain. The limited effect of Russian cyber attacks since the 2022 invasion goes against the conventional wisdom of their destructiveness. Similar to the lessons learned about the use of air power, cyber defenses, when used properly, can have an instrumental effect on degrading the effectiveness of offensive cyber operations. Unfortunately, the continued activity of advanced persistent threats like Volt Typhoon suggest that the United States remains critically vulnerable to the PRC cyber threat and that the protection afforded to Ukraine may be more difficult to achieve in the U.S. case.

Space

Defense may also be gaining an advantage in outer space, a domain traditionally considered to be offense dominant. Starlink has demonstrated that proliferated low Earth orbit systems with their thousands of satellites can provide the resilience necessary to deny an adversary the advantage of counterspace operations when accompanied by effective cyber and electronic warfare defenses. The satellite system continues to be the backbone of the Ukrainian communication infrastructure despite recent Russian advances in electronic warfare.[179]

National will

A second factor contributing to the protracted nature of the Russia-Ukraine war has been the importance of national will for both countries. Russia has been able to maintain national will despite casualties not seen since its involvement in World War II. Despite suffering 790,000 killed and wounded, Russia is now fielding more troops on the battlefield than it did at the outset of the 2022 invasion.[180] The Russia-Ukraine war has also demonstrated how an outnumbered but well-armed and motivated Ukrainian military and population has been instrumental in mounting an effective defense.

Major wars can become proxy wars

A third factor contributing to the protracted nature of the Russia-Ukraine war is the importance of international support in sustaining both countries' war efforts. Total international support for Ukraine since the 2022 invasion has been estimated to be approximately $304 billion as of December 2024 in the form of military, financial, and humanitarian aid.[181] Similarly, Russia would likely not have been able to sustain three years of brutal attrition warfare without the support of China, Iran, and North Korea.

One outcome of the international support for Russia is a deepening of relationships between authoritarian governments that could be used against the United States and its allies and partners in other conflicts. While the United States for decades has used its system of alliances and partnerships to achieve its military and diplomatic goals, China, Russia, Iran, and North Korea have been more isolated in their approach to world affairs and military ambition. This isolation appears to be changing, however. A more united or coordinated approach by China, Russia, Iran, and North Korea to countering the United States would complicate U.S. actions during a conflict with China. Such actions could entail support in the form of direct involvement in the conflict, diversionary wars, arms transfers, and economic and diplomatic support.

Recent military cooperation between Russia and China in the Pacific, for example, could portend the involvement of Russia in a conflict between the United States and China. In 2024, Russia and China conducted bomber patrols near Alaska and Guam. The bomber patrol near Guam for the first time included nuclear-capable PLA Air Force H-6N bombers. In addition, Russia and China conducted their first joint coast guard patrol, two naval patrols, and three naval exercises in 2024, indicating a deepening level of engagement between Russia and China in the western Pacific.[182]

Russia could also threaten or start a war in Europe to divert U.S. and allied forces away from the Indo-Pacific. According to NATO Secretary General Mark Rutte, "if Xi Jinping would attack Taiwan, he would first make sure that he makes a call to his very junior partner in all of this, Vladimir Vladimirovich Putin, residing in Moscow, and telling him, 'Hey, I'm going to do this, and I need you to keep them busy in Europe by attacking NATO territory.' That is most likely the way this will progress."[183]

Russia's relationship with North Korea has also deepened. In June 2024, Russia and North Korea signed a mutual defense treaty after which North Korea sent 12,000 troops as well as large amounts of weapons and ammunition to support Russia.[184] Similarly, North Korea could exploit a U.S.-China conflict to extract economic or technological aid from the PRC in return for North Korean support, such as infantry or missile forces. The Russian-North Korean defense treaty in addition to the defense treaty between China and North Korea signed in 1961 could also provide new confidence to Pyongyang in its dealings with the United States and South Korea and suggests that a conflict on the Korean peninsula could escalate to a wider war involving four nuclear armed powers.

New Technologies: Evolutionary or Revolutionary?

A second broad takeaway from the findings of this report is that, much like World War I, the Russia-Ukraine war is a proving ground for new technologies, yet the realization of their full potential appears to be uneven. Uncrewed systems, for example, remain a hallmark of the Russia-Ukraine war but according to a report by the Center for New American Security, their use has not brought about a revolutionary change on the battlefield. Instead, the main application of UAVs has been as ISR platforms.[185]

Nevertheless, the use of strike UAVs is becoming more prominent and strategic. According to the Ukrainian military, 19 of the 31 Abrams tanks provided by the United States have been destroyed, disabled or captured, with some attacked by UAVs.[186] In comparison, no Abrams were destroyed by enemy action during the 1991 Gulf War.[187] Russian one way attack UAVs guided by fiber optic cables instead of by radio also reportedly played an important role in denying logistics to Ukrainian forces during Russia's operation to retake the Kursk region.[188]

Uncrewed systems have also had a strategic effect. Attacks against the Russian navy by Ukrainian uncrewed boats have forced Russia to withdraw its ships from Crimea, have deterred amphibious assault on Odessa, and have effectively neutralized Russia's Black Sea fleet.[189] Most strikingly, in June 2025, Ukraine conducted attacks against Russian airbases, some thousands of kilometers from the Ukrainian border, using UAVs smuggled in from Ukraine. The attack resulted in at least 13 bombers being destroyed and could potentially impair Russia's ability to carry out long-range missile attacks against Ukraine.[190]

The use of space has also exceeded expectations. The Russia-Ukraine war shows that commercial space companies can provide countries access to space-based capabilities that were once the province of the major space powers. Although this study has focused on the importance of Starlink to maintaining Ukrainian communications, the use of space for intelligence, surveillance, and reconnaissance has also closed a gap in Ukrainian capabilities.[191] The launch of a similar Starlink-type system by the PRC, however, indicates that the one-sided advantage brought about by Starlink may become less impactful over time. Moreover, the significant attention paid to counterspace capabilities by the PLA suggests that a U.S.-China conflict could see large scale and less discriminate use of counterspace capabilities despite the existence of Starlink-type constellations, which could potentially degrade mission critical space-based capabilities.[192]

Don't Forget Old Lessons

While the Russia-Ukraine war has offered new lessons for future wars, a third broad takeaway is that warfare can remain constant in many ways and that old lessons may need to be relearned.

Logistics

While weapons systems grab headlines, logistics remains a key feature of successful campaigns despite the efficiency brought about by precision weapons. The immense distances involved in a Pacific war coupled with enemy attacks and the high expenditure rate of ammunition

indicate that the resupply effort during a war over Taiwan will be more complex and fraught than that encountered by the Russians in Ukraine. The U.S. military's use of "just in time logistics," developed over decades of peacetime use where supplies are delivered exactly when and where needed in order to reduce the cost of inventories, will likely need to be replaced by a system that emphasizes resiliency over efficiency.

Nuclear weapons

The Russia-Ukraine war demonstrates that nuclear weapons remain the foundation of security for major powers and continue to be used in the conflict as both a deterrent and a tool of coercion. The reemergence of the importance of nuclear weapons in international conflict suggests that the United States needs a reinvigorated nuclear deterrent that is accompanied by new nuclear doctrine that takes into account trilateral nuclear deterrence, the possibility of "non-strategic" nuclear use, as well as non-nuclear attacks on one another's homelands that might encourage nuclear escalation.

IMPLICATIONS

U.S. wars since 1991 have been fought against opponents that were overmatched by the U.S. military's conventional capabilities. The Russia-Ukraine war, however, demonstrates that contemporary war between two more equal and motivated adversaries can be both protracted and intense. In total, the ten takeaways presented in this report demonstrate the need for the United States to counter China's military's preparations across the military, diplomatic, and economic domains. The evolution of the Russia-Ukraine war into a protracted and intense conflict can be attributed to the prominence of defensive technologies, the national will of the two adversaries, alliance systems, and the ability to muster resources. Improving U.S. capabilities across all four areas will require a Cold War-era focus to overcome the China military challenge. In short, the United States needs to be able to fight a protracted high-end conflict at the military and national levels. Moreover, preparing both the military and the nation to fight a protracted high-end conflict will add to U.S. deterrence efforts a whole-of-nation effort that can counter China's combined military and civil preparations. Much of this work is already being done, but more work remains.

Weapon systems

Future U.S. combat capabilities will need to be composed of systems that can operate over long distances, are numerous, and can deliver sufficient firepower either individually or as a group. Technologies that improve mobility have been traditionally been thought to favor the offense whereas technologies that improve firepower favor the defense.[193] However, given the long distances needing to be traveled for the U.S. military to engage PRC forces in a conflict over Taiwan, it is likely that the United States will require weapon systems that both increase firepower and improve mobility. In addition, the Russia-Ukraine war tells us that in order to form an effective defense, numbers matter. The U.S. military can no longer be composed of just a relatively small number of high-end platforms.

