Workers assemble B-25 bombers at North American Aviation, Kansas City, Kansas, October 1942 (Library of Congress/Alfred T. Palmer)

Mobilization in the 21st Century

Asking the Right Question

By Matthew C. Gaetke

A renewed focus on Great Power competition means major wars are getting attention again, and these kinds of wars consume a lot of resources. Historically, big wars required wartime industrial mobilization to produce all those resources. War mobilization conjures black and white images of tanks, planes, and ships pouring out of American factories during World War II. But does bringing these pictures to life reflect the realities of major war in the 21st century? Can we even make all those things? More important, is planning for this kind of industrial overhaul a high priority in preparing for a major war with a peer competitor? Is this even the right question?

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This article analyzes the factors behind mobilizing U.S. industry to support a large modern war. But what is mobilization? U.S. joint doctrine broadly defines *mobilization* as "the process of assembling . . . national resources . . . in time of war."[1] This means, at least, massing people into uniform, leveraging industry to produce weapons and equipment, and sustaining public support for these measures.[2] It also requires generating the financial resources to pay for it all. Among these elements of mobilization, this article focuses on industry, the economy, and producing military equipment—and doing so when wartime demands exceed military industrial capacity. This is different from stockpiling in case of war, peacetime decisions over force size, rapid development of new technologies, and surging existing industry. Mobilization happens when these are not enough. Mobilization means converting a significant portion of the civilian economy to military production to generate the materiel necessary to fight a sustained major war.

The following sections show, first, that the contextual differences between World Wars I and II—wars that involved mobilization—and a war in this century make such mobilization unlikely. The belligerents of the world wars began them with roughly similar economic potential, which set the conditions for neither side being able to overwhelm the other. Since mobilization happens in relation to an adversary, among modern competitors only China could play this role. Second, unlike in the world wars, the United States would enter a 21st-century conflict already fitted with high-end military equipment in considerable quantity. There would be no need for the U.S. military to expand just to catch up, a driver of previous mobilizations. Overcoming previous American disarmament required a rapid expansion of military production into the civilian economy. While a 21st-century major war would certainly require increased military production, the increase would be considerably smaller and would not require widespread conversion of the civilian economy. Finally, projected combat losses in a war between the United States and China further scope the industrial effort required. These loss rates, although sometimes exceeding current production rates, do not dwarf them. Today, production rates for some items already exceed estimated wartime loss rates.

Given this context, the United States is well postured to sustain a major 21st-century war without the kind of mobilization experienced in the world wars. Immense uncertainty, however, surrounds other aspects of such a war. Since the United States has not fought a peer war since Korea, characterizing this kind of future combat is guesswork. Furthermore, the United States has never fought a modern war with the homeland at risk, as it would be—at least through cyberspace—during even minor 21st-century wars. In the face of these unknowns, *how to mobilize* is the wrong question. How to develop the right options to prevail despite this uncertainty is far more important than fretting over re-creating the mobilization of World War II.

A Peer War Requires a Peer Competitor

A sustained major conflict that would drive mobilization requires closely matched adversaries in terms of military capability, productive capacity, and economic power. This is logical; significant differences in productive capacity would allow one side to outproduce the other without converting swaths of its civilian economy. Gross domestic product (GDP) is a proxy for the productive capacity of an economy and therefore gives a rough indication of its ability to sustain a major war. Examining the GDPs of the major powers from World Wars I and II shows what degree of difference might exist between adversaries' economies and yet still see them engage in the kind of sustained major war that involves mobilization. Filtering today's potential adversaries by that degree of difference—while having no political or military predictive ability—indicates how well their economies might be able to sustain such a war against the United States. Only a war with such a matched adversary might require the mobilization of the American economy.

