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China's recent military growth challenges the dominance of the United States military during a time of great power competition. A comparison of key military production sectors, shipbuilding, aviation, and missile production, allow comparison of the current military-industrial complexes and facilitate projection of future growth and its impact on the balance of power. Identifying and addressing future force strength gaps via relationships with current and potential partner nations can aid in maintaining the strategic advantage.

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MASTER OF MILITARY STUDIES

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SUBMITTED IN PARTIAL FULFILLMENT
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## Executive Summary

**Title:** Countering China's Rapid Military Growth Via Increased Partner Nation Export Sales and Efficient Divestment of Legacy Assets

**Author:** Major Vincent Teixeira, United States Marine Corps

**Thesis:** While China's recent industrial growth raises significant concern over the potential for surpassing American military strength, the United States maintains a significant advantage in key military production sectors. If current production and spending trends continue, the United States should offset the shrinking gap through increased exports of both new systems and sale of aging assets to allies.

**Discussion:** Over the last decade, the United States increased attention on the competition with China in the Western Pacific region. This increased competition encompasses all aspects of national power, though specific instruction to the United States Department of Defense drew extra scrutiny. One primary aspect of the perceived Chinese threat is their recent military modernization and reorganization combined with significant production increases in the last decade raising concerns over the United States' current and future military superiority in the region. Much attention in the national security documents regarding China focuses on their remarkable recent economic growth, mirrored by their capacity to produce large quantities of modern military systems. China's newly strengthened military-industrial complex gives rise to an American military perception that it is no longer the sole remaining superpower and cannot rely upon numerical superiority alone for victory. An analysis of current force strengths as well as projected industrial production capacity provides a more accurate assessment of the future combat power comparison during great power competition with China.

**Conclusion:** China continues to close the gap with the United States in available military power, but the United States maintains a numerical and technological advantage in several key sectors. Unable to rely solely upon increased funding to purchase guaranteed numerical superiority in remaining sectors, the United States must foster the growth of partner nations using existing manufacturing capabilities or sale of legacy equipment while simultaneously avoid wasting crucial resources and time on military equipment designed to fight previous wars.

DISCLAIMER

THE OPINIONS AND CONCLUSIONS EXPRESSED HEREIN ARE THOSE OF THE INDIVIDUAL STUDENT AUTHOR AND DO NOT NECESSARILY REPRESENT THE VIEWS OF EITHER THE MARINE CORPS COMMAND AND STAFF COLLEGE OR ANY OTHER GOVERNMENTAL AGENCY. REFERENCES TO THIS STUDY SHOULD INCLUDE THE FOREGOING STATEMENT.

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## Preface

As the military "pivots to the Pacific" following a nearly twenty-year fight in the Middle East, the community at large struggles with refocusing on a near-peer threat like that which dominated military thinking during the Cold War. One of the most common myths or rumors that we hear is that China is already out-producing American military growth across the board and their accession to the top of the proverbial mountain is imminent. Being privy to such thinking has often made me wonder how imminent this threat is and what if anything can the United States do to slow or prevent losing the lead. Presented with the opportunity to conduct my own research and offer recommendations, I wanted to confirm or deny the pessimistic rumors and understand what if any options were available to the United States to alter or simply maintain the current balance of power.

First and foremost, none of this would have been possible without the support of my incredible wife, Jessica, who not only supported me throughout the many hours of research, analysis, and writing to compile this paper, but also by being the driving force in caring for our newborn daughter throughout this academic year. Completing the research and gleaning applicable recommendations from the findings would not have been possible without the additional support provided by faculty at Marine Corps University. Dr. Eric Shibuya provided vital steers during the early stages of research to help determine useful indicators that could be quantified and researched as representative of the overall military-industrial complex. I would also like to acknowledge Dr. James Joyner for his insight into the multi-layered takeaways that could be gleaned from this national level concept and prevented me from limiting my thinking to that of a standard field grade officer. Additionally, I would like to recognize the many officers at Marine Corps Warfighting Laboratory for the opportunity to participate in a detailed wargame that helped determine what the most valuable military sectors would likely be in the next war, without which I would not have been able to narrow down the most applicable production sectors for research.

# Countering China's Rapid Military Growth Via Increased Partner Nation Export Sales and Efficient Divestment of Legacy Assets

## Introduction

Recent national strategic guidance directed national focus to shift from the previous European and Middle East theaters to the emerging threat posed by China, referencing its military growth and potential to challenge the United States' military dominance. The relationship between the United States and China is reminiscent of the Cold War as both parties compete through military buildup, global posturing, and economic pressure without resorting to traditional armed conflict. Both nations seek regional diplomatic and economic advantages while increasing the size and capability of their respective military forces. The United States seeks to counter China's military growth and increasing global influence while ideally avoiding escalation from competition to war. However, as with the Cold War, military strength plays a significant role in the posturing of both sides and directly affects the ability of either to influence the adversary and third parties in the region. Both China and the United States operate with differing levels of control over their respective private sectors. Each nation utilizes specialized companies to produce aircraft and warships that have excess capacity typically utilized for commercial products, though the level of flexibility and ability to surge production of purely military goods varies greatly. However, should armed conflict erupt, either or both nations could divert private sector production capacity to produce additional military goods essential to an ongoing conflict. Relative balance of power assessments during this competition phase focus on long-term trends and the potential for military dominance to shift between nations during peaceful competition. While China's recent industrial growth raises significant concern over the potential for surpassing American military strength, the United States maintains a significant

advantage in key military production sectors. If current production and spending trends continue, the United States should offset the shrinking gap through increased exports of new systems, sale of aging assets to allies, and maximizing efficiency of new procurement projects.