Ideally, this force could be composed of a "high-low" mix of higher end crewed systems and lower end uncrewed systems. For example, the U.S. Air Force plans to order at least 100 B-21s, its next generation stealth bomber, with the option to purchase as many as 145 of the

aircraft.[194] When armed with long-range precision strike weapons, this platform could more easily penetrate PRC air defense systems than its predecessors. The addition of up to 145 of the aircraft could potentially more than double the Air Force's current fleet of 140 bombers.[195] The U.S. Air Force has also announced the development of the F-47 sixth generation fighter that promises next-generation stealth and sensor fusion along with a range greater than 1,000 nautical miles that will also add to the service's mobility and firepower.[196]

On the lower end, the U.S. military's Replicator Initiative intends to deliver thousands of attritable autonomous systems to warfighters. The majority of UAVs used in the Russia-Ukraine have been small quadcopters. Although useful for operations in Taiwan, these platforms lack the range and capabilities that the U.S. military will need to traverse the long distances needed in a Taiwan scenario. The increased complexity required for uncrewed systems in a Taiwan mission, however, will likely result in fewer platforms being fielded in a Taiwan conflict than in the Russia-Ukraine war, limiting both their impact on the battlefield and cost savings.

Alliance systems

A hallmark of U.S. military operations since the 1991 Gulf War has been a reliance on coalition warfare. Given the long distances involved in conducting operations in the western Pacific that complicate both operations and logistics, allies and partners will play an essential role in supporting and potentially participating in U.S. operations. The United States will require both "places and bases" in the western Pacific from which to launch operations, maintain presence, and resupply. Fostering interoperability with allies and partners will also be important to break down organizational, cultural, political, and technological barriers that could impede operations.

Unlike the European theater, there are no regularized collective defense entities, such as NATO, in Asia. Efforts to enhance military cooperation with U.S. allies and partners are being implemented, however. In 2024, the United States announced that U.S. Forces Japan (USFJ) would be upgraded from a primarily administrative command to a joint force headquarters reporting to the Commander of the Indo-Pacific Command. The newly reformulated USFJ will facilitate interactions with Japan's Joint Operations Command, established in 2025.[197] The United States has also been deepening its partnership with the Philippines. In 2023, the United States and the Philippines announced plans to expand U.S. access to four new air bases, increasing to nine the number of sites available to the United States.[198] Security cooperation is also being enhanced between U.S. allies. Japan, for example has signed reciprocal access agreements with Australia, the United Kingdom, and the Philippines that enhance bilateral defense cooperation by facilitating the hosting of joint international military exercises and the process of bringing troops into each other's countries.[199]

Industrial capacity

U.S. wars fought since Vietnam have involved relatively little loss of life or equipment. A war between the United States and China, on the other hand, could involve large expenditures of weapons and equipment. The possibility of significant losses of weapons and equipment highlights the importance of creating an industrial base that can replace losses. According to the Center for Strategic and Budgetary Assessments (CSBA), based on their experience conducting dozens of exercises, expanding industrial production will achieve a greater likelihood of sustaining a

protracted war than the mere stockpiling of weapons. CSBA points out, however, that globalization has weakened the U.S. defense industrial base to such an extent that "the enabling conditions of U.S. industrial mobilization for World War II no longer exist."[200] After decades of downsizing and consolidation, the U.S. defense industrial base is now less diverse than during the Cold War even while the complexity of modern weapons makes them more difficult to manufacture.[201]

Attrition of personnel

The potential for significant losses of weapons and equipment in a conflict over Taiwan would also likely coincide with the loss of military personnel. Both Ukraine and Russia have been able to replace combat losses despite significant casualties. However, their efforts have been mainly focused on recruiting or conscripting for the infantry. In the case of Russia, this has even included recruiting convicts. A conflict over Taiwan, however, would primarily be an air and naval conflict that would result in the loss of highly trained and technologically competent personnel, like pilots, who are harder to replace than infantry. For example, fighter pilot training in the PLA Air Force can take up to four years while fighter pilot training in the U.S. Air Force can take up to five years.[202] Although training can be shortened to meet operational requirements, it will also result in lower skilled pilots entering into combat.

As a result, even if both countries were to sustain national will, significant losses of highly skilled personnel critical to maintaining the fight would threaten each country's ability to field a proficient force and could risk creating a "doom loop" in which replacing highly trained professionals with less skilled personnel would result in a compounding effect generating even more losses. Such a situation could disproportionately affect the U.S. military. While there is no indication of pilot shortages in the PLA, a 2025 report by the Mitchell Institute for Aerospace Studies found that the U.S. Air Force has a shortage of nearly 1,850 pilots, including 1,142 fighter pilot billets. The Mitchell Institute report concludes that "numbers matter—if an air force does not have enough experienced pilots in reserve, it reaches a tipping point where it begins to hemorrhage its forces and loses efficacy in combat, just as Germany and Japan experienced in WWII."[203]

Resiliency as deterrence

The inability of the U.S. military to sustain losses of weapons, equipment, and personnel removes a key aspect of deterrence: resiliency. The PRC leadership when deciding to go to war with the United States could conclude that even if the PLA suffers disproportionate combat losses, it could still inflict enough losses on the U.S. military to generate a war winning advantage. In this case, the U.S. military could be forced to try and achieve a quick victory at the beginning of the war, just as the Japanese attack on Pearl Harbor was intended to do. That attack failed to achieve its decisive intent, allowing U.S. superiority in personnel and industrial production to eventually defeat the Japanese military. Similarly, a failed decisive strike at the outset of a conflict against PLA forces would allow the PRC to marshal its industrial capacity and population to wear down the U.S. military.[204]

National will

The U.S. government will need to sensitize the American public to the possible costs and risks of peacetime competition and wartime conflict with China. A conflict with China could result in losses of ships and aircraft and their crews not seen since World War II. Preparing the American

public for the potential budgetary costs of preparing for a conflict with China and the potential for grave losses during conflict could entail measures that seek to educate Americans on why defending Taiwan matters.

Similarly, a well-armed and motivated Taiwan military able to prevent an invasion of the island and a Taiwan population that maintains the will to fight will be the primary factor that decides the outcome of a war with China over Taiwan. Both Taiwan and the United States have work to do in buttressing Taiwan against attack, however, including delivering weapons already purchased, solving recruitment shortfalls, and changing the culture of the Taiwan military.[205] In addition, the United States may want to encourage Taiwan to develop and employ capabilities to deliver early and shocking surprises to PLA initial entry forces so as to demonstrate early "wins" that can buttress popular support.

ENDNOTES

[1] Stavros Atlamazoglou, "The War in Ukraine is the World's First Drone War," *The National Interest*, December 25, 2024, https://nationalinterest.org/blog/buzz/war-ukraine-worlds-first-drone-war-214153.
[2] Sandra Erwin, "On National Security | Drawing Lessons from the First Commercial Space War," *Space News*, May 20, 2022, https://spacenews.com/on-national-security-drawing-lessons-from-the-first-commercial-space-war/.
[3] Yurii Shchyhol, "Vladimir Putin's Ukraine Invasion is the World's First Full-Scale Cyberwar," *Atlantic Council*, June 15, 2022, https://www.atlanticcouncil.org/blogs/ukrainealert/vladimir-putins-ukraine-invasion-is-the-worlds-first-full-scale-cyberwar/.
[4] *2022 National Defense Strategy, Nuclear Posture Review, and Missile Defense Review*, Department of Defense, October 27, 2022, p. 22, https://media.defense.gov/2022/Oct/27/2003103845/-1/-1/1/2022-NATIONAL-DEFENSE-STRATEGY-NPR-MDR.pdf.
[5] CIA Director William Burns on "Face the Nation with Margaret Brennan," *YouTube*, February 26, 2023, https://www.youtube.com/watch?v=HN4bgqKq2MU.
[6] Jim Garamone, "Milley Says Ukraine Has Leadership. Morale to Beat Russia," *Department of Defense*, April 21, 2023, https://www.defense.gov/News/News-Stories/Article/Article/3370802/milley-says-ukraine-has-leadership-morale-to-beat-russia/.
[7] Timothy R. Heath, Sale Lilly, and Eugeniu Han, *Can Taiwan Resist a Large-Scale Military Attack by China?*, RAND, June 27, 2023, https://www.rand.org/pubs/research_reports/RRA1658-1.html.
[8] Heath, Lilly, and Han, *Can Taiwan Resist a Large-Scale Military Attack by China?*.
[9] Julian E. Barnes, "Why the US Was Wrong About the Ukraine and Afghan War," *The New York Times*, March 24, 2022, https://www.nytimes.com/2022/03/24/us/politics/intelligence-agencies-ukraine-afghanistan.html.
[10] Charles K.S. Wu, Fang-Yu Chen, Yao-Yuan Yeh, "Public Support for Self-Defence in Taiwan: The Current State of Research," *Taiwan Politics*, November 17, 2023, https://taiwanpolitics.org/article/90278-public-support-for-self-defence-in-taiwan-the-current-state-of-research.
[11] Yingtai Lung, "In Taiwan, Friends are Starting to Turn Against Each Other," *The New York Times*, April 18, 23, https://www.nytimes.com/2023/04/18/opinion/taiwan-china-war-us.html.
[12] Austin Horng-En Wang, Charles K.S. Wu, Fan-Yu Chen, and Yao-Yuan Yeh, "What do People in Taiwan think of Their Military," *The Diplomat*, October 21, 2021, https://thediplomat.com/2021/10/what-do-people-in-taiwan-think-about-their-military/; Jimmy Chien, "Conversations with the Taiwanese About Taiwan's Defense," *Global Taiwan Institute*, November 1, 2023, https://globaltaiwan.org/2023/11/conversations-with-the-taiwanese-about-taiwans-defense/.
[13] John Dotson, "Taiwan Initiates Its New One-Year Military Conscription Program," *Global Taiwan Institute*, February 7, 2024, https://globaltaiwan.org/2024/02/taiwan-initiates-its-new-one-year-military-conscription-program/.
[14] Jimmy Chien, "Conversations with the Taiwanese About Taiwan's Defense," *Global Taiwan Institute*, November 1, 2023, https://globaltaiwan.org/2023/11/conversations-with-the-taiwanese-about-taiwans-defense/.
[15] Thomas Maresca, "In Taiwan, Citizens Train for a Chinese Invasion," *UPI*, April 5, 2023, https://www.upi.com/Top_News/World-News/2023/04/05/taiwan-Kuma-Academy-Taiwan-civil-defense-training-China-invasion/3671680721096/; Mehdi Chebil, "'People Don't Want To Talk About War' Taiwan Civil Defence Battles Invasion Risk Denial," *France 24*, November 1, 2024, https://www.france24.com/en/asia-pacific/20240111-people-don-t-want-to-talk-about-war-taiwan-civil-defence-battles-invasion-risk-denial.
[16] Patrick Ko, "Taiwan's Military Reform is Failing Where It Matters Most," *Defense News*, June 13, 2025, https://www.defensenews.com/opinion/2025/06/13/taiwans-military-reform-is-failing-where-it-matters-most/.
[17] Andrew E. Kramer, "'I am Still Dreaming It Will Stop': A Deadlocked War Tests Ukrainian Morale," *The New York Times*, November 5, 2023, https://www.nytimes.com/2023/11/05/world/europe/ukraine-war-morale.html.
[18] Hannah Arhirova and Samya Kullab, "Ukraine Lowers Its Conscription Age to 25 to Replenish Its Beleaguered Troops," *Associated Press*, April 3, 2024, https://apnews.com/article/russia-ukraine-war-conscription-mobilization-