Before World War I, the economies of the major powers were of comparable size, especially when measured by the alliance blocks that played a key role in the war. The figure shows the 1913 GDPs of the major powers (at purchasing power parity in 2011 dollars, showing how far government spending could go within each economy). The economies of most, such as the United Kingdom, were within a factor of two of the median. The Ottoman Empire was significantly less, and the United States significantly more. Grouping the economies by alliance block gives an even clearer picture of the prewar balance. Considering the initial combatants, the entente's GDP was 1.8 times larger than that of the Central Powers. On a smaller scale, as the Austrians issued an ultimatum that would start the war, they faced an adversary alliance with almost exactly the same GDP ($503 billion for Germany vs. $495 billion for Russia and Serbia).[3]

The World War II powers' GDPs were also comparable at the start. In 1938, their economic output was again within a factor of about two, with the United States again an outlier.[4] Only Italy was less than half, and the Soviet Union was more than twice the median (again the United Kingdom).[5] Separating the powers into alliance blocks, France and Britain faced continental adversaries Germany and Italy with an almost identical combined GDP. Including Japan and the United States would make the ratio 3.4 to 1 in favor of the Allies, but that is misleading. By the time the United States entered the war, France and portions of the Soviet Union were already producing—at lower levels—for the Axis. One estimate of the impacts of the early Axis gains puts the adjusted Allied GDP at about $1.44 trillion by 1942 to the Axis's $1.55 trillion, assuming full production from conquered areas.[6] That means a GDP ratio of between 1.1 and 2 to 1, depending on how effectively the Axis could convert the economic potential of captured workers and territory.

Together, the world wars suggest that adversaries with GDPs within a factor of about two are sufficiently comparable to allow for a sustained major war

and mobilization. Other 20th-century wars—those without American mobilizations—saw a very different degree of economic disparity between adversaries. As the United States entered the Korean War, American GDP (conservatively excluding allies) was 5.5 times greater than that of China and North Korea combined. In 1965, U.S. GDP was 95 times larger than that of North Vietnam.[7] In the Gulf War, the ratio was 71 to 1, again excluding the coalition.[8] It rose to 135 to 1 by 2002 for Operation *Iraqi Freedom*.[9] These cases where the GDP difference was greater than a factor of two included other forms of marshaling resources (activating Reserve personnel, leveraging Reserve lift, surging production, even creating specific acquisition programs like Mine-Resistant Ambush Protected vehicles), but not the widespread conversion of the civilian economy that is mobilization.[10]

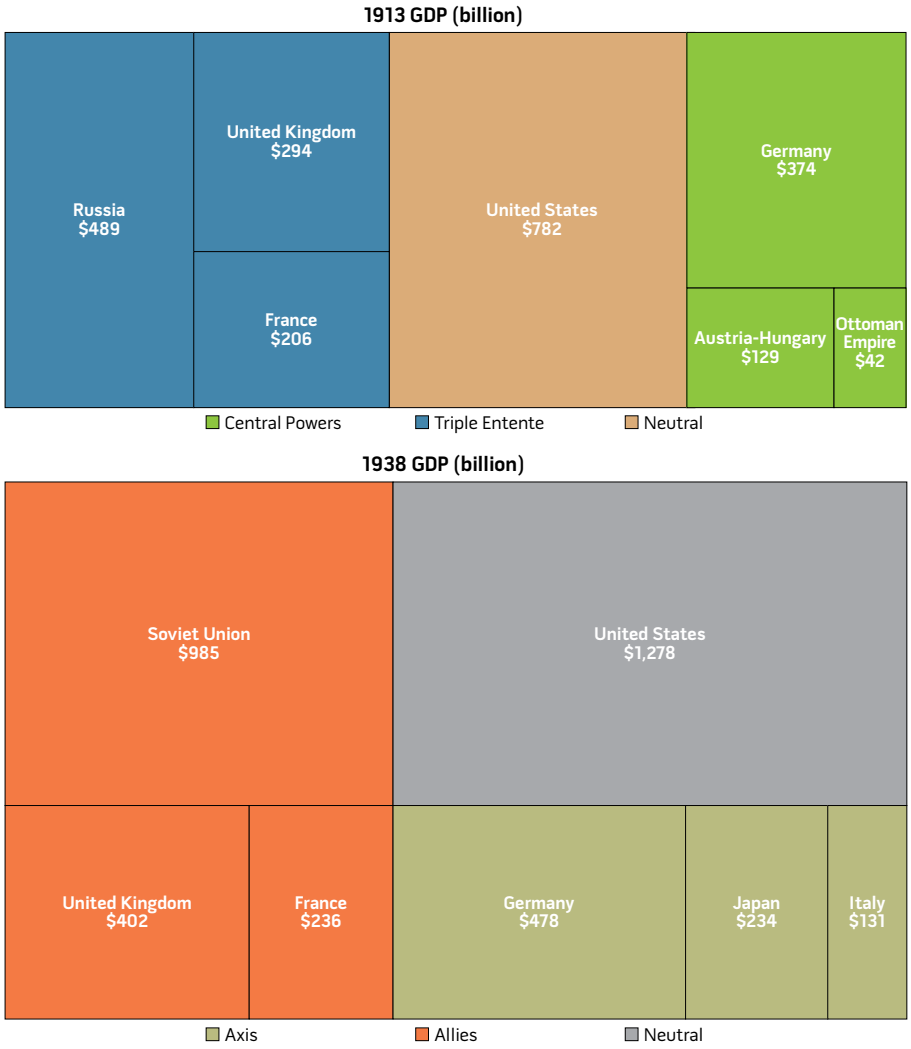
How do today's potential adversaries stack up? American GDP is roughly $21 trillion as of late 2018, in current dollars.[11] At purchasing power parity (internal buying power of government spending), China's GDP is $23 trillion and Russia's is $3.8 trillion.[12]