An initial assessment of each nation's military spending both as an absolute and percentage of Gross Domestic Product (GDP) aids in determining the accuracy of using recent production data to project future growth. Each nation's GDP and the relative percentage spent on their respective defense industry is a well-documented statistic for most global powers, including China and the United States. While GDP provides a numerical value for comparison of national economic power and government priorities, it does not directly translate into military hardware quantities, and therefore additional, more detailed production metrics should be considered.[1] In addition to dedicated military production facilities, both nations possess additional civilian sector industrial capacity that could be mobilized in support of war to amplify peacetime production numbers. While both countries are currently engaged in economic competition across multiple sectors, including military production, they are more accurately mobilized for great power competition across the spectrum of national power, vice mobilized for war as seen in World War II. Neither country officially releases their production rates for key military systems, but comparing force strength over time for several key, quantifiable systems identifies average production rates by which national industrial capacity can be measured.

For this assessment, three major industries will be analyzed to assess military production: naval shipbuilding, aircraft production, and ballistic and cruise missile manufacturing. Not only do these three industries provide quantifiable data for calculating and comparing production rates, but they will be valuable during any conflict between the United States and China. Annual peacetime inventory growth within each sector provides quantifiable production rates for each

nation, allowing for average recent rates depending upon system as well as projection of most likely future trends. Where applicable, known export production are added to the domestic production quantities since resident production capacity is independent of eventual destination. Additionally, export sales are applicable since allies are likely expected to participate directly or indirectly in any future armed conflict. Production rates incorporating both domestic and export quantities provide the most accurate assessment of peacetime production capacity, from which future trends and resulting force strength gaps are assessed.

## Military Spending Comparison

Relative national power comparisons are often based on GDP which compares resources available to spend but not actual strength.[2] Actual national military budgets, either absolute or as a percentage of GDP, provide more accurate assessments of relative military strength and potential. Analysts from government agencies and think tanks rely heavily on GDP and government budget information to assess current military strength as well as future trends. A Center for Strategic and International Studies (CSIS) assessment of Chinese economics estimated the 2017 GDP at $11.94 trillion, which trailed the United States by approximately $8 trillion in the same year.[3] While this shows China trailing the United States in economic power, China maintained a GDP growth rate of more than 6.5% per year since 2000. This growth rate leads analysts to predict that China will surpass the United States within the next decade.[4] Total GDP only measures a nation's total capacity to spend, which in this case demonstrates China's increasing economic spending power. China's increasing GDP and military budget do not establish military dominance yet and must be paired with budget allocations and manufacturing output to quantify their future military production capacity.

Gross Domestic Product assessments represent national economic power or capacity, but do not provide insight into current military power or future growth until they are translated into actual defense spending. In 2020, the Office of the Secretary of Defense (OSD) estimated that the Chinese military budget in 2019 was $174 billion (1.3% of GDP), a 6.2% rise from the previous year. This growth continued a twenty-year trend of increased annual defense spending by China, which resulted in their budget more than doubling between 2010 and 2019.[5] Meanwhile, the United States' military budget still dwarfs China's with a recent approval for $686 billion in 2019, but has steadily declined by more than 15% over the past decade.[6] This trend implies that Chinese military spending and therefore purchase and production of military hardware will continue increasing while the United States' production rate over the same period remains static or declines. Based on this spending trend, United States production rate will likely remain static while Chinese production maintains its current growth unless escalating to armed conflict, in which case the United States' higher GDP will translate to more available resources for surging capacity to support mobilization. Sources differ on China's exact annual defense budget since the government's official budget omits many defense-related expenditures.[7] Likewise, the United States' declining budget could still provide static military production if funds are allocated to production of existing systems over research and development of new weapons. This uncertainty makes GDP and defense budget information useful for trend analysis though it cannot be directly translated into individual items. The trend assumptions made to facilitate this analysis would require additional research to confirm as well as constant revision to match the changing budgets, economic performance, and military strategies of both nations.