251058a942a253f3eaec2c53373adf03 and Taras Kuzio, "Russia's War Against Ukraine in 2024 and Looking Ahead to 2025, Eurasia Daily Monitor, July 10, 2024, https://jamestown.org/program/russias-war-against-ukraine-in-2024-and-looking-ahead-to-2025/.

[19] Heath, Lilly, and Han, *Can Taiwan Resist a Large-Scale Military Attack by China?,* p. 64.

[20] "Russia," *PRB*, https://www.prb.org/international/geography/russia/.

[21] "Statement of General Christopher G. Cavoli, United States Army United States European Command, to the United States Senate Armed Services Committee," April 3, 2025, p. 2. https://www.armed-services.senate.gov/imo/media/doc/general_cavoli_opening_statements.pdf and Veronika Melkozerova, "Russian Army Had 70,000 Casualties in Past 2 Months, UK Reports," *Politico*, July 12, 2024, https://www.politico.eu/article/russia-army-lost-70k-soldiers-ukraine-war-uk-defense-ministry/.

[22] "China's Population Falls for a Third Consecutive Year," January 17, 2025, *Reuters*, https://www.reuters.com/world/china/chinas-population-falls-third-consecutive-year-2025-01-17/ and Farah Master, "China's Population Drops for Second Year, With Record Low Birth Rate," *Reuters*, January 17, 2024, https://www.reuters.com/world/china/chinas-population-drops-2nd-year-raises-long-term-growth-concerns-2024-01-17//.

[23] "Demographics of China," *Statistics Times*, February 4, 2025, https://statisticstimes.com/demographics/country/china-demographics.php

[24] Sarah Cahlan, Evan Hill, Imogen Piper, Isabelle Khurshudyan and Anastacia Galouchka, "Ukraine Has Captured More Than 200 Russian Soldiers in Kursk Offensive, Videos Show," *The Washington Post*, August 25, 2024, https://www.washingtonpost.com/world/2024/08/25/ukraine-kursk-offensive-russia-videos/.

[25] Nick Schifrin and Sarah Cutler, "Russia's ethnic minorities disproportionately die in the war in Ukraine," *PBS News Hour*, December 11, 2023, https://www.pbs.org/newshour/show/russias-ethnic-minorities-disproportionately-conscripted-to-fight-the-war-in-ukraine.

[26] Martin Fornusek, "Ukraine's 2024 Mortality Rate is 3 Times Higher Than Birth Rate, Data Shows," *The Kyiv Independent*, August 5, 2024, https://kyivindependent.com/ukraine-birth-rates/.

[27] Hannah Arhirova and Samya Kullab, "Ukraine Lowers Its Conscription Age to 25 to Replenish Its Beleaguered Troops," *Associated Press*, April 3, 2024, https://apnews.com/article/russia-ukraine-war-conscription-mobilization-251058a942a253f3eaec2c53373adf03.

[28] Elsa Court, "As US Pushes Ukraine to Lower Conscription Age, Why Won't Kyiv Draft Younger Men?," *The Kyiv Independent*, December 16, 2024, https://kyivindependent.com/as-us-pushes-for-ukraine-to-lower-draft-age-why-wont-ukraine-conscript-younger-men/.

[29] Alex Vershinin, "The Attritional Art of War: Lessons from the Russian War on Ukraine," *Royal United Services Institute*, March 18, 2024, https://www.rusi.org/explore-our-research/publications/commentary/attritional-art-war-lessons-russian-war-ukraine.

[30] Seth G. Jones, Riley McCabe, and Alexander Palmer, "Ukrainian Innovation in a War of Attrition," Center for Strategic and International Studies, February 2023, https://www.csis.org/analysis/ukrainian-innovation-war-attrition and Stacie Pettyjohn, Hannah Dennis, and Molly Campbell, Swarms over the Strait: Drone Warfare in a Future Fight to Defend Taiwan Center for New American Security, June 2024, p. 5, https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/Indo-Pacific-Drones_DEFENSE_2024-final.pdf.

[31] Vershinin, "The Attritional Art of War: Lessons from the Russian War on Ukraine."

[32] Michael Horowitz, "Battles of Precise Mass: Technology Is Remaking War-and America Must Adapt," *Foreign Affairs*, Vol. 103, No. 6 pp. 34-40.

[33] *Military and Security Developments Involving the People's Republic of China 2024*, Department of Defense, p. 30, https://media.defense.gov/2024/Dec/18/2003615520/-1/-1/0/MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA-2024.PDF and Kevin Pollpeter and Amanda Kerrigan, *The PLA and Intelligent Warfare: A Preliminary Analysis*, CNA/China Aerospace Studies Institute, October 2021, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Translations/2021-11-17%20Communique%20of%20the%20Fifth%20Plenary%20Session%20of%20the%2019th%20Central%20Committee%20of%20the%20Communist%20Party%20of%20China.pdf?ver=YsJuJy8mBmqG_jIadpcHcA%3d%3d.

[34] *Military and Security Developments Involving the People's Republic of China 2024*, p. 26, 55, 56, 62, and 82.