Considering a future major war, though, requires estimating future GDPs. The U.S., Chinese, and Russian GDPs all grew in 2019, by 2.1 percent, 6.1 percent, and 1.3 percent, respectively, according to each government.[13] All three real GDP growth rates, however, show faster growth than each economy's long-term, potential GDP growth rate. Based on Conference Board estimates—comparable to Federal Reserve and Congressional Budget Office projections—U.S. potential GDP growth is just less than 2 percent, China's is close to 3 percent, and Russia's is essentially zero.[14] While actual GDP growth will fluctuate—COVID-19 throws a wrench in any projection—over the long term it should converge to the potential GDP growth rate.

All three rates are also slowing, but the U.S. growth potential is slowing the least quickly and shows the best prospects for stable growth.[15] For simplicity, projecting future GDP based on current potential GDP growth rates—ignoring rates of change of the growth rates or the immediate impact of the COVID-19 crisis—should therefore give a conservative estimate of U.S. advantage. If 2018 potential GDP growth rates were made actual to 2070, the U.S. economy would remain about the size of China's, but would be 34 times larger than Russia's. Meanwhile the sluggishness of the Russian economy has already impacted military purchases.[16] None of this accounts for allies—among which the United States counts some of the world's largest economies, with no similar economic powerhouses likely to align with either China or Russia.

In summary, only China has the economic capacity to sustain a major war with the United States. Unfortunately, the seeds of such a war are all too easy to imagine. After promising in 2015 not to militarize its outposts in the South China Sea, China later installed antiship and antiaircraft missiles on several manufactured islands, threatening any ship passing between Vietnam and Brunei.[17] Taiwan also presents a potential flashpoint. On

Figure. GDPs of Major Powers



Sources: Stephen Broadberry and Mark Harrison, "The Economics of World War I: An Overview," in *The Economics of World War I*, ed. Stephen Broadberry and Mark Harrison (Cambridge: Cambridge University Press, 2005), 7–10. Updated gross domestic products (GDPs) per capita are from Maddison Project Database 2018, last modified January 25, 2018, as described in Jutta Bolt et al., *Rebasing "Maddison": New Income Comparisons and the Shape of Long-Run Economic Development*, Groningen Growth and Development Centre Research Memorandum 174 (Groningen, The Netherlands: Groningen Growth and Development Centre, January 2018).

Table 1. U.S. and China Militaries

	United States	China	U.S. Advantage	Sixty Percent, U.S. Advantage
Tactical Submarines	54	58	0.9	0.6
Major Surface Combatants	87	23	3.8	2.3
Aircraft Carriers	11	1	11	6.6
Fifth-Generation Fighters	303	6	50.5	30.3
Fourth-Generation Fighters	1,568	1,542	1	0.6
Fighters Total	1,871	1,548	1.2	0.7
Bombers	139	189	0.7	0.4
Personnel (Active and Reserve)	2,206,000	2,545,000	0.9	0.5

Source: "Chapter Three: North America," *The Military Balance* 118, no. 1 (2018), 46–63; "Chapter Six: Asia," *The Military Balance* 118, no. 1 (2018), 249–259.