Gross domestic product comparisons between China and the United States do not translate into actual production rates or capacity of military hardware since defense spending can

be allocated to many different projects, which will each have different unit costs, especially when comparing between dissimilar nations. Instead, these numbers facilitate estimating whether future funding changes will cause current production rates to rise, fall, or remain steady in future years. Since China's defense spending has increased, both in inflation-adjusted dollars and percent of annual government budget, each year for more than twenty years; it is likely that the Chinese military continues purchasing new hardware at the same or increased rate. Therefore, current production rates are conservative estimates when projecting future peacetime growth. The Chinese government support this assessment with numerous assertions that modernizing their military is a top priority and involves not only purchasing Russian imported hardware, but upgrading or replacing current equipment.[8] These modernization efforts contributed to the rise in domestic production of military hardware over the last twenty years, with the most drastic increase occurring over the last five years. In contrast, based on declining spending, the United States' current production rates are an optimistic projection for future trends and combine with conservative estimates of Chinese production to form a best-case scenario for continued American dominance. Analysis of China's production capacity within the three key military sectors of shipbuilding, aircraft, and missiles provides a vital snapshot for determining the likeliest trend of balance of military power in the western Pacific.

## Production Capacity Assessments by Sector

### Ships

The United States already surrendered the advantage in shipbuilding to China, with the People's Liberation Army Navy (PLAN) now surpassing the United States in total number of surface combatants as well as production rate.[9] China is now the top shipbuilding nation in the world by tonnage and is also producing more vessels per year than the United States. Construction of individual naval surface combatants is easier to track than other military

systems, which allows organizations such as Jane's Information Group to not only track total force strength, but important construction milestones for each shipyard and vessel. China operates two shipyards for major naval combatants: Dalian and Jiangnan Changxingdao shipyards, each of which is independently capable of simultaneous construction of multiple vessels. As the preeminent symbol of naval power, aircraft carrier production represents the epitome of naval construction attainable only by the most powerful navies in the world. China's first domestically produced aircraft carrier, the Type 002 *Shandong* was launched in April 2017 after 3.5 years of construction.[10] While sea trials delayed commissioning until 2019, future iterations will likely require less time for completion of the sea trials, representing an overall decrease in time required to produce each vessel for future variants. In 2018, China began construction on their third aircraft carrier, a more modern design, which the United States OSD estimates will be commissioned and fully operational by 2022.[11] China decreased aircraft carrier production time to less than four years per aircraft carrier, which will be used to estimate their future aircraft carrier production as well. In comparison, the United States required 5.5 years to commission the final *Nimitz*-class aircraft carrier, the *USS George H.W. Bush*, while the *USS Gerald R. Ford* remains under construction and testing after more than ten years.[12] If the United States were to halt production of future aircraft carriers, China would need thirty-two years at current production rates to match the American inventory, or fifty years if the United States purchases additional *Ford*-class carriers and maintains the current ten-year production cycle. Therefore, despite China's significant advantage in current shipbuilding rates, they remain unable to match or surpass the United States aircraft carrier fleet in the near-term.

While current production rates afford the United States the numerical advantage in aircraft carriers for the next thirty to fifty years, their surface and submarine combatant fleet is

growing rapidly enough to facilitate more timely effect on the global balance of power. The PLAN is now numerically the largest navy in the world with approximately 350 total ships and submarines with more than 130 major surface combatants.[13] China's most modern surface combatant is the *Renhai*-class destroyers which began construction in 2014 and was launched in mid-2017.[14] Parallel to the more advanced *Renhai*-class, China also continues to produce the modern Type 052D *Luyang III*-class destroyers at both shipyards. Utilizing both available shipyards, the PRC currently produces one *Renhai*-class from each shipyard every 3.5 years plus a total of three *Luyang III*-class per year. These destroyers represent China's most advanced surface warships and are produced slower than earlier generation destroyers, which were each built in less than two years.[15] China also continues to produce frigates at a rate of two per year since 2005.[16] Construction of these destroyers and frigates is simultaneous and independent of their continued aircraft carrier construction, however if China divests of additional aircraft carrier production in favor of more missile-capable surface warships, the production gap would likely significantly increase.

Like China, the United States utilizes two shipyards for production of its *Arleigh Burke*-class destroyers and averages three years per destroyer at each facility.[17] However, the United States' intermittent destroyer production throughout the past decade is a result of the U.S. Navy shifting funding between numerous new or potential programs. Both China and the United States produce destroyers at nearly the same rate, though China augments this with its significant frigate production, which confirms the production advantage. Numerically, the PLAN already surpasses the United States, though the U.S. Navy fleet still boasts an advantage in quality as its entire surface combatant fleet is composed of modern cruisers and destroyers, while the PLAN fleet is approximately half modern destroyers and half smaller frigates. Since the PLAN already

holds the advantage in numbers and production rate, the gap between Chinese and American navies will increase by two frigates per year, or potentially an additional one destroyer every two years if the Chinese shipyards maintain production of their modern *Renhai*-class destroyers at the current rate going forward. Critically, this surface warship-specific arms race does not account for the traditional technological advantage of the American ships, only the respective production capacities of each nation and the relative future growth of their surface navies.

