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America's Operational Imperatives

Some Budgetary Considerations

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Introduction

Following the collapse of the Soviet Union over forty years ago, national security planners expressed optimism. The United States was "the only nation with the military to influence events globally" and Washington was "heartened and encouraged" that the "hammer and sickle no longer flies over Moscow."[1] President George H. W. Bush would observe that we had "entered a remarkable stage in our relationship with the Soviet Union," allowing us to "narrow our differences and seize this historic opportunity to help create lasting peace."[2] Today, in startling contrast, threats abound, gloom predominates, and America's economic, political, and military strength, and resolve, are in question. Russia's invasion of Ukraine and China's looming threat to Taiwan underscore this transformation.

In the post–Cold War period, Pax Americana and the concurrent period of Western ascendency undergirded a relative peace that was founded on liberal values, democratic governance, and free markets. The predominant views through the 1990s and 2000s were that nations were drawing together around Western values, particularly political and economic liberalization. This direction of progress seemed inevitable, and US military and economic strength overmatched any potential rival.

America's power relative to other powers was at its apex. The economy had grown robustly from the reforms of the Reagan revolution. The Reagan military buildup modernized and equipped all the armed services and broke new

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ground with the Strategic Defense Initiative and other programs. Russia was mired in a deep economic depression, its military in shambles. Communist China, still reeling from the Tiananmen Square demonstrations, had not yet fully opened up its economy, and its military still adhered to antiquated doctrines of the people's war. Iran was emerging from the catastrophic, decade-long war with Iraq. North Korea was experiencing a famine. The major powers of Europe were consumed with the creation of the European Union, while Germany dealt with the assimilation of East Germany. India, for its part, was on the verge of an economic crisis.

The 1992 National Military Strategy explained that the US would now move away from threat analysis as a basis for planning, since there were no significant threats facing the United States. It observed that "we can still point to a North Korea, a weakened Iraq, and perhaps even a hostile Iran," and there may be "one or two added to such a list without straining credulity" but the real threat was "the threat of the unknown."[3] As one military analyst later observed, "a strategy oriented on a potential enemy was out."[4]

The 1993 Defense Department's Bottom-Up Review set the foundation for major cuts in the US defense budget.[5] Defense Secretary Les Aspin explained that the Department of Defense (DoD) would reduce its combat forces and make related cuts in "support forces, the massive and costly infrastructure of bases, centralized maintenance and supply facilities—all of which were built up during the Cold War." Total active-duty personnel declined from 1.6 million to 1.4 million. The "bottom line of the Bottom-Up Review," he said, "was that most elements of the force will be smaller."[6] The budget cuts that took place were known as the "peace dividend" and persisted throughout the Clinton administration.

The hope during this period was that China could become a responsible stakeholder in the international system.[7] The United States welcomed the "rise of a stable, peaceful, and prosperous China" and hoped that constructive relations could deliver benefits around the world.[8] This view was the basis for China's entry into the World Trade Organization (WTO). While there were some concerns about China's growing military investments, the Pentagon explained that the People's Liberation Army (PLA) had a large but somewhat obsolete force: its "emergent cyber capabilities were rudimentary; its use of information technology was well behind the curve; and its nominal space capabilities were based on outdated technologies for the day."[9] Fundamentally, US defense experts viewed China as a regional, not global, power and argued that its military modernization goals were "to create a force sufficient to defend against any regional opponent, maintain the credibility of

territorial claims, protect national interests, maintain internal security, deter any moves by Taiwan toward *de jure* independence, and deter aggression."[10]

Today, as evident in the National Security Strategies of the Trump and Biden administrations, leaders of both political parties accept that we have entered a new era of great-power competition. Moscow continues its attempts to conquer Ukraine; it projects military power into the Middle East and conducts hybrid aggression around the world. Beijing has pursued a breathtaking decades-long military buildup, founded on economic growth catalyzed by access to export markets when it was granted ascension to the WTO. It continues to make illegal claims to sovereignty over the South China Sea, has sought to create a chain of civilian and military maritime facilities across the Indo-Pacific region, and appears to be preparing to coerce Taiwan into unification on China's terms. In addition, Russia and China have proclaimed a partnership with "no limits," designed to challenge the US-led international order and to discredit the idea of universal democratic values. Iran, working through proxies in Iraq, Syria, Lebanon, and Yemen, seeks to dominate the region through the so-called Axis of Resistance and is once again approaching the status of a nuclear threshold state.