January 2, 2019, Chinese President Xi Jinping reiterated that Taiwan "must and will" be united with mainland China.[18] A conflict would be easy to start and could easily escalate. A 2016 RAND study concludes that Sino-American tension has "a bias toward a long, severe, bitter war."[19] Such a war would demand more from American industry, but just because the economies will likely remain comparable does not mean it will require mobilization.

Mobilization to Catch Up

Despite their economies' relative sizes, the similarity of the American and Chinese militaries' sizes actually makes war mobilization less likely. Previous American mobilizations began as an effort to catch up to other powers. The situation is very different now. For the world wars, the military industrial base that supplied the prewar American military could not support the multifold military expansion required just to draw even. That growth meant converting large portions of the civilian economy to military production—that is, mobilization.

In 1913, the U.S. military was neither large enough nor well enough equipped to register as a peer competitor in Europe, using the number of military personnel as a proxy for quantity of military equipment and for military production capacity. The prewar U.S. military was several times smaller than those of the other powers, one-fifth the size of Germany's and one-quarter the size of France's or the United Kingdom's.[20] It grew almost 19 times by 1918.[21] Even if the 1913 American military had been equipped with plentiful quantities of the best equipment—and it was not—this growth would have overwhelmed the industrial base that initially supplied it.[22] The problem turned out to be insurmountable. In fact, when the Doughboys made it to the front, they fought with weapons made in Europe.[23]

In 1939, the U.S. military was again much smaller than those of the European powers, only one-eighth the size of Germany's and one-third the size of Japan's.[24] If the United States alone had needed to fight the Axis powers, its military would have needed to grow by a factor of 13 just to be even.[25] In the event, it grew 36 times by 1945.[26] Once again, the industry supplying the American military in 1939 could not surge to equip one 36 times larger. Instead, the United States needed to convert large portions of its civilian economy to handle this growth. Mobilization was first an effort to catch up.

The situation is different today. Even three decades after the Cold War, despite an overall decrease in military spending relative to GDP, the United States still fields the world's most powerful military, and one of the largest.[27] By many measures, the United States has a numerically equivalent force to China's. In terms of total military personnel (Active plus Reserve), tactical submarines, and nonstealthy aircraft, the Chinese and the American militaries are of similar size (table 1). The United States, however, has 11 aircraft carriers in comparison to China's 2 and a significant head start in stealthy, fifth-generation fighter aircraft. This article focuses on sea and air forces, anticipating a certain kind of Sino-American war and also simplifying the analysis to focus on big-ticket platforms. This method would also apply to a large army engaged in a major land war with China, but the logic of such a war is less clear.

On the other hand, the United States has global responsibilities, in contrast to China's regional focus, and must always balance the risk from other threats. The RAND study projected that the United States would commit 60 percent of its global force to such a conflict.[28] With this handicap, the American advantage decreases. For submarines, in particular, the Chinese would have a 1.8 to 1 advantage, a 1.4 to 1 advantage in total tactical fighter aircraft, a 2.3 to 1 advantage in bombers, and a 1.9 to 1 advantage in total personnel. Thus, the United States finds itself at a quantitative disadvantage to China, but not a historically large one. For the world wars, the U.S. military needed to grow four to eight times just to achieve parity with the other powers. Furthermore, this tallying gives no credit for qualitative differences in materiel or for China's requirement to maintain a lengthy land border.