[35] "U.S. Indo-Pacific Command Posture," Statement of Admiral John C. Aquilino, U.S. Navy Commander, U.S. Indo-Pacific Command, March 18, 2024, p. 2, https://www.congress.gov/118/meeting/house/116960/witnesses/HHRG-118-AS00-Wstate-AquilinoJ-20240320.pdf.
[36] "2024 USAF & USSF Almanac: Equipment," *Air and Space Forces Magazine*, June 7, 2024, https://www.airandspaceforces.com/article/2024-usaf-ussf-almanac-equipment/ and The Military Balance, Institute for International and Strategic Studies, 2025, pp. 245-246.
[37] "About USINDOPACOM," United States Indo-Pacific Command, https://www.pacom.mil/about-usindopacom/.
[38] *Military and Security Developments Involving the People's Republic of China 2024*, pp. 59 and 60.
[39] *Military and Security Developments Involving the People's Republic of China 2024*, p. 48.
[40] US Navy website, "Mission Statement," https://www.navy.mil/About/Mission/.
[41] Mark F. Cancian, Matthew Cancian, and Eric Heginbotham, *The First Battle of the Next War: Wargaming a Chinese Invasion of Taiwan, Center for International and Strategic Studies*, January 2023, p. 88, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/230109_Cancian_FirstBattle_NextWar.pdf?VersionId=XlDrfCUHet8OZSOYW_9PWx3xtc0ScGHn.
[42] Cancian, Cancian, and Heginbotham, *The First Battle of the Next War*, p. 136.
[43] Seth Jones and Alexander Palmer, *Rebuilding the Arsenal of Democracy: The U.S. and Chinese Defense Industrial Bases in an Era of Great Power Competition*, Center for Strategic and International Studies, March 2024, p. 1, https://csis-website-prod.s3.amazonaws.com/s3fs-public/2024-03/240306_Jones_Rebuilding_Democracy_0.pdf?VersionId=KkuViuhUaxBPHB0nc_FtQ.qufXNOgxUj.
[44] Aquilino, "U.S. Indo-Pacific Command Posture," p. 2.
[45] Brad Lendon and Haley Britzky, "US Can't Keep Up With China's Warship Building, Navy Secretary Says," February 22, 2023, https://www.cnn.com/2023/02/22/asia/us-navy-chief-china-pla-advantages-intl-hnk-ml/index.html.
[46] Jones and Palmer, *Rebuilding the Arsenal of Democracy*, p. 24.
[47] Steven Kosiak, "Is the U.S. Military Getting Smaller and Older?," *Center for New American Security*, March 14, 2017, https://www.cnas.org/publications/reports/is-the-u-s-military-getting-smaller-and-older.
[48] Mark F. Cancian with Adam Saxton, Owen Helman, Lee Ann Bryan, and Nidal Morrison, *Industrial Mobilization Assessing Surge Capabilities, Wartime Risk, and System Brittleness*, December 2020, pp. 36-38, https://csis-website-prod.s3.amazonaws.com/s3fs-public/publication/210108_Cancian_Industrial_Mobilization.pdf.
[49] Seth G. Jones, "The U.S. Defense Industrial Base Is Not Prepared for a Possible Conflict with China," *Center for Strategic and International Studies*, https://features.csis.org/preparing-the-US-industrial-base-to-deter-conflict-with-China/.
[50] "Canada vs Russia: Economic Indicators Comparison," *Georank*, https://georank.org/economy/canada/russia#:~:text=Canada%20vs%20Russia%3A%20Economic%20Indicators,ranked%2011th%20with%20%241.7T.
[51] Thomas Friedman, *The World is Flat: A Brief History of the Twenty-first Century*, (New York: Farrar, Strous, and Giroux, 2005), p. 8
[52] "What are the Sanctions on Russia and Have They Affected Its Economy?," *BBC*, February 23, 2024, https://www.bbc.com/news/world-europe-60125659.
[53] Statement of General Christopher G. Cavoli, United States Army United States European Command, to the United States Senate Armed Services Committee, April 3, 2025, p. 4, https://www.armed-services.senate.gov/imo/media/doc/general_cavoli_opening_statements.pdf.
[54] Richard Connolly, "Russia's Wartime Economy Isn't as Weak as It Looks," *Royal United Services Institute*, January 22, 2025, https://www.rusi.org/explore-our-research/publications/commentary/russias-wartime-economy-isnt-weak-it-looks.
[55] Simone McCarthy, "NATO Allies Call China A 'Decisive Enabler' Of Russia in Ukraine War As Bloc Eyes Asia Security Threats," *CNN*, July 11, 2024, https://www.cnn.com/2024/07/11/china/nato-china-russia-ukraine-intl-hnk/index.html.

[56] "China-Russia Trade Has Surged as Countries Grow Closer," *Reuters*, March 1, 2022, https://www.reuters.com/markets/europe/china-russia-trade-has-surged-countries-grow-closer-2022-03-01/#:~:text=Exports%20of%20Russian%20oil%20and,2%20coal%20supplier%20in%202021; "China-Russia 2024 Trade Value Hits Record High – Chinese Customs," *Reuters*, January 13, 2025, https://www.reuters.com/markets/china-russia-2024-trade-value-hits-record-high-chinese-customs-2025-01-13/.
[57] Dan De Luce and Owen Hayes, "In Ukraine war, China is Helping Tilt Momentum in Russia's Favor, Top U.S. Spy Says," *NBC*, May 2, 2024, https://www.nbcnews.com/politics/national-security/china-helping-russia-momentum-ukraine-war-top-us-spy-rcna150437.
[58] De Luce and Hayes, "In Ukraine war, China is Helping Tilt Momentum in Russia's Favor, Top U.S. Spy Says."
[59] De Luce and Hayes, "In Ukraine war, China is Helping Tilt Momentum in Russia's Favor, Top U.S. Spy Says."
[60] Michael R. Gordon, Warren P. Strobel, and Alan Cullison, "China Has Helped Russia Boost Arms Production, U.S. Says; Beijing's Support is Helping Moscow at Critical Stage in its War in Ukraine, Officials Say, *Wall Street Journal*, April 12, 2024.
[61] Andrew Jones, "U.S. Sanctions Chinese Satellite Firm for Allegedly Supplying SAR imagery to Russia's Wagner Group," *Space News*, January 27, 2023, https://spacenews.com/u-s-sanctions-chinese-satellite-firm-for-allegedly-supplying-sar-imagery-to-russias-wagner-group/.
[62] Jim Garamone, "Pentagon Says 10K North Korean Troops in Kursk Oblast," *Department of Defense*, November 4, 2024, https://www.defense.gov/News/News-Stories/Article/Article/3955757/pentagon-says-10k-north-korean-troops-in-kursk-oblast/#:~:text=Pat%20Ryder%20also%20said%20officials,we%20cannot%20corroborate%20those%20reports.
[63] Dasl Yoon and Matthew Luxmore, "Satellite Images Show North Korea Boosting Arms Flow to Russia; Pyongyang is Producing and Sending More Arms to Russia for its war in Ukraine, Deepening Their Alliance and Giving Moscow More Battlefield Firepower," *Wall Street Journal*, December 23, 2024; https://apnews.com/article/north-korea-russia-ukraine-artillery-f16f8a95fc6b4314c52d4a9271c3632d; Yoonjung Seo and Sophie Tanno, "North Korea Believed To Have Exported Over 1 Million Shells to Russia," *CNN*, November 1, 2023, https://www.cnn.com/2023/11/01/asia/north-korea-one-million-shells-russia-ukraine-war/index.html; Howard Altman, "More North Korean Artillery Troops Heading To Russia: Ukraine Intel Chief," *The War Zone*, January 22, 2025, https://www.twz.com/news-features/more-north-korean-artillery-troops-heading-to-russia-ukraine-intel-chief.
[64] Yoon and Luxmore, "Satellite Images Show North Korea Boosting Arms Flow to Russia" and Daria Tarasova-Markina, Lauren Kent, Nick Paton Walsh and Victoria Butenko, "Ukraine Is Being Hit With a Surge of Attacks Using North Korean Missiles. Western Components Help Make It Possible," *CNN*, November 23, 2024, https://edition.cnn.com/2024/11/23/europe/ukraine-north-korean-missile-attacks-western-components-intl/index.html#:~:text=Russia%20has%20fired%20about%2060%20North%20Korean%20KN-23,attacks%20publicly%20acknowledged%20by%20Ukraine%E2%80%99s%20air%20force%20shows.
[65] "Ukraine Says Russia Launched 8,060 Iran-Developed Drones During War," *Reuters*, September 13, 2024, https://www.reuters.com/world/europe/ukraine-says-russia-launched-8060-iran-developed-drones-during-war-2024-09-13/.
[66] Benoit Faucon, Nicholas Bariyo, and Matthew Luxmoore, "The Russian Drone Plant That Could Shape the War in Ukraine; The Factory Uses Iranian Tech and has Hired a Workforce From East Africa, But is Now in Ukraine's Sights," *Wall Street Journal*, May 28, 2024.
[67] Faucon, Bariyo, and Luxmoore, "The Russian Drone Plant That Could Shape the War in Ukraine."
[68] "UN General Assembly Calls for Immediate End to War in Ukraine," *United Nations*, February 23, 2023, https://news.un.org/en/story/2023/02/1133847.
[69] Jagannath Panda, "Can India Advance Peace in Ukraine," Institute for Security and Policy Development, January 2025, https://www.isdp.eu/publication/can-india-advance-peace-in-ukraine/; Nidhi Verma, "India Surpasses China to Become Russia's Top Oil Buyer in July," *Reuters*, August 22, 2024, https://www.reuters.com/markets/commodities/india-surpasses-china-become-russias-top-oil-buyer-july-2024-08-22/.
[70] "Putin Remotely Attends BRICS Summit In South Africa While Facing War Crimes Warrant," *PBS News*, August 22, 2023, https://www.pbs.org/newshour/world/putin-remotely-attends-brics-summit-in-south-africa-while-facing-war-crimes-warrant.