Analysis of Chinese submarine production is more difficult since they guard production rates and service numbers more closely than that of surface combatants. Additionally, the PLAN made significant advances and changes to its submarine program over the past twenty-five years, resulting in the development of new submarine classes at frequent intervals vice maintaining a steady-state production. Nonetheless, most sources report China's submarine production to be approximately 1.5-2 submarines per year, with a variable mix of nuclear- and diesel-powered variants throughout the last twenty years.[18] This reporting is likely a conservative estimate as the PLAN also retired aging submarines at a rapid rate during this period to be replaced by more modern, indigenous variants. In comparison, the United States produces mature submarine designs at a rate of 1.2 submarines per year,[19] only slightly slower than the PRC production. Based on current submarine force strength, the PLAN will surpass the U.S. Navy's submarine force in less than ten years. However, this projection does not assess the relative power of each respective submarine, nor does it account for the global requirements levied on the United States submarine force. Both China and the United States produce submarines in less than a year, allowing for each nation to replace combat losses or commission reinforcements during conflict, potentially altering the balance of power should conflict last longer than six months.

China's recent shipbuilding surge brings the first challenge to United States naval supremacy since the conclusion of the Cold War. While the United States maintains a significant numerical and technological lead over the PLAN, China's current production rates allow them to potentially match the United States Navy in total force strength within the next ten years, excepting aircraft carriers. Both nations rely heavily upon two shipyards for their respective naval production. The organization of China's primary shipbuilding companies, China Shipbuilding Industry Corporation (CSIC) and China State Shipbuilding Corporation (CSSC) is a significant difference between the two nations' shipbuilding organization that potentially impacts capability. Originally split along rough military and civilian lines, the two companies merged in 2019,[20] likely improving the ability to share production details and enhance the ability to transition from production of civilian products to purely military products. In 2016, the PLAN commissioned eighteen warships compared to the five produced in the United States.[21] In 2017, these two shipbuilding companies delivered twice as many warships and submarines as the top shipbuilding companies in the United States and Europe combined.[22] This drastic gap emphasizes that China's running average production rate is increasing in relation to Western powers, as evidenced by PLAN force growth and China's increased military spending over the past decade. As the largest weapons system fielded by either nation, naval power represents both the most visible deterrent and the most valued asset or target for overt combat. Based on current production rates and trends, the United States will maintain superiority in aircraft carriers for the next generation but faces an increasingly numerically superior fleet of destroyers and frigates employing a variety of anti-ship and land attack missiles. United States strategy and tactics should emphasize the advantage gained by its larger aircraft carrier fleet and seek to neutralize

the advantage gained by the PLAN's more diversified surface warship fleet while also avoiding a prolonged conflict which favors China and its ability to replenish combat losses more rapidly.

**Aircraft**

In contrast to the easily identifiable production rates of naval warships, aircraft production for both nations is more difficult to track due to several factors. Most notably, China has imported significant numbers of Russian-made aircraft both as primary aircraft for operational units and as templates for reverse-engineering to produce indigenous variants. Chinese military aviation is predominantly split between the People's Liberation Army Navy and People's Liberation Army Air Force (PLAAF) each of which currently use a mix of imported and domestic aircraft. Since aircraft are significantly smaller, produced in far more significant numbers and typically built inside aerospace plants instead of visible in large shipyards, tracking individual aircraft throughout the production cycle is more difficult than tracking warship production. Therefore, end strength is a more reliable reporting metric for aircraft production. However, since both nations produce additional export fighters and bombers, arms sales must be combined with domestic service numbers to accurately assess national production.

China initially modernized its air force through procurement of exported Soviet aircraft, predominantly Su-27 and Su-30 variants. While important for considering the overall force strength of the Chinese air component, these initial aircraft need to be removed from consideration for calculating overall production organic to China. Since the mid-1990s, China built numerous fighter, bomber, and special mission aircraft as part of its modernization effort. The majority of these aircraft were initially reverse-engineered variants of Soviet aircraft, with initial squadrons purchased outright.[23] Industrial espionage during the last twenty years increased the speed with which China has procured new technology[24] and built new aircraft, including development and production of their first fifth-generation aircraft, the J-20. Accounting for each

of the domestic variants, China maintains a production rate of approximately ninety-six fighter aircraft per year produced by its state-owned Aviation Industry Corporation of China (AVIC). This branch is primarily responsible for military aircraft production. Additionally, a subsidiary of AVIC builds approximately thirteen large special mission aircraft per year, including multiple variants that complicate mass production.[25] These aircraft variants include transport; refueling; early warning; and intelligence, surveillance, and reconnaissance versions. While the total aircraft production is currently distributed among five fighter and attack variants as well as three special mission airframes, the ability for one company to simultaneously produce ninety-six fighters and thirteen special mission aircraft per year implies the manufacturing capacity to vary that distribution and create any combination of those aircraft. As of 2017, the PLAAF and PLAN operated over two thousand combat aircraft, including 790 fourth or fifth generation fighter aircraft[26] and 110 modern special mission aircraft.[27] The lack of strategic bomber production during this period is of special note since they typically represent the pinnacle of aviation deterrence and power projection. The PLAAF currently operates approximately 100 H-6 bombers, though no new airframes were produced in the last ten years. PLAAF leadership claimed in official reports that they were developing a new, domestically produced strategic bomber that would replace the aging H-6 bomber in the PLAAF inventory.[28] Without current production trends for estimating production of the new aircraft, it seems most likely that its production would compare to that of the special mission aircraft produced by AVIC at a rate of thirteen per year. A final factor that restricts the true aircraft production capacity of the PRC is their continued inability to domestically produce reliable, high-performance aircraft engines, forcing them to rely upon engines produced in Russia, Europe, or the United States for their most capable aircraft.[29]