Like GDP, the trends are important; if China were to significantly outpace the United States in military production, it could achieve world war–level numerical superiority in a few decades. Like GDP, military production is possible to obfuscate, but it gives a rough idea of projection capability. Based on inventory changes, China has produced roughly 3 submarines, up to 2 destroyers, and 30 to 40 combat aircraft each year over the past several years.[29] It has focused on modernizing, however, rather than expanding its force, building its own fifth-generation fighters, aircraft carriers, and cruisers rather than expanding capacity.[30] At the same time, growth in Chinese military spending has slowed. After decades of

Maginot Line fortification Ouvrage Michelsberg formed part of Fortified Sector of Boulay and fortified region of Metz, photographed June 10, 2006 (© Pascal Dihé)

double-digit increases, recent years' growth has been 7 percent to 8 percent, only slightly faster than China's GDP growth.[31] With wide skepticism over the Chinese official budget figures, outside experts estimate its 2017 military spending to be between $180 and $216 billion, less than 2 percent of GDP.[32] While a few years ago projections of Chinese military spending had it passing America's by 2030, now that seems unlikely.[33] To do so, China would have to double its military's share of GDP, at a time when China has many other pressing needs.

Meanwhile, current U.S. trends are similar. The Navy seeks to increase from 287 ships to 355 by mid-century.[34] Lockheed Martin built 131 F-35s in 2019.[35] The Air Force intends to buy some 1,763 F-35s in total through 2044, in addition to Navy and Marine Corps purchases.[36] The Air Force is also pursuing the B-21 bomber, expecting to field it in the 2020s and acquire at least 100.[37] Even assuming a one-for-one drawdown in legacy aircraft, these purchases will keep pace with current Chinese production rates.

Additionally, annual military spending fails to account for accumulated advantage. Even if China spent more on its military annually than did the United States, the incumbent would still benefit from its head start in research and development. Copying technology to catch up is relatively easy, but taking the lead is much harder. Of course, China could ramp up production of known technology in the meantime, but probably not in secret. With its initial advantage, the United States can afford to wait and see.

Based on current military capacity and current trends in production, the United States is not likely to have to mobilize to catch up to China for the foreseeable future. This is not to say the United States is already postured to prevail in a major sustained war with China. The current military industrial base would certainly need to expand, but starting conditions alone would not drive mobilization the way they did in the world wars. Barring major changes in the force balance, a war should not require industrial catching up at a scale to drive widespread conversion of the civilian economy.

Sustaining a Major War

Even without playing catch-up, a sustained major war could still stress military production to replace combat losses or as part of a strategy to overcome the adversary with quantity. With sufficiently high rates, this could require mobilization. The expected loss rates in a war with China, however, should be more modest. Replacing losses might require a surge of existing capacity, but again not a massive expansion into the civilian economy.

The RAND study estimates potential losses in a Sino-American war based

Table 2. Losses and Production

	2018 Inventory	60% to PAC	Best-Case Loss Rate (5%/year)	Worst-Case Loss Rate (15%/year)	Estimated Production Rate (year)	Estimated Unit Cost (2018$B)	Effective Replacement Rate (%)	Factor to Cover Worst Case	Factor to Cover Double Worst Case
Submarines	54	32	1.6	4.9	3	3.1	9	1.6	3.2
Aircraft Carriers	11	7	0.3	1	0.3	13	4	4	7.9
Large Surface Combatants	87	52	2.6	7.8	3.1	2.1	6	2.5	5
Bombers	139	83	4.2	12.5	0	N/A	N/A	N/A	N/A
Fighters (including Navy)	2,012	1,207	60.4	181.1	217	0.09	18	Exceeds	1.7