[71] Kevin Yao and Ellen Zhang, "China Revises Up 2023 GDP, Sees Little Impact on 2024 Growth," *Reuters*, December 26, 2024, https://www.reuters.com/world/china/china-revises-up-2023-gdp-1773-trillion-2024-12-26/; United Nations Industrial Development Organization, *The Future of Industrialization*, https://mipforum.org/wp-content/uploads/2024/11/MIPF-Conference-Paper-FINAL-WEB.pdf, October 2024, p. 17.
[72] "ASEAN-China Economic Relation," Association of Southeast Asian Nations, https://asean.org/our-communities/economic-community/integration-with-global-economy/asean-china-economic-relation/; "News Analysis: Summit Injects Strong Momentum Into China-Africa Relations," *Xinhua*, September 10, 2024, https://2024focacsummit.mfa.gov.cn/eng/zpfh_1/202409/t20240910_11488045.htm#:~:text=China%20has%20been%20the%20largest,the%20whole%20world%2C%20observers%20say; and Diana Roy, "China's Growing Influence in Latin America," *Council on Foreign Relations*, January 10, 2025, https://www.cfr.org/backgrounder/china-influence-latin-america-argentina-brazil-venezuela-security-energy-bri.
[73] "China," European Commission, https://policy.trade.ec.europa.eu/eu-trade-relationships-country-and-region/countries-and-regions/china_en#:~:text=China%20is%20the%20EU's%20second,3.1%25%20and%2018%25%20respectively.
[74] "Diplomatic Allies," Republic of China Ministry of Foreign Affairs, https://en.mofa.gov.tw/AlliesIndex.aspx?n=1294&sms=1007 and "The One-China Principle is a Universally Recognized Basic Norm Governing International Relations," Embassy of the People's Republic of China in the Republic of the Philippines, March 19, 2024, http://ph.china-embassy.gov.cn/eng/sgdt/202403/t20240319_11262567.htm.
[75] Ngeow Chow Bing, "How Southeast Asia Might React in a Potential Military Conflict Over Taiwan," *Carnegie Endowment for International Peace*, June 17, 2024, https://carnegieendowment.org/research/2024/06/how-southeast-asia-might-react-in-a-potential-military-conflict-over-taiwan?lang=en.
[76] Jude Blanchette, Ryan Hass, and Lily McElwee, "Building International Support for Taiwan," *Center for International and Strategic Studies*, February 13, 2024, https://www.csis.org/analysis/building-international-support-taiwan.
[77] Jeffrey Reeves, "Southeast Asian States Have Their Own Views on the Ukraine War," *Asia Policy*, Vol. 18, No. 2, April 2023, p. 63, https://muse.jhu.edu/article/893909/pdf.
[78] Reeves, "Southeast Asian States Have Their Own Views on the Ukraine War," pp. 57-58.
[79] Reeves, "Southeast Asian States Have Their Own Views on the Ukraine War," p. 56.
[80] Jim Sciutto, "Exclusive: US Prepared 'Rigorously' For Potential Russian Nuclear Strike in Ukraine in Late 2022, Officials Say," *CNN*, March 9, 2024, https://www.cnn.com/2024/03/09/politics/us-prepared-rigorously-potential-russian-nuclear-strike-ukraine/index.html.
[81] Anna Chernova and Christian Edwards, "Putin Orders Tactical Nuclear Weapons Drills in Response to Western 'Threats'," *CNN*, May 7, 2024, https://www.cnn.com/2024/05/06/europe/putin-tactical-nuclear-weapon-drill-russia-ukraine-intl/index.html.
[82] David E. Sanger, *New Cold Wars: China's Rise, Russia's Invasion and America's Struggle to Defend the West*, (New York: Crown Publishing, 2024), p. 312.
[83] *Military and Security Developments Involving the People's Republic of China 2023*, p. 106.
[84] "China," Center for Arms Control and Non-Proliferation, https://armscontrolcenter.org/countries/china/.
[85] *Military and Security Developments Involving the People's Republic of China 2024*, pp. 107 and 109.
[86] Caitlin Talmadge, "The U.S.-China Nuclear Relationship: Growing Escalation Risks and Implications for the Future," Testimony before the U.S.-China Economic and Security Review Commission Hearing on China's Nuclear Forces, June 7, 2021, https://www.uscc.gov/sites/default/files/2021-06/Caitlin_Talmadge_Testimony.pdf and *Military and Security Developments Involving the People's Republic of China 2023*, Department of Defense, p. VIII and 109, https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF.
[87] "China Says it has Halted Arms-Control Talks with US Over Taiwan," *Reuters*, July 17. 2024, https://www.reuters.com/world/china/china-says-it-has-halted-arms-control-talks-with-us-over-taiwan-2024-07-17/.
[88] Joseph Khan, "Chinese General Threatens Use of A-Bombs if U.S. Intrudes," *The New York Times*, July 15, 2005, https://www.nytimes.com/2005/07/15/washington/world/chinese-general-threatens-use-of-abombs-if-us-intrudes.html.

[89] Khan, "Chinese General Threatens Use of A-Bombs if U.S. Intrudes."
[90] Julian Borger, Pippa Crerar, and Pjotr Sauer, "Biden Denounces Putin's Nuclear Threats as 'Reckless' in UN Address," *The Guardian*, September 21, 2022, https://www.theguardian.com/us-news/2022/sep/21/joe-biden-putin-nuclear-weapons-ukraine-un-general-assembly and John Hudson and Dan Lamothe, "Biden Shows Growing Appetite to Cross Putin's Red Lines," *The Washington Post*, June 1, 2023, https://www.washingtonpost.com/national-security/2023/06/01/ukraine-f-16s-biden-russia-escalation/.
[91] Bradley Martin, D. Sean Barnett, ands Devin McCarthy, "Russian Logistics and Sustainment Failures in the Ukraine Conflict," *RAND*, July 11, 2023, https://www.rand.org/pubs/research_reports/RRA2033-1.html.
[92] Paul Schwartz, Anya Fink, Julian Waller, Michael Kofman, *Russian Military Logistics in the Ukraine War: Recent Reforms and Wartime Operations*, CNA, September 2023, p. ii, https://www.cna.org/reports/2023/10/Russian-Military-Logistics-in-the-Ukraine-War.pdf.
[93] Schwartz, Fink, Waller, Kofman, *Russian Military Logistics in the Ukraine War: Recent Reforms and Wartime Operations*, pp. ii-iii and Devin McCarthy, "Russian Logistics and Sustainment Failures in the Ukraine Conflict," *RAND*, July 11, 2023, https://www.rand.org/pubs/research_reports/RRA2033-1.html; "HIMARS: Protecting Our Soldiers with Combat Proven Reliability," Lockheed Martin, https://www.lockheedmartin.com/en-us/products/himars.html.
[94] Schwartz, Fink, Waller, Kofman, *Russian Military Logistics in the Ukraine War*, p. iii.
[95] Nectar Gan, Eric Cheung, and Brad Lendon, "China Says Military Drills Encircling Taiwan Designed to Test Its Ability to 'Seize Power'," *CNN*, May 23, 2024, https://www.cnn.com/2024/05/23/asia/china-military-drills-taiwan-second-day-intl-hnk/index.html.
[96] Gan, Cheung, and Lendon, "China Starts 'Punishment' Military Drills Around Taiwan Days After Island Swears in New Leader."
[97] "Ukraine's Recovery, Poland's Opportunity: A Vision for Shared Growth," The Chancellery of the Prime Minister, Republic of Poland, July 10, 2025, https://www.gov.pl/web/primeminister/ukraines-recovery-polands-opportunity-a-vision-for-shared-growth.
[98] Mark F. Cancian, Matthew F. Cancian, Eric Heginbotham, "Lights Out? Wargaming a Chinese Blockade of Taiwan", July 2025, p. XII, https://csis-website-prod.s3.amazonaws.com/s3fs-public/2025-07/250730_Cancian_Taiwan_Blockade.pdf?VersionId=nr5Hn.RQ.yI2txNNukU7cyIR2QDF1oPp.
[99] Maximillian K. Bremer and Kelly A. Grieco, "The Four Tyrannies of Logistical Deterrence," *Stimson Center*, November 8, 2023, https://www.stimson.org/2023/the-four-tyrannies-of-logistical-deterrence/.
[100] Bremer and Grieco, "The Four Tyrannies of Logistical Deterrence."
[101]Phil Stewart and Idrees Ali, "How the US is Preparing for a Chinese Invasion of Taiwan," *Reuters*, January 31, 2024, https://www.reuters.com/world/china/logistics-war-how-washington-is-preparing-chinese-invasion-taiwan-2024-01-31/.
[102] Gabriel W. Pryor, "Logistics in the Indo-Pacific: Setting the Theater for a Conflict over Taiwan," US Army, February 1, 2024, https://www.army.mil/article/272919/logistics_in_the_indo_pacific_setting_the_theater_for_a_conflict_over_taiwan.
[103] "Ships of MSC," U.S. Navy Military Sealift Command, https://sealiftcommand.com/about-msc/ships-msc.
[104] Emma Salisbury, "Don't Protect the Merchant Marine – Promote It," *War on the Rocks*, January 27, 2025, https://warontherocks.com/2025/01/dont-protect-the-u-s-merchant-marine-promote-it/.
[105] Isabel van Brugen, "Every Russian Black Sea Ship Sunk or Disabled by Ukraine," *Newsweek*, April 1, 2024, https://www.newsweek.com/every-russian-black-sea-ship-sunk-damaged-ukraine-full-list-1884448.
[106] Kevin Shalvey, "Russia Launches 'Nightmare' Deadly Drone And Missile Strikes Across Ukraine, Kyiv Says," *ABC News*, August 26, 2024, https://abcnews.go.com/International/russian-launches-nightmare-deadly-drone-missile-strikes-ukraine/story?id=113144851.
[107] Sarah Cahlan and Jonathan Baran, "Ukraine's 'Operation Spiderweb' Hit at Least 12 Planes, Visuals Show," *The Washington Post*, June3, 2025, https://www.washingtonpost.com/investigations/2025/06/03/ukraine-attack-russian-bombers-damage/.
[108] David E. Sanger, *New Cold Wars: China's Rise, Russia's Invasion and America's Struggle to Defend the West*, (New York: Crown Publishing, 2024), p. 401.