The United States military operates equivalent fighters, attack aircraft, and bombers across three services and maintains a significant numerical advantage. The United States Air Force operates all the nation's strategic bombers, approximately 150, along with an additional 1,900 fighters and attack aircraft, augmented by the United States Navy's additional 1,400 fighter and attack aircraft.[30] However, unlike China, the United States discards older aircraft faster than it is procuring newer models or in some cases, replacing aging aircraft with fewer, more capable modern versions. It is therefore likely that the United States air component will decrease below current strength in future years while the PLAN and PLAAF continue to grow. If the United States maintains current strength while the PRC continues producing new aircraft at its current rate, the PRC requires four years to match the United States' bomber force and twenty-five years to reach parity with the American fighter inventory. The lack of aircraft production in the United States is not due to a lack of industrial capacity however, but instead a funding decision. Prior to 1992, the United States' aerospace companies produced approximately 200 aircraft per year, which speaks to the nation's industrial capacity. Currently, that production capacity is used to build new fifth generation aircraft for both domestic and export use. Lockheed Martin produces approximately fifty F-35 aircraft per year, the only fifth generation aircraft currently in production.[31] While the current production supports not only the United States but also partner nations around the world and does not drastically increase the United States' inventory, it suggests that declining production rates are not indicative of industrial shortfalls, but instead represent that the limiting factor in American fighter production is financial vice a lack of manufacturing capacity.

**Missiles**

Production rates of ballistic and cruise missiles are far more difficult to analyze since they are considerably smaller than warships and aircraft and are typically covered and concealed

within bunkers until used. This makes estimation of production rates far more ambiguous and reliant upon published force strengths relative to original operational dates in order to determine rates of production. Since these missiles provide the destructive power behind both land-based forces and naval power projection, maintaining numerical and technological superiority over potential adversaries is of utmost importance to both parties. Since missile technology advances more quickly than other military hardware, production runs are very limited, often producing only a single initial order before manufacturing plants transition to development and production of newer variants.

China originally developed short-range ballistic missiles (SRBMs) in the mid-1990s and for the next fifteen years, the nation's missile production focused solely on two variants. During this period, China manufactured an estimated 865 missiles, averaging sixty-two missiles per year over that period.[32] China's shifting production of medium-range, long-range, and cruise missiles complicated estimates of production rates and capacity since the Chinese industry rarely stabilized production of any single variant. Averaging inventory totals over time for newer missiles suggests China can produce roughly thirty medium-range ballistic missiles (MRBMs) per year and an additional 110 cruise missiles per year.[33] While the United States does not currently produce SRBMs or MRBMS, the United States achieved a maximum rate of production of MRBMs during the Cold War of sixty-eight missiles per year. This previous maximum rate almost exactly matches the production capacity exhibited by China from 1996-2010 when building its SRBM inventory and implies relative parity in national ballistic missile production capacity between the two nations. The United States intermittently produced its primary land-attack cruise missile, the Tomahawk Land Attack Missile (TLAM), with recent production runs averaging eighty missiles per year.[34] Similar to the Cold War, relative balance of

missile inventories plays a massive role in the assessment of comparative strength, and production of such assets, while difficult to accurately assess, can drastically alter the balance of power in a future war.

Unlike warships and aircrafts, missiles are expendable ordnance and rapid replenishment of these vital weapons is vital to any prolonged conflict between the United States and China, especially as missile defense systems become more advanced. Recent wargames conducted at the Marine Corps Warfighting Laboratory further developed this dependence upon missile inventories as the ability of each side to employ and replenish ballistic and cruise missiles dictated the tempo of entire national-level campaigns. Both nations appear equal in their ability to produce quantities of these missiles over time, though initial inventory levels are unknown, limiting the ability to predict which nation currently owns the advantage. One additional consideration that complicates the United States' missile production is the physical location of the missile production facilities compared to their most likely location of use: the Western Pacific. Though the United States proved it is capable of producing missiles at an equal rate to China, the U.S. faces financial constraints and additional logistical limitations restricting delivery to the likeliest military theaters.

## Recommendations

The United States maintained military superiority over global competitors for the past thirty years across every warfighting domain. The recent global war on terrorism reinforced this American dominance, fostering a level of comfort within the United States military in its numerical and technological advantage in the military domain. However, China represents a new near-peer competitor who can challenge or surpass the American military in key domains. Even more so than during the Cold War, the United States faces this competition while financially

constrained and unable to simply increase spending to produce more weapons and assets to maintain the strategic advantage. The United States must focus on efficiency in developing and producing its new military hardware to maintain its current advantage in the face of increased Chinese spending. Without increasing the military budget, the United States has two primary options for countering the Chinese military-industrial complex: fostering the growth of partner and ally nations through export sales and transfer of divested legacy equipment while simultaneously reducing waste in the development and procurement of future weapon systems. With production of new systems already in progress, the United States can first build the capacity of its many partner nations through increasing export sales of new military technology as well as transferring retired military equipment to nations in need of modernization.