Sources: "Chapter Three: North America," *The Military Balance*," 118, no. 1 (2018), 46–63; *An Analysis of the Navy's Fiscal Year 2019 Shipbuilding Plan* (Washington, DC: Congressional Budget Office [CBO], October 2018), 22, available at <www.cbo.gov/publication/54564>; Julia Bergman, "U.S. Navy Gearing Up for Boost in Submarine Production," *Navy Times*, April 23, 2018, available at <www.navytimes.com/news/your-navy/2018/04/23/us-navy-gearing-up-for-boost-in-submarine-production/>; Aircraft carriers: *An Analysis of the Navy's Fiscal Year 2019 Shipbuilding Plan*, 17–18; For large surface combatants, see *An Analysis of the Navy's Fiscal Year 2019 Shipbuilding Plan*, 22–24. Unit cost numbers average the CBO estimates of the upgraded DDG-51 Flight III destroyer and a future large surface combatant. Production rates for bombers are too hypothetical to include, although the Air Force plans to buy at least 100 B-21s, fielding in the mid-2020s. See Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, *Program Acquisition Cost by Weapon System* (Washington, DC: Department of Defense, February 2020), 1–18. For fighter production rates, see Mike Stone, "Lockheed Martin Reaches 2018 F-35 Delivery Target of 91 Jets," Reuters, December 20, 2018, available at <www.reuters.com/article/us-lockheed-f35/lockheed-martin-reaches-2018-f-35-delivery-target-of-91-jets-idUSKCN1OJ2J9>; "F/A-18 Hornet Production," *Global Security*, available at <www.globalsecurity.org/military/systems/aircraft/f-18-production.htm>; "Chapter Three: North America," 63. Estimated F-35 cost of $100 million per aircraft (for Air Force and Navy variants) and fourth-generation aircraft at $75 million per aircraft are based on *The Cost of Replacing Today's Air Force Fleet* (Washington, DC: CBO, December 2018), 7; Daniel Cebul, "New F-16s Are Headed to Bahrain," *Defense News*, June 25, 2018, available at <www.defensenews.com/air/2018/06/25/new-f-16s-are-headed-to-bahrain/>; Valerie Insinna, "Lawmakers Stand Ready to Protect F-35 from F-15X Budget Threats," *Defense News*, February 27, 2019, available at <www.defensenews.com/digital-show-dailies/air-warfare-symposium/2019/02/27/congressional-supporters-stand-ready-to-protect-f-35-from-f-15x-budget-threats/>.

on projected capabilities in 2025. After "significant" losses in the first days of the conflict (roughly 15 percent of committed American forces), casualties become "heavy" by the end of the first year of fighting, adding another 5 to 15 percent.[38] The study stops after a year, but this linear, steady-state loss rate would likely continue,[39] and a linear rate is expected for sea and air combat.[40] Notably, the study projects heavier Chinese losses, based on the relative quality of equipment, meaning the United States would gain in relative quantity during the conflict.

Over a long war, military production would, at a minimum, need to replace this sustained loss rate, which then gives a low estimate of wartime production. Since there is no upper bound for the production rate assuming a desire to outproduce the enemy, this article arbitrarily targets 30 percent of the committed force per year, doubling RAND's worst case loss rate. This padding offsets adding training equipment, replacing initial losses, and outproducing China to win with mass.

Comparing current production rates to the target indicates required wartime growth. This estimate should be conservative, since it ignores any peacetime surge capacity. The Navy, for instance, estimates it has 25 percent surge capacity across the board.[41] applies the RAND study's projections to the 2018 U.S. military inventory by major platform with data from recent production or expected production for emerging capabilities, per-unit cost, and effective replacement rates. Finally, it shows the growth required to meet the double worst case loss rate target. The required growth over current production rates shows how much American military production would need to expand for a hypothetical war with China. While significant, it is not massive.

Estimating the intrusion into the civilian economy requires estimating the cost of increased production against GDP. This estimate depends on the expected price of additional equipment at higher levels of demand. Assuming that demand for several times peacetime production would result in doubled prices, table 2 shows the estimated costs of the increased production. Even producing at double the worst case loss rates and doubling the unit price based on surge demand, the total increase in cost would still be less than 1 percent of 2018 U.S. GDP. In that year, the United States spent 3.1 percent of GDP on defense.[42] Even with significant padding, the military share of GDP would grow to only 4 percent (conservatively assuming the extra spending produces no GDP growth). For comparison, during World War I, national security spending rose to 20 percent of the economy, which itself expanded roughly 20 percent from 1914 to 1918.[43] Defense spending peaked at 42 percent of the economy in World War II, alongside 87 percent growth from 1938 to 1944.[44] Although the 4 percent estimate accounts for only some of the increased costs of such a war, the world wars dwarf the magnitude of economic conversion required. The United States spent 4 percent of GDP on defense as recently as 1993, and a far larger portion through the 1970s and 1980s.[45] A war with China would demand a surge by military industry, but not widespread conversion of the civilian economy.