The unipolar moment enjoyed by the United States lapsed within two decades, with American power going from uncontested to contested in virtually all military domains. Across the traditional domains of warfare—land, sea, and air—the United States could no longer operate freely. The spread of technologies and the development of new weapons systems, from precision-guided munitions to unmanned autonomous vehicles, meant that America's ability to find and hold targets at risk; supply and safeguard its forces abroad; freely navigate the seas and control sea lines of communication; and protect its homeland had now diminished, significantly. In the critical regions of Eurasia, rival powers sought to create anti-access/area denial zones—areas where US power projection assets would be under threat of ballistic missiles, airpower, and other systems. Due to the proliferation of accurate and extremely fast (even hypersonic) weapons systems, the ability of US aircraft, ships, and troops to get to where they needed to go, on our terms, was gone. With these developments, much of what had given the US military overmatch against its rivals was gone.[11]

While the US defense budget remained the largest in the world, America's relative advantages were declining. US goals and commitments remained the same, including keeping threats away from the homeland, preserving favorable military balances in key regions, and preserving access to global commons of the sea, air, cyber, and space.[12] As rivals recovered and threats rose,

resources were stretched thin. It has already been several years since the National Defense Panel pointed out that US military superiority had "eroded to a dangerous degree."[13]

Perhaps one of the biggest shifts in this period has been technology—both as a driver of change and as a domain of competition itself. As the Cold War ended, the internet had barely made a dent in the world. In 1992, less than 1 percent of the world was using the internet, while today that figure is closer to 60 percent.[14] In recent years, US leadership in emerging technologies has been increasingly challenged, primarily by China.[15] Technology is at the heart of a long-term, systemic competition between open, democratic societies and closed, authoritarian systems to shape the future of the international rules-based order.[16] New technological developments will emerge from multiple countries with less warning. This will put increasingly sophisticated capabilities in the hands of small groups and individuals, as well as nation-states.[17]

The United States now faces a formidable pacing threat in China, which under President Xi Jinping's rule continues to pursue military modernization with the goal of developing a world-class military by 2049 that is capable of fighting and winning global wars. In 2020, the Pentagon's annual report on China noted that the PLA's goal is to become "equal to—or in some cases superior to—the US military, or that of any other great power that the People's Republic of China (PRC) views as a threat."[18] The DoD report adds that "the PRC has marshaled the resources, technology, and political will" to do so.[19] It is widely accepted that China's goal is to achieve leadership in key technology fields by 2030—particularly those it sees as critical to its military and economic future, such as biotechnology, advanced computing, and artificial intelligence (AI).

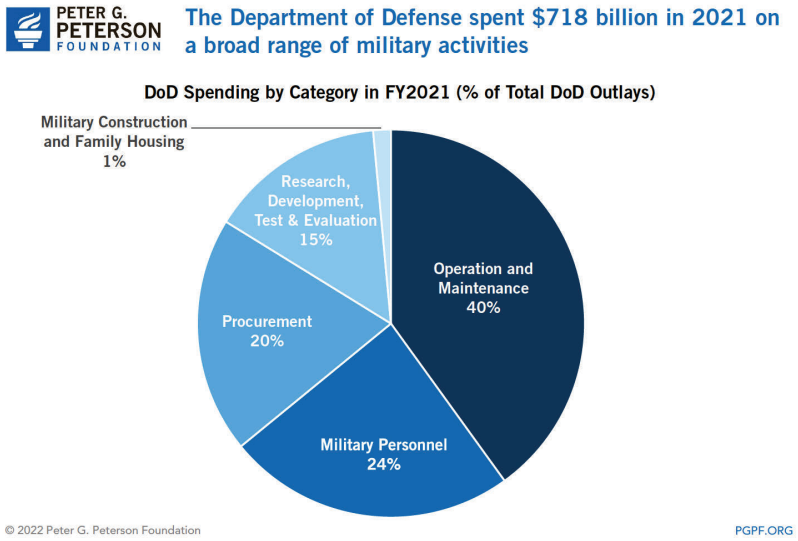
In the broadest sense, the world seems to be fragmenting politically, economically, militarily, and technologically. Globalization is, to a degree, being replaced by regionalization, with countries around the world—from the Middle East to Southeast Asia—seeking opportunities to hedge against the broader US-China systemic rivalry. The United States and China are locked into competition over two different political and economic systems.