The aircraft production sector provides the simplest option for assisting partner nation growth. Lockheed Martin, developer of the F-35 variants, produced its fifth-generation fighter for the United States in parallel with export variants to eight partner nations throughout the ten years of operational production. Total fighter production rates in the United States decreased in the last twenty years, likely due more to the increased development and individual unit costs of newer aircraft rather than decreased production capability. With more investment in the overall program, Lockheed Martin's production facility could manufacture at its potential capacity rather than constrained by the limited order size and programmed delivery schedule. To keep production optimized, the United States should grow and modernize the air forces of its likeliest partner nations and allies via a two-pronged approach. Approaching the end of its budgeted F-35 order, the United States should find and convince additional partner nations willing and able to purchase export variants, therefore enabling continued production of a modern fighter at or near Lockheed Martin's capacity. In addition to standard negotiations and advertising, the United

States can attract additional investors via security cooperation exercises in which foreign air forces and leadership gain exposure to the aircraft and its capabilities.

Without increasing future F-35 sales, American fighter production will decline or temporarily halt in the near future due to lack of buyers rather than a loss of manufacturing capability. This production downtime allows China to narrow the gap in a key warfighting domain in which the United States would otherwise maintain a significant advantage. However, many partner nations are unwilling or unable to budget the necessary funds for expensive, fifth-generation fighters but may be suitable buyers for legacy aircraft as the United States continues its own modernization efforts. As the U.S. military phases out current fourth-generation fighters such as F-16s, F-15s, and F/A-18 variants, these older airframes are available for sale or transfer to allies. Despite being legacy aircraft in the United States arsenal, these aircraft are substantial upgrades on current legacy fighters used by many nations in Southeast Asia. While this recommendation does not directly increase the American fighter inventory, improving the overall force ratios in the Western Pacific without requiring a corresponding increase in the United States military budget. This transfer of assets provides a similar benefit to new sales at reduced cost to the United States government. Rather than relying on aging third generation aircraft currently in use by many nations, modernized regional partners and allies significantly increase the lethality of any coalition formed during a future conflict with China by augmenting the organic aviation inventory the U.S. brings to bear.

The United States' many global obligations to international organizations and ongoing missions pose a significant obstacle to massing its numerically superior forces against any singular adversary such as China. These obligations continuously tie up significant resources and prevent the United States from mobilizing its entire arsenal against any one adversary or specific

theater. Increasing the fighter inventories of partner nations around the globe potentially allows otherwise uninvolved allies to temporarily relieve the United States of European or Middle Eastern responsibilities in order to focus on the Western Pacific. Ten of the fourteen nations purchasing F-35s are European and while it is unlikely that they would all commit forces to combat action in the Western Pacific, a more capable NATO air force would allow the United States to divert more assets to the Pacific theater, enabling the United States to mass its sizable aviation advantage against the adversary.

Unlike the aviation sector, the United States does not export warships in the same manner, nor is it feasible to export a new destroyer, submarine, or aircraft carrier to a partner nation or ally. However, as the United States Navy commissions new warships but remains constrained by both fiscal limitations and manpower caps, it divests of older warships. Similar to the sale of legacy fighter aircraft to allied nations, the modernization of the U.S. Navy's fleet presents a similar opportunity. The Unites States established precedent for transferring legacy warships to partner nations with the *Oliver Hazard Perry*-class frigates, of which twenty-three were transferred to partner nation navies once they decommissioned from active service in the United States Navy. However, an additional twenty-seven *Oliver Hazard Perry*-class were decommissioned and those warships saw no further use.[35] While considered obsolete by the United States Navy, these frigates would significantly upgrade many international navies and provide vertical launch missile capabilities that could be leveraged by the United States in any future conflict in the region. Considering China's numerically superior destroyer and frigate fleet along with its rapid production rate, the United States and allies should not waste surface warships that provide additional offensive or defensive capabilities in that domain.

As the United States Navy seeks to modernize and divest of legacy warships, it must ensure that future projects, both research and development as well as operational production, are adequately aligned with the future fight. Warships are the costliest military system to produce, both financially and in time required as evidenced by the years required for each vessel. The significant cost of each warship makes any miscue in design, development, and production extremely detrimental to long-term success in any arms race. When the Navy divested of frigates, it invested heavily in the development and production of two classes of littoral combat ships (LCS) that were specifically designed to operate near the coastlines of contested regions. Neither of these ship designs incorporated the long-range anti-ship missiles, air defenses, or anti-submarine warfare equipment required to fight and survive against a peer or near-peer adversary employing anti-access/area denial capabilities. Despite this deficiency, the U.S. Navy spent more than sixteen years' worth of money and production resources building twenty-one of the vessels with another fourteen remaining on order.[36] In 2017, the Navy finally directed development of replacement frigates that provide the offensive and defensive missile capabilities necessary for the envisaged future conflict with a near-peer adversary. This thirteen-year delay and financial outlay must be avoided in future procurement endeavors by all services. While the LCS program was originally devised during the peak years of the war on terror and prior to the "pivot to the Pacific," long-term procurement programs must assess future viability across the entire spectrum of warfare. This applies to not only surface warships, but submarines, aircraft, and land-attack capabilities as well.