The Right Question: Bets vs. Options

Stepping back from the numbers, it is uncertain how a sustained major conflict with China would play out. Advanced

F-35B Lightning II fighter aircraft assigned to 31st Marine Expeditionary Unit, Marine Medium Tiltrotor 265 (Reinforced), lands on flight deck of USS *America*, South China Sea, April 19, 2020 (U.S. Navy/Vance Hand)

technologies on both sides have never actually faced off in armed conflict. How they might compete against each other is speculation. Defense acquisition choices occur in this uncertainty, pitting present capabilities against future options. At the same time, while a major war with China is the only likely driver of mobilization, it is only one of many scenarios for which the U.S. military must prepare.

This high degree of uncertainty requires an analysis based on risk and options. The key question facing the United States is not how much it could mobilize, but what it needs to face down the uncertainty. Each strategic choice either creates or eliminates options for future decisions, reducing some risks at the cost of increasing others. Business real options are an analogy: A real option creates competitive advantage; maintains flexibility by providing a right rather than an obligation; and is highly leveraged, offering limited downside and large potential upside.[46] Options are different from "big bets," which may provide an even larger upside, but at the risk of a symmetrically large potential downside.[47] Firms pursue options to avoid the downside risk of a big bet, accepting a reduced but unbounded upside for a known and limited downside. Not all options pay off, but since the downside is limited and the upside is not, the ones that pay off could make up the losses.

National security is hard to value. So are strategic options, but the concept and language of options provide a different way of thinking about choices, especially the value of delaying them in the face of uncertainty. A large part of the uncertainty comes from the interval since the last sustained major war. The use of technology in combat changes quickly. In World War I, tacticians were unprepared for the defensive combination of machine guns and barbed wire—neither of which were new technologies. Convinced of the durability of this defensive advantage, the interwar French constructed the Maginot Line. World War II, however, saw tanks and airplanes—both of which were used in World War I—smash these defensive measures, a shocking transformation in only 22 years. While the Germans simply drove around the Maginot Line, it remains emblematic of the uncertainty of war, and how quickly its nature can change. Three-quarters of a century later, and with a major war still beyond the horizon, it is hard to predict what technologies might turn the tide. Any concept will be wrong until it clears Carl von Clausewitz's market of combat.[48] The "Maginot Line problem" haunts every military investment, and the greater the commitment to one concept, the greater the potential consequences if it turns out to be wrong.

Sailor tracks contact bearings during Taiwan Strait transit aboard USS *Shiloh*, Taiwan Strait, January 16, 2019 (U.S. Navy/Chanel L. Turner)

The way to combat this uncertainty is by pursuing options in military technology. To start, the United States must ensure its portfolio of military technologies is diversified enough to include whatever emerges as the machine gun of the next war. In this context, the prewar stockpile of a technology is far less important than having developed that technology and considered how to use it. In addition to the Maginot Line, for example, France also had the world's best tank but had not sufficiently considered how to use it.[49] Such diversification, assuming constant budgets, would force smaller stockpiles of each type of equipment. Nevertheless, rather than committing to large buys of any single technology, the United States should ensure that it covers as many technological bases as possible.

More directly, when developing a new technology, the Department of Defense (DOD) could negotiate a production option, buying the ability to increase production when required. Doing so would save the production costs, plus the personnel and sustainment costs, of actually acquiring large quantities of any technology. Additionally, it would increase stability for boom-and-bust contractors, making their capacity investment decisions easier and therefore cheaper. Contractors could demonstrate that they had worked out the kinks at wartime production rates, but then slow down. That way, surging the equipment for war would mean simply allocating capital to production. For example, the wartime production of large surface combatants assessed earlier requires increasing production five times. If the Navy bought the 13 extra ships per year in peacetime to guarantee the industrial capacity, it would also take on $1.9 billion in annual operations and supply costs, plus the personnel costs of the 9,100 Sailors to crew the ships.[50] In general, since 60 to 80 percent of a system's life cycle cost occurs in sustainment, a production option looks like a good deal even at the full production price.[51] DOD could buy the option, save the sustainment costs, and still keep industry on the hook for the wartime production rate.