This highly contested world is creating a range of operational challenges for the Defense Department, which in turn have budget implications. The purpose of this paper is to describe four of these, which the United States must address if we are to preserve deterrence and to ensure that if deterrence fails, the United States can prevail militarily to protect the safety and security of the American people well into the future.

These challenges are (1) resetting US strategic forces for the second nuclear age; (2) rightsizing and integrating US and allied conventional forces; (3) restoring the US defense industrial base to support a protracted war; and (4) preserving freedom of action in space. All will require a combination of new investments, weapons systems, processes, and force employment concepts that must come together. And undergirding all of these challenges is the cross-cutting need to integrate the software required to upgrade these domains and to protect our ability to operate in cyberspace, which links many of these challenges. Failures in these foundational areas will undercut our chances of success.

There are, of course, more than four challenges facing the department. But these are starting points in considering the range of budgetary pressures in the future. Moreover, they may offer a different way of thinking about how to evaluate the defense budget.

The five categories depicted in figure 6.1 have been in existence for decades.[20] The key strategic question, however, is how these categories of



Note: The "Other" category, which accounted for about 0.2 percent of DoD spending in FY2021, is presented in this chart as part of the Operation and Maintenance category.
Source: Peter G. Peterson Foundation, from data provided by the Office of Management and Budget, *Public Budget Database, Budget of the United States Government: Fiscal Year 2023*, March 2022.

spending come together to shape and advance progress on the operational problems that the Defense Department faces. That is a much harder number to assess, but it is an approach that might give us better insights into the degree to which the United States is actually prepared to deter adversaries and, if necessary, to fight and win.

Nuclear Operational Challenges

The Shift

In fall 2022, two former senior Pentagon officials testified before Congress that the United States faces the most "complex configuration of questions about nuclear weapons that it has ever faced since the onset of the nuclear age."[21] The United States now faces a world with three major nuclear powers, along with lesser but rising nuclear powers; qualitative changes in nuclear weapons themselves; challenges related to defending against ballistic missiles and new types of missiles such as hypersonics; and the destabilizing implications of AI and other software on nuclear command-and-control infrastructure.

The years following the Cold War were dominated by a focus on Russia's nuclear arsenal, an arms control regime centered on Washington and Moscow, and a commitment to maintaining the US strategic nuclear triad. Every Nuclear Posture Review since the early 1990s affirmed the importance of doing so, arguing that a mix of delivery systems, each with different characteristics and attributes, would enhance strategic stability by ensuring that no adversary could conduct a successful first strike and thereby eliminate the United States' ability to respond to a nuclear attack.[22] This led to unilateral reductions in US-deployed nuclear weapons.

Today, although Russia is bound by New START, it has refused to allow on-site inspections since the onset of the COVID-19 pandemic. It violated the terms of the INF Treaty by testing weapons with a prohibited range. It has maintained a robust capability at the tactical nuclear level as part of its doctrine to "escalate to de-escalate," which implies that such weapons might be employed to coerce opponents in a conventional conflict.

Regarding China, the US intelligence community has warned that Beijing is pursuing the "most rapid expansion and platform diversification of its nuclear arsenal in its history."[23] China's nuclear buildup puts it on a trajectory to become a nuclear peer of the United States in *qualitative* and *quantitative* terms by 2030.[24] Some experts believe that China has adopted a strategy of limited nuclear first use whereby China could use the threat of

nuclear weapons to achieve its objectives, such as deterring a US intervention or coercing Taiwan. Overall, China seems poised to shift from a minimum deterrence posture to one that suggests a more coercive nuclear strategy.[25]

The nuclear arsenals of other countries are also growing. India and Pakistan are both credible nuclear powers with nearly identically sized arsenals.[26] A 2021 RAND study projected that North Korea could have around two hundred nuclear weapons stockpiled by 2027.[27] And Iran's ability to enrich uranium at high enough levels to produce a nuclear weapon is now measured in months.[28]

DoD Imperatives

Given these developments, US nuclear strategy, force structures, and doctrine—all of which assumed a bipolar nuclear order—must be rethought. Similarly, the US nuclear modernization program must be revisited in light of new circumstances. All of these shifts have serious implications for a deterrence construct that has kept nuclear peace for over half a century—and have significant budget implications as well. Four particular challenges stand out.