[109] Kristen D. Thompson, "How the Drone War in Ukraine Is Transforming Conflict," *Council on Foreign Relations*, January 16, 2024, https://www.cfr.org/article/how-drone-war-ukraine-transforming-conflict.
[110] Jack Watling and Nick Reynolds, "Meatgrinder: Russian Tactics in the Second Year of Its Invasion of Ukraine," *Royal United Services Institute*, May 19, 2023, https://rusi.org/explore-our-research/publications/special-resources/meatgrinder-russian-tactics-second-year-its-invasion-ukraine.
[111] "Ukraine to Produce One Million Drones Next Year, Zelenskiy Says," *Reuters*, December 19, 2023, https://www.reuters.com/world/europe/ukraine-produce-one-million-drones-next-year-zelenskiy-says-2023-12-19/ and Volodymyr Zelenskyy "I Signed A Decree Initiating the Establishment of a Separate Branch Of Forces – the Unmanned Systems Forces – Address By The President Of Ukraine," https://www.president.gov.ua/en/news/pidpisav-ukaz-yakij-rozpochinaye-stvorennya-okremogo-rodu-si-88817.
[112] Ulrike Franke, "Drones in Ukraine and Beyond: Everything You Need to Know," *European Council on Foreign Relations*, August 11, 2023, https://ecfr.eu/article/drones-in-ukraine-and-beyond-everything-you-need-to-know/; Stacie Pettyjohn, Hannah Dennis, and Molly Campbell, *Swarms Over the Strait: Drone Warfare in a Future Fight to Defend Taiwan*, *Center for New American Security*, June 2024, p. 37, https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/Indo-Pacific-Drones_DEFENSE_2024-final.pdf.
[113] Thompson, "How the Drone War in Ukraine Is Transforming Conflict."
[114] Stacie Pettyjohn, Hannah Dennis, and Molly Campbell, *Swarms Over the Strait: Drone Warfare in a Future Fight to Defend Taiwan*, *Center for New American Security*, June 2024, p. 54, https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/Indo-Pacific-Drones_DEFENSE_2024-final.pdf.
[115] Josh Rogin, "The U.S. Military Plans A 'Hellscape' to Deter China from Attacking Taiwan," *Washington Post*, June 10, 2024, https://www.washingtonpost.com/opinions/2024/06/10/taiwan-china-hellscape-military-plan/.
[116] Yimou Lee, James Pomfret, and David Lague, "Inspired by Ukraine War, Taiwan Launches Drone Blitz To Counter China," *Reuters*, July 21, 2023, https://www.reuters.com/investigates/special-report/us-china-tech-taiwan/.
[117] *ROC National Defense Report 2023*, Republic of China Ministry of National Defense, September 2023, p. 137, https://www.ustaiwandefense.com/tdnswp/wp-content/uploads/2023/09/Taiwan-National-Defense-Report-2023.pdf.
[118] Pollpeter and Kerrigan, *The PLA and Intelligent Warfare: A Preliminary Analysis*.
[119] *Military and Security Developments Involving the People's Republic of China 2023*, p. 64.
[120] *Military and Security Developments Involving the People's Republic of China 2023*, p. 97.
[121] Dylan Malyasov, "China Places Massive Order for Kamikaze Drones," *Defence Blog*, December 22, 2024, https://defence-blog.com/china-places-massive-order-for-kamikaze-drones/?amp. Note that the representative reportedly referred to a contract with the PRC government, not the military, suggesting that the drones could be used for internal security and other nonmilitary uses.
[122] Peter Roberts interview with Juliana Suess, "The First Commercial Space War," This Means War, podcast audio, January 19, 2023, https://sites.libsyn.com/420071/the-first-commercial-space-war.
[123] Ronan Farrow, "Elon Musk's Shadow Rule," *The New Yorker*, August 21, 2023, https://www.newyorker.com/magazine/2023/08/28/elon-musks-shadow-rule.
[124] "KA-SAT Network Cyber Attack Overview," *Viasat*, March 30, 2022, https://news.viasat.com/blog/corporate/ka-sat-network-cyber-attack-overview.

[125] Christopher Miller, Mark Scott, and Bryan Bender, "UkraineX: How Elon Musk's Satellites Changed the War on the Ground," *Politico*, June 8, 2022, https://www.politico.eu/article/elon-musk-ukraine-starlink/.
[126] Alex Horton and Serhii Korolchuk, "Whatever the Fuss Over Elon Musk, Starlink Is Utterly Essential In Ukraine," *Washington Post*, September 18, 2023, https://www.washingtonpost.com/world/2023/09/08/elon-musk-starlink-ukraine-war/; Adam Satariano, Scott Reinhard, Cade Metz, Sheera Frenkel and Malika Khurana, "Elon Musk's Unmatched Power in the Star," *The New York Times*, July 28, 2023, https://www.nytimes.com/interactive/2023/07/28/business/starlink.html.
[127] Charlie Parker, "Specialist Ukrainian Drone Unit Picks Off Invading Russian Forces as They Sleep," *The Times*, March 18, 2022, https://www.thetimes.com/world/russia-ukraine-war/article/specialist-drone-unit-picks-off-invading-forces-as-they-sleep-zlx3dj7bb; Stacie Pettyjohn, "Evolution Not Revolution: Drone Warfare in Russia's 2022 Invasion of Ukraine," *Center for New American Security*, February 2024, https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNAS-Report-Defense-Ukraine-Drones-Final.pdf; Alex Horton and

Serhii Korolchuk, "Whatever the Fuss Over Elon Musk, Starlink Is Utterly Essential In Ukraine," *Washington Post*, September 18, 2023, https://www.washingtonpost.com/world/2023/09/08/elon-musk-starlink-ukraine-war/.
[128] Alex Horton and Serhii Korolchuk, "Whatever the Fuss Over Elon Musk, Starlink Is Utterly Essential in Ukraine," *Washington Post*, September 18, 2023, https://www.washingtonpost.com/world/2023/09/08/elon-musk-starlink-ukraine-war/.
[129] Tariq Malik, "Elon Musk Says Spacex Focusing on Cyber Defense After Starlink Signals Jammed Near Ukraine Conflict Areas," *Space.com*, March 5, 2022, https://www.space.com/elon-musk-spacex-starlink-cyber-defense-ukraine-invasion and Valerie Insinna, "Spacex Beating Russian Jamming Attack Was 'Eyewatering': DoD Official," *Breaking Defense*, April 20, 2022, https://breakingdefense.com/2022/04/spacex-beating-russian-jamming-attack-was-eyewatering-dod-official/.
[130] Thomas Withington, "Ukraine's Favorite Dish," *European Security and Defence*, May 30, 2023, https://euro-sd.com/2023/05/articles/30035/ukraines-favourite-dish/.
[131] Paul Mozur and Adam Satariano, "Russia, In New Push, Increasingly Disrupts Ukraine's Starlink Service," *The New York Times*, May 25, 2024, https://www.nytimes.com/2024/05/24/technology/ukraine-russia-starlink.html.
[132] Mozur and Satariano, "Russia, In New Push, Increasingly Disrupts Ukraine's Starlink Service."
[133] Andrew Jones, "China Launches First Satellites for Thousand Sails Megaconstellation," *SpaceNews*, August 26, 2024, https://spacenews.com/china-launches-first-satellites-for-thousand-sails-megaconstellation/.
[134] Larry Press, "Two New Chinese Internet Service Constellations and Their Market," *CircleID*, June 5, 2024, https://circleid.com/posts/20240605-two-new-chinese-internet-service-constellations-and-their-market.
[135] Andrew Jones, "China to Launch First Satellites for Megaconstellation in August," *SpaceNews*, June 27, 2024, https://spacenews.com/china-to-launch-first-satellites-for-megaconstellation-in-august/.
[136] "Taiwan Teams Up with SES To Boost Digital Resilience," *Taipei Times*, Aug. 04, 2023, https://www.taipeitimes.com/News/front/archives/2023/08/04/2003804212 and "Chunghwa Telecom selects Eutelsat OneWeb for Low Earth Orbit (LEO) satellite services," Eutelsat OneWeb, (Nov. 15, 2023), https://oneweb.net/resources/chunghwa-telecom-selects-eutelsat-oneweb-low-earth-orbit-leo-satellite-services.
[137] "TASA to Launch Six Satellites from 2026," *Taipei Times*, May 13, 2024, https://www.taipeitimes.com/News/front/archives/2024/05/13/2003817776.
[138] David A. Deptula and Christopher J. Bowie, "The Significance of Air Superiority." p. 3.
[139] Herbert Bowsher, "Air Denial Lessons from Ukraine," *US Naval Institute Proceedings*, September 2023, Vol. 149, No. 9, https://www.usni.org/magazines/proceedings/2023/september/air-denial-lessons-ukraine.
[140] Bowsher, "Air Denial Lessons from Ukraine."
[141] "The Commander-In-Chief of Ukraine's Armed Forces on How to Win the War," *The Economist*, November 1, 2023, https://www.economist.com/by-invitation/2023/11/01/the-commander-in-chief-of-ukraines-armed-forces-on-how-to-win-the-war.
[142] Franz-Stefan Gady and Michael Kofman, "Making Attrition Work: A Viable Theory of Victory for Ukraine," Institute for International Strategic Studies, February 9, 2024, https://www.iiss.org/en/online-analysis/survival-online/2024/01/making-attrition-work-a-viable-theory-of-victory-for-ukraine/.
[143] Maximilian K. Bremer and Kelly A. Grieco, "Assumption Testing: Airpower is Inherently Offensive," The Stimson Center, January 25, 2023, https://www.stimson.org/2023/assumption-testing-is-airpower-inherently-offensive/.
[144] Maximilian K. Bremer and Kelly A. Grieco, "In Denial About Denial: Why Ukraine's Air Success Should Worry the West," *War on the Rocks*, June 15, 2022, https://warontherocks.com/2022/06/in-denial-about-denial-why-ukraines-air-success-should-worry-the-west/.
[145] Gady and Kofman, "Making Attrition Work."
[146] *Military and Security Developments Involving the People's Republic of China 2024*, p. 87.
[147] "HQ-9 (Hong Qi 9) Chinese 8x8 Long-Range Air Defense Missile," US Army Training and Doctrine Command, Systemhttps://odin.tradoc.army.mil/WEG/Asset/HQ-9_.
[148] *Military and Security Developments Involving the People's Republic of China 2024*, p. 62.
[149] *Military and Security Developments Involving the People's Republic of China 2024*, p. 87.
[150] *Military and Security Developments Involving the People's Republic of China 2024*, p. 46.