In reality, the option should cost less, given the low probability of exercising it. Since a significant indicator of risk for aircraft and shipbuilding contractors is the depth of their order books, DOD could purchase an option that would wait at the end of the line. If the commercial orders dried up, DOD would buy a ship or aircraft to float the contractor over a dry spell. If a war broke out, the option would entitle DOD to jump to the front of the line. Industry may actually value this demand insurance comparably to the value it assigns to DOD's privilege to jump the line. Contractors may pay for this option, rather than the other way around.

Admittedly, implementing such an approach would require a significant culture shift. Failure of an acquisition program currently means cancelation before it is fielded. Congressional oversight kicks in based on costs and schedule, with programs presumed terminated for certain breaches of cost thresholds.[52] High costs and delays are easy to target as "waste." It is much harder to legislate against a lack of technological ambition, when missing a technological leap becomes clear only in war. Audacious technological advances will run roughshod over budgets and timelines—how does one estimate these things for something never done before? By this way of thinking, *waste* is buying large quantities of equipment that reach obsolescence in the field, rather than expiring as unexecuted options. *Failure* means being late with a technology. We should celebrate options that the military lets go, since letting go means we saved a big bet that would have grown obsolete before it was needed in combat. Thinking of acquisitions as investing in technology and capability options rather than purchasing equipment means diversifying to mitigate surprise (not risk of fielding), containing downside potential while maximizing upside opportunities, and accepting small losses in pursuit of big gains.

Conclusion and Recommendations

Despite the small chance for a sustained major peer war, the existing size of the American military, and the existing production capacity relative to potential demands from such a war, several questions remain for further research:

- To what extent does military production rely on Chinese components or supply systems, which would be at risk during a war with China? DOD is already working on this par-

ticular question.[53] Again, an options approach makes sense. Peacetime acquisition could leverage the cheapest suppliers, but industry should maintain an option on inputs robust to wartime supply restrictions.

- How vulnerable is the industrial base to attack? Adversaries were unable to contest previous U.S. mobilizations, but modern wartime production would be less benign. Industry must produce under attack, at least through space and cyberspace.
- Does the United States have more than one answer to every technological challenge it might face in such a war? Developing options by mastering the technology, production, and tactics should be the priority. Then, only when required and with the latest information (perhaps even from initial combat), DOD could execute options to tailor the fielded force to the nature of the war as it becomes clear. Options rather than big bets mitigate the uncertainty over what form potential wars might take. They are the antidote to the Maginot Line.

At the same time, none of these mobilization issues or concerns should drive an outsized policy change. Chances of a war with China are slim. Chances that such a war would demand widespread conversion of the civilian economy to military production are slimmer still. Other causes of war mobilization are even less likely. Only China appears economically capable of challenging the United States in the kind of sustained major war that might require mobilization. The U.S. military is already comparable in size—and superior in capability—to that of China, even considering global American commitments. The productive capacity of the U.S. military industrial base already comes close to replacing losses in most scenarios for such a war, and expanding this industrial base to outproduce worst case losses requires a much smaller economic conversion than the mobilization efforts in the world wars. Mobilization could easily become a red herring, driving resources away from more pressing matters, both within the defense budget and within the halls of strategic thought. Even thinking about mobilization generally should focus more on other reasons to harness resources—as COVID-19 has shown—rather than marshaling them for war.

How to mobilize, then, is the wrong question. The right question is how to equip future wartime leaders with the broadest sheaf of technologies, since we cannot predict which will be the right ones, and then train them to make flexible decisions over their use. The nature of the war they could fight might be surprising. Preparing for that uncertainty means developing many options, not placing a few large bets, regardless of how promising a technology appears. This preparation requires a shift in strategic mentality, reframing perspectives on cost, risk, waste, and value. Big bets could turn out far worse. In fact, they could leave strategic choices in someone else's hands altogether. **JFQ**

Notes

[1] Joint Publication 4-05, *Joint Mobilization Planning* (Washington, DC: The Joint Staff, October 23, 2018), ix.

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