Similar to the "sunk cost" trap of the LCS, both the Army and Marine Corps heavily invested in mine-resistant vehicles that proved cost prohibitive to deploy and redeploy from the Middle East and possessed no shipboard or amphibious capability. Even had the vehicles been

retrograded from Afghanistan and Iraq instead of destroyed in place, they would have no use in future conflict against China where the logistics of deploying such vehicles are impractical and operationally untenable. All services must reevaluate their development programs to ensure that the weapons and hardware being purchased in the next five to ten years are suitable not just for the current fight, but the potential high-end fight against a peer adversary where their deployment and maneuver will be heavily contested. The Marine Corps recently released plans to invest heavily in High Mobility Artillery Rocket Systems (HIMARS) to develop a robust long-range anti-ship and land-attack capability. While investing in future technology is preferred over chasing legacy systems, the HIMARS family has significant strategic mobility shortfalls which make it extremely difficult to maneuver in a maritime environment. Investing too heavily in a product that cannot be transported to the fight will not successfully counter China's military growth and only serves to delay production of more worthwhile weapon systems. The United States can no longer afford the inefficiencies caused by such delays as evidenced by the shrinking advantage over China. Additionally, the joint force must consider commercial sector options for currently available lightweight or unmanned systems. Adapt these systems for combat could be significantly cheaper and faster than embarking on a long-term research and development project that will not see results for five to ten years. Utilization of the commercial sector alleviates start-up costs and shortens the production timeline, allowing American military production assets to continue building operational units at peak efficiency, which is essential to maintaining the current technological and numerical lead.

Countering China's rapid growth and reorganization requires the United States to maximize efficiency in its own acquisition endeavors. Since the military cannot count on the simple answer of continually increasing the budget to maintain a numerical advantage, it must

seek efficiencies elsewhere. The greatest advantage can be found in improving partner nation forces through either export sales of new equipment such as the F-35 or transfer of divested legacy equipment like the *Oliver Hazard Perry*-class frigates. This course of action not only keeps American production of military hardware operating at its peak level, but prevents waste of functional assets and bolsters international relations with partner nations. Internally, each military branch must evaluate acquisition projects to ensure that requested capabilities not only match the current asymmetric fight, but continue to prove useful in conflict with a peer competitor.

## Conclusion

Despite recent alarms predicting that the China's military will imminently surpass the United States in military power, the United States military's current numerical and technological advantage mean the threat is less dire than typically predicted. China produces specific key military hardware at a faster rate than the United States, though the United States will maintain superiority for the next generation, apart from surface warships. The United States can and must leverage its current advantage in specific critical sectors such as aviation and submarines to mitigate the shortfalls presented by China's most dominant industrial sector: shipbuilding. Unable to rely solely upon increased funding to purchase guaranteed numerical superiority for the future, the United States must foster the growth of partner nations using existing manufacturing capabilities or sale of legacy equipment while simultaneously avoid wasting crucial resources and time on military equipment designed to fight the previous war.

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[1] Michael Beckley, "The Power of Nations: Measuring What Matters," *International Security* 43, no. 2 (Fall 2018), 9.
[2] Beckley, "The Power Of Nations," 17.
[3] Anthony H. Cordesman, *Chinese Strategy, Military Forces, and Economics: The Metrics of Cooperation, Competition and/or Conflict* (Washington, DC: Center for Strategic and International Studies, September 18, 2018), PowerPoint presentation, 21.
[4] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 15.