[151] Joshua Rovner, "Warfighting in Cyberspace," *War on the Rocks*, March 17, 2021, https://warontherocks.com/2021/03/warfighting-in-cyberspace/ and Jan Kallberg, "Strategic Cyberwar Theory - A Foundation for Designing Decisive Strategic Cyber Operations," *The Cyber Defense Review*, Vol. 1, No. 1 (SPRING 2016), pp. 113-128 (16 pages).
[152] Rovner**, "**Warfighting in Cyberspace."
[153] *Annual Threat Assessment of the US Intelligence Community*, Office of the Director of National Intelligence, March 2025, pp. 19 and 21, https://www.dni.gov/index.php/newsroom/reports-publications/reports-publications-2025/4058-2025-annual-threat-assessment.
[154] Mike McQuade, "The Untold Story of NotPetya, the Most Devastating Cyberattack in History," *Wired*, August 22, 2018, https://www.wired.com/story/notpetya-cyberattack-ukraine-russia-code-crashed-the-world/.
[155] McQuade, "The Untold Story of NotPetya, the Most Devastating Cyberattack in History."
[156] McQuade, "The Untold Story of NotPetya, the Most Devastating Cyberattack in History."
[157] Patrick Howell O'Neill, "Russia Hacked an American Satellites Company One Hour Before the Ukraine Invasion," *MIT Technology Review*, May 10, 2022, https://www.technologyreview.com/2022/05/10/1051973/russia-hack-viasat-satellite-ukraine-invasion/; Shaun Waterman, "Hackers Attacked Satellite Terminals Through Management Network, Viasat Officials Say," *Air and Space Forces Magazine*, March 24, 2022, https://www.airandspaceforces.com/hackers-attacked-satellite-terminals-through-management-network-viasat-officials-say/.
[158] David Kirichenko, "Lessons from The First Cyber War: How Supporting Ukraine on the Digital Battlefield Can Help Improve the UK's Online Resilience," *Henry Jackson Society*, February 2024, https://henryjacksonsociety.org/wp-content/uploads/2024/02/Lessons-from-the-First-Cyberwar-by-Kirichenko.pdf; Jenna McLaughlin, "Ukraine Says Government Websites and Banks Were Hit With Denial Of Service Attack," *National Public Radio*, February 15, 2022, https://www.npr.org/2022/02/15/1080876311/ukraine-hack-denial-of-service-attack-defense.
[159] Gavin Wilde, "Cyber Operations in Ukraine: Russia's Unmet Expectations," *Carnegie Endowment for International Peace*," December 12, 2022, https://carnegieendowment.org/research/2022/12/cyber-operations-in-ukraine-russias-unmet-expectations?lang=en.
[160] Brad Smith, "Defending Ukraine: Early Lessons from the Cyber War," *Microsoft*, June 22, 2022, https://blogs.microsoft.com/on-the-issues/2022/06/22/defending-ukraine-early-lessons-from-the-cyber-war/.
[161] David E. Sanger, *New Cold Wars*, pp. 237-240.
[162] David Kirichenko, "Lessons from The First Cyber War: How Supporting Ukraine on the Digital Battlefield Can Help Improve the UK's Online Resilience," *Henry Jackson Society*, February 2024, https://henryjacksonsociety.org/wp-content/uploads/2024/02/Lessons-from-the-First-Cyberwar-by-Kirichenko.pdf; Brad Smith, "Defending Ukraine: Early Lessons from the Cyber War," *Microsoft*, June 22, 2022, https://blogs.microsoft.com/on-the-issues/2022/06/22/defending-ukraine-early-lessons-from-the-cyber-war/.
[163] Grace B. Mueller, Benjamin Jensen, Brandon Valeriano, Ryan C. Maness, and Jose M. Macias, "Cyber Operations During the Russo-Ukrainian War, *Center for International and Strategic Studies*, July 13, 2023, https://www.csis.org/analysis/cyber-operations-during-russo-ukrainian-war.
[164] *Military and Security Developments Involving the People's Republic of China 2024*, pp. 95-96.
[165] *Annual Threat Assessment of the US Intelligence Community*, Office of the Director of National Intelligence, March 2025, pp. 9 and 11, https://www.dni.gov/index.php/newsroom/reports-publications/reports-publications-2025/4058-2025-annual-threat-assessment.
[166] *Annual Threat Assessment of the US Intelligence Community*, pp. 9 and 11.
[167] "PRC State-Sponsored Actors Compromise and Maintain Persistent Access to U.S. Critical Infrastructure," Cybersecurity and Infrastructure Security Agency, February 7, 2024, https://www.cisa.gov/news-events/cybersecurity-advisories/aa24-038a.
[168] *Military and Security Developments Involving the People's Republic of China 2024*, p. 95-96.
[169] *Annual Threat Assessment of the US Intelligence Community*, p. 12.
[170] *Military and Security Developments Involving the People's Republic of China 2024*, p. 93.

[171] Hal Brands and Michael Beckley, "Getting Ready for a Long War: Why a US-China Fight in the Western Pacific Won't End Quickly," *American Enterprise Institute*, https://www.defendingtaiwan.com/getting-ready-for-a-long-war-why-a-us-china-fight-in-the-western-pacific-wont-end-quickly/.
[172] Brands and Beckley, "Getting Ready for a Long War."
[173] Brands and Beckley, "Getting Ready for a Long War."
[174] "Ambassador Zheng Zeguang: The Taiwan Question Is At The Core Of China's Core Interests," Embassy of the People's Republic of China in the United Kingdom of Great Britain and Northern Island, January 24, 2024, http://gb.china-embassy.gov.cn/eng/dshdjjh/202401/t20240125_11232668.htm; John Culver and Ryan Hass, "Understanding Beijing's Motives Regarding Taiwan, and America's Role: A 35-Year CIA Officer's View," Brookings Institution, March 30, 2021, https://www.brookings.edu/articles/understanding-beijings-motives-regarding-taiwan-and-americas-role/; Hal Brands and Michael Beckley, "Getting Ready for a Long War: Why a US-China Fight in the Western Pacific Won't End Quickly," *American Enterprise Institute*, https://www.defendingtaiwan.com/getting-ready-for-a-long-war-why-a-us-china-fight-in-the-western-pacific-wont-end-quickly/.
[175] Brands and Beckley, "Getting Ready for a Long War."
[176] Chris Gordon, "Allvin: Air Force Needs 'High-End Penetrating Capability' in Future Combat, *Air & Space Forces Magazine*, March 18, 2025, https://www.airandspaceforces.com/allvin-air-force-high-end-penetrating-capability/?src=dr.
[177] Tirpak, "Wargames Show Air Force Isn't Accelerating Fast Enough, Hinote Says."
[178] John A. Tirpak, "Air Force Wants to Cut 421 Old Fighters, Buy 304 New Ones;" Peter Porkka and Vilho Rantanen, "Windows, Not Walls;" Deptula and Bowie, "The Significance of Air Superiority;" and Tirpak, "Wargames Show Air Force Isn't Accelerating Fast Enough, Hinote Says"; Chris Gordon, "Allvin: Air Force Needs 'High-End Penetrating Capability' in Future Combat, *Air & Space Forces Magazine*, March 18, 2025, https://www.airandspaceforces.com/allvin-air-force-high-end-penetrating-capability/?src=dr.
[179] Sandra Erwin, "Russia, China Target SpaceX's Starlink in Escalating Space Electronic Warfare," *Space News*, April 3, 2025, https://spacenews.com/russia-china-target-spacexs-starlink-in-escalating-space-electronic-warfare/.
[180] Brad Dress, "US General Says Russian Army Has Grown by 15 Percent Since Pre-Ukraine War," *The Hill*, April 11, 2024, https://thehill.com/policy/defense/4589095-russian-army-grown-ukraine-war-us-general/.
[181] Pietro Bomprezzi, Daniel Cherepinskiy, Giuseppe Irto, Ivan Kharitonov, Taro Nishikawa, and Christoph Trebesch, "Ukraine Support After Three Years of War: Aid Remains Low But Steady and There is a Shift Toward Weapons Procurement," *Kiel Institute*, p. 4, https://www.ifw-kiel.de/fileadmin/Dateiverwaltung/Subject_Dossiers_Topics/Ukraine/Ukraine_Support_Tracker/3rd_Aniv_Report.pdf/.
[182] Statement of Admiral Samuel J. Paparo Commander, U.S. Indo-Pacific Command
U.S. Indo-Pacific Command Posture April 2025 to the Senate Armed Services Committee, pp. 4-5, https://www.armed-services.senate.gov/imo/media/doc/testimony_of_adm_paparo.pdf.
[183] Lulu Garcia-Navarro, "The Interview: The Head of NATO Thinks Trump 'Deserves All the Praise,'" *The New York Times*, July 5, 2025, https://www.nytimes.com/2025/07/05/magazine/mark-rutte-interview.html.
[184] Anthony Kuhn, "Concerns Mount as Russia and North Korea Commit to a Mutual Defense Pact," *NPR*, June 20, 2024, https://www.npr.org/2024/06/20/nx-s1-5011604/leaders-of-russia-and-north-korea-sign-pact-indicating-a-deeper-cooperation.
[185] Stacie Pettyjohn, "Evolution Not Revolution: Drone Warfare in Russia's 2022 Invasion of Ukraine."
[186] Marc Santora, Lara Jakes, Andrew E. Kramer, Marco Hernandez and Liubov Sholudko, "A Thousand Snipers in the Sky: The New War in Ukraine," *The New York Times*, March 3, 2025, https://www.nytimes.com/interactive/2025/03/03/world/europe/ukraine-russia-war-drones-deaths.html.
[187] "Operation Desert Storm: Early Assessment Performance of Bradley and Abrams," US General Accounting Office, January 1992, p. 4, https://www.gao.gov/assets/nsiad-92-94.pdf.
[188] Siobhán O'Grady, Kostiantyn Khudov and Serhii Korolchuk, "Ukraine scrambles to overcome Russia's edge in fiber-optic drones," *The Washington Post*, May 23, 2025, https://www.washingtonpost.com/world/2025/05/23/ukraine-russia-drones-fiberoptic-jamming/.

[189] David Kirichenko, "Sea Drones Helping Ukraine Win the Battle of the Black Sea," *Geopolitical Monitor*, October 31, 2024, https://www.geopoliticalmonitor.com/sea-drones-helping-ukraine-win-the-battle-of-the-black-sea/.
[190] Thomas New Dick, "What Ukraine's Unprecedented Drone Attack Means for Russia's Bomber Force," *The War Zone*, June 2, 2025, https://www.twz.com/air/what-ukraines-unprecedented-drone-attack-means-for-russian-bomber-force.
[191] David T. Burbach, "Early Lessons from the Russia-Ukraine War as a Space Conflict," *Atlantic Council*, August 30, 2022, https://www.atlanticcouncil.org/content-series/airpower-after-ukraine/early-lessons-from-the-russia-ukraine-war-as-a-space-conflict/.
[192] *Military and Security Developments Involving the People's Republic of China 2024*, p. 93.
[193] Charles L. Glaser and Chaim Kaufmann, "What Is the Offense-Defense Balance and Can We Measure It?" *International Security*, Vol. 22, No. 4 (Spring 1998), p. 62.
[194] John A. Tirpak, "More B-21s May Be Necessary If B-52J Upgrade Goes Awry, Allvin Says," *Air and Space Forces Magazine*, May 21, 2025, https://www.airandspaceforces.com/allvin-more-b-21s-may-be-necessary-b-52j-upgrade-goes-awry/.
[195] John A. Tirpak, "New B-52 Radar Program Has Nunn-McCurdy Cost Breach, May Be Reduced in Scope," *Air and Space Forces Magazine*, May 8, 2025, https://www.airandspaceforces.com/new-b-52-radar-cost-breach/#:~:text=A%20low%2Drate%20initial%20production,and%20evaluation%20in%20fiscal%202028; Harrison Kass, "Why the U.S. Air Force Now Only Has 19 B-2 Spirit Bombers," *The National Interest*, May 14, 2024, https://nationalinterest.org/blog/buzz/why-us-air-force-now-only-has-19-b-2-spirit-bombers-210999; Peter Suciu, "How Many Bombers Does the U.S. Air Force Have?," *The National Interest*, December 16, 2023, "https://nationalinterest.org/blog/buzz/how-many-bombers-does-us-air-force-have-207991.
[196] John A. Tirpak, "Air Force Chief: How the New F-47 Will Improve on the F-22," *Air and Space Forces Magazine*, March 21, 2025, https://www.airandspaceforces.com/new-f-47-f-22-allvin/; Tyler Rogoway, "F-47 Now Has an Officially Stated Combat Radius of 1,000+ Nautical Miles," *The War Zone*, May 13, 2025, https://www.twz.com/air/f-47-now-has-an-officially-stated-combat-radius-of-1000-nautical-miles.
[197] Matthew Olay, "Defense Secretary Announces US Forces Japan's Upgrade to Joint Force Command," *Defense Department News*, March 30, 2025, https://www.defense.gov/News/News-Stories/Article/Article/4139213/defense-secretary-announces-us-forces-japans-upgrade-to-joint-force-command/.
[198] "Philippines, U.S. Announce Locations of Four New EDCA Sites," US Department of Defense, April 3, 2023, https://www.defense.gov/News/Releases/Release/article/3349257/philippines-us-announce-locations-of-four-new-edca-sites/.
[199] "Signing of the Japan-Philippines Reciprocal Access Agreement," Ministry of Foreign Affairs of Japan, July 8, 2024, https://www.mofa.go.jp/s_sa/sea2/ph/pageite_000001_00432.html; "Australia-Japan Reciprocal Access Agreement," Australian Government, https://www.defence.gov.au/defence-activities/programs-initiatives/australia-japan-reciprocal-access-agreement.
[200] Tyler Hacker, "What If Our Assumptions About a War with China Are Wrong?," *Modern War Institute*, May 20, 2025, https://mwi.westpoint.edu/what-if-our-assumptions-about-a-war-with-china-are-wrong/.
[201] Office of the Under Secretary of Defense for Acquisition and Sustainment, "State-of-Competition-Within-the-Defense-Industrial-Base," February 2022, https://media.defense.gov/2022/feb/15/2002939087/-1/-1/1/state-of-competition-within-the-defense-industrial-base.pdf; Megan Eckstein, "Supplier bottlenecks threaten US Navy effort to grow arms stockpiles," *Defense News*, February 6, 2024, https://www.defensenews.com/naval/2024/02/06/supplier-bottlenecks-threaten-us-navy-effort-to-grow-arms-stockpiles/.
[202] Derek Solen, "Modernization of Fighter Pilot Training in the PLA Air Force Proceeds Apace," *China Aerospace Studies Institute*, November 18, 2024, https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLAAF/2024-11-18%20Modernization%20of%20Fighter%20Pilot%20Training%20in%20PLAAF%20Proceeds%20Apace.pdf?ver=UohKp62x8xot-laygKRXCg%3d%3d.

[203] Heather R. Penney, *Want Combat Power? The Fix the Air Force Pilot Crisis*, Mitchell Institute for Aerospace Studies, January 2025, p. 3, https://www.mitchellaerospacepower.org/app/uploads/2025/02/Want-Combat-Airpower-FINAL.pdf.
[204] Aaron MacLean, "Ep 221: Joel Wuthnow and Phillip Saunders on China's PLA," *School of War*, August 12, 2025, podcast, https://open.spotify.com/episode/0mvNoSzn4ml03KjYRduLn5.
[205] Yuster Yu and Michael A. Hunzeker, "Taiwan's Biggest Problem in Steeling Itself for War with China is Cultural," *War on the Rocks*, April 16, 2025, https://warontherocks.com/2025/04/taiwans-biggest-problem-in-steeling-itself-for-war-with-china-is-cultural/.