[5] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*, (Washington, DC: Office of the Secretary of Defense, August 2020), 139.
[6] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 33.
[7] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 34; Eric Heginbotham et al., *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996-2017*, (Santa Monica, CA: RAND Corporation, 2015), 2, https://www.rand.org/pubs/research_reports/RR392.html; Office of the Secretary of Defense, *Annual Report to Congress 2020*, 139-140.
[8] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 79; Lindsay Maizland, *China's Modernizing Military*, Backgrounder (Council on Foreign Relations, February 2020), https://www.cfr.org/backgrounder/chinas-modernizing-military; Office of the Secretary of Defense, *Annual Report to Congress 2020*, 38; The State Council Information Office of the People's Republic of China, *China's National Defense in the New Era* (Beijing, China: Foreign Languages Press Co. LTD., 2019), https://www.globalsecurity.org/military/library/report/2019/china-national-defense-new-era-20190724.pdf.
[9] Office of the Secretary of Defense, *Annual Report to Congress 2020*, vii.
[10] *World Navies – China*, October 19, 2020, Jane's Information Group, https://customer.janes.com/WorldNavies/Display/JWNA0034-JWNA#.
[11] Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*, (Washington, DC: Office of the Secretary of Defense, May 2019), 37-38.
[12] *World Navies – United States*, December 10, 2020, Jane's Information Group, https://customer.janes.com/WorldNavies/Display/JWNA0160-JWNA.
[13] Office of the Secretary of Defense, *Annual Report to Congress 2020*, 44.
[14] *World Navies – China,* October 19, 2020, Jane's Information Group.
[15] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 93; Heginbotham et al, *The U.S.-China Military Scorecard*, 177.
[16] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 93.
[17] *World Navies – United States*, October 5, 2020, Jane's Information Group.
[18] Office of the Secretary of Defense, *Annual Report to Congress 2019*, 36; Cordesman, *Chinese Strategy, Military Forces, and Economics*, 92-93; *World Navies – China,* January 19, 2021, Jane's Information Group.
[19] *World Navies – United States*, October 5, 2020, Jane's Information Group.
[20] Nan Tian and Fei Su, *Estimating the Arms Sales of Chinese Companies*, SIPRI Insights on Peace and Security No. 2020/2 (Stockholm, Sweden: Stockholm International Peace Research Institude, January 2020), 4, https://www.sipri.org/publications/2020/sipri-insights-peace-and-security/estimating-arms-sales-chinese-companies.
[21] Maizland, *China's Modernizing Military*, 3.
[22] Nan Tian and Fei Su, *Estimating the Arms Sales of Chinese Companies*, 12.
[23] Heginbotham, *The U.S.-China Military Scorecard*, 31.
[24] Office of the Secretary of Defense, *Annual Report to Congress 2020*, 138.
[25] Cordesman, *Chinese Strategy, Military Forces, and Economics*, 108; Heginbotham et al, *The U.S.-China Military Scorecard*, 31 & 76; *World Air Forces – China*, November 30, 2020, Jane's Information Group.
[26] Office of the Secretary of Defense, *Annual Report to Congress 2020*, viii; Cordesman, *Chinese Strategy, Military Forces, and Economics*, 108.
[27] *World Air Forces – China*, November 30, 2020, Jane's Information Group.
[28] *World Air Forces – China*, November 30, 2020, Jane's Information Group.
[29] Office of the Secretary of Defense, *Annual Report to Congress 2020*, 144.
[30] *World Air Forces – United States*, January 19, 2021, Jane's Information Group; *World Navies – United States*, October 5, 2020, Jane's Information Group.
[31] *World Air Forces – United States*, January 19, 2021, Jane's Information Group.
[32] Heginbotham, *The U.S.-China Military Scorecard*, 48.
[33] Heginbotham, *The U.S.-China Military Scorecard*, 51-52.
[34] *Weapons: Naval*, January 7, 2021, Jane's Information Group.
[35] *Jane's Fighting Ships*, March 19, 2016, Jane's Information Group.

[36] *Jane's Fighting Ships*, February 11, 2021, Jane's Information Group.

## Bibliography


Beckley, Michael. "The Power of Nations: Measuring What Matters." *International Security* 43, no. 2 (Fall 2018).

Cordesman, Anthony H. *Chinese Strategy, Military Forces, and Economics: The Metrics of Cooperation, Competition and/or Conflict*. PowerPoint presentation. Center for Strategic and International Studies, Washington, DC, September 18, 2018.

Heginbotham, Eric, Michael Nixon, Forrest E. Morgan, Jacob L. Heim, Jeff Hagen, Sheng Tao Li, Jeffrey Engstrom, et al. *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power, 1996–2017*. Santa Monica, CA: RAND Corporation, 2015. https://www.rand.org/pubs/research_reports/RR392.html.

US Defense Intelligence Agency. *China Military Power*. Washington, DC: Defense Intelligence Agency, 2019. https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/China_Military_Power_FINAL_5MB_20190103.pdf.

Jane's Information Group. https://customer.janes.com/.

Maizland, Lindsay. *China's Modernizing Military*. Backgrounder. Council on Foreign Relations, February 2020. https://www.cfr.org/backgrounder/chinas-modernizing-military.

Medeiros, Evan S., Roger Cliff, Keith Crange, and James C. Mulvenon. *A New Direction for China's Defense Industry*. Santa Monica, CA: RAND Corporation, 2005. http://jstor.org/stable/10.7249/mg334af.9.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*. Washington, DC: Office of the Secretary of Defense, May 2019.

Office of the Secretary of Defense. *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China*. Washington, DC: Office of the Secretary of Defense, August 2020.

O'Rourke, Ronald. *China Naval Modernization: Implications for U.S. Navy Capabilities – Background and Issues for Congress*, CRS Report for Congress RL33153. Washington, DC: Congressional Research Service, September 1, 2020. https://crsreports.congress.gov/product/pdf/RL/RL33153/243.

Tian, Nan and Fei Su. *Estimating the Arms Sales of Chinese Companies*. SIPRI Insights on Peace and Security No. 2020/2. Stockholm, Sweden: Stockholm International Peace Research Institute, January 2020. https://www.sipri.org/publications/2020/sipri-insights-peace-and-security/estimating-arms-sales-chinese-companies.

The State Council Information Office of the People's Republic of China. *China's National Defense in the New Era*. Beijing, China: Foreign Languages Press Co. LTD., 2019. https://www.globalsecurity.org/military/library/report/2019/china-national-defense-new-era_20190724.pdf.