First, it must address qualitative issues by continuing to modernize US nuclear delivery systems and weapons to ensure they remain effective, safe, and reliable. While there is bipartisan support thus far for this mission, it must be sustained. As the head of US Strategic Command put it, he is working with "submarines built in the 80s and 90s, an air launch cruise missile built in the 80s, intercontinental ballistic missiles built in the 70s, a bomber built in the 60s, and part of our nuclear command and control that predates the internet."[29]

Second, the department must ensure that the US nuclear force structure is adequate to deter two peer competitors *simultaneously*, as well as countries such as Iran and North Korea. With this larger pool of competitors, the number of considerations required to maintain deterrence increases.[30] Already this new dynamic is challenging Washington.[31] As one expert put it, when you "move this into a three-party problem, it is a completely different set of effects, dynamics, that needs lots of work to understand."[32] Deterrence is not just based on the existence of nuclear forces but also on the ability to hold at-risk assets most valued by an enemy.[33] In today's world, there are more of these assets to consider.

Third, the US must maintain a credible missile defense posture. Over a decade ago, the Obama administration's missile defense review outlined the need for a more ambitious approach toward Europe and other regions so that the United States and its allies could defend against short-, medium-, and

intermediate-range missiles, as well as against missiles that could threaten the US homeland.[34] These challenges have intensified. Today, in addition to ballistic missiles, the US must be able to defend against ballistic missiles with maneuvering reentry vehicles and hypersonic systems that give adversaries the ability to hold forces at risk from hundreds, even thousands, of miles away, with flight times that are measured in minutes. Hypersonic missiles, in particular, create significant defense challenges due to their speed and maneuverability, making them ideal first-strike weapons. Defenses will need to explore new approaches to these weapons, such as the ability to detect and destroy missiles in the boost phase as well as the use of directed energy weapons for interception, which in turn will require additional resources.[35]

Finally, AI and machine learning will impact nuclear arsenals and command-and-control infrastructure, adding to the challenges presented by the nuclear domain. While AI could offer commanders improved situational awareness, it could also increase instability.[36] For instance, in cases of multilateral nuclear deterrence, a state may perceive that an adversary's investment in AI, even non-nuclear-related, could give that adversary the ability to threaten the state's future second-strike capability.[37] As one expert put it, the question is less "whether nuclear-armed states will adopt AI technology into the nuclear enterprise, but rather by whom, when, and to what degree."

In FY2021, the Congressional Budget Office (CBO) estimated that plans for nuclear forces based on DoD and Department of Energy budget requests would cost a total of $634 billion over the 2021–2030 period, *provided those plans did not change or experience any cost growth or schedule delays*.[38] My emphasis is added to illustrate that key caveat. Given that in the past, actual costs were close to 30 percent higher than originally predicted, this trend will likely continue into the future. Moreover, these CBO estimates do *not* include several categories of costs that are critical to the nuclear domain as well, such as the DoD's overhead and support costs; the costs of dismantling retired nuclear weapons and environmental cleanups; the costs of antiproliferation efforts; and perhaps most importantly, the costs of developing and maintaining active defenses against other countries' nuclear weapons.[39]

Operational Challenge: Integrating Coalitions Better

The Shift

US policy makers consistently herald the strength of America's alliances. The Biden administration's 2022 National Security Strategy reaffirmed that America's "alliances and partnerships around the world are our most

important strategic asset" and are indispensable to peace and stability. Yet the ability of the United States and its allies and partners to fight together in highly contested environments in a fully *integrated* manner remains open to question. Working with allies means that the United States can present adversaries with multiple dilemmas. The proximity of allies to key theaters allows for the forward staging of US equipment or better intelligence collection, and of course, such alignments are helpful politically as well.[40] But forward positioning and political unity are quite different from operating together on a battlefield.

The complexity of regional security environments and proliferation of military capabilities, however, make it impossible for the United States to deter or, if required, fight and win alone. The United States does not have or cannot amass capabilities at scale without partners. For example, in the East China Sea, Japan brings significant air defense capabilities.[41] The South Korean Marine Corps is the second largest in the world.[42] As retired US Forces in Europe Commander LTG Ben Hodges put it, "We have no choice but to be in multinational task forces because the United States doesn't have enough capacity to do all that is required."[43]

America's decisive victory in the Gulf War in 1991 created expectations of continued US military dominance; many believed that the United States could shoulder the burden of stability for the world. At the time, two former Defense Department officials observed that "the United States and its allies currently have no strategic understanding that common interests should be defended jointly" and that "current US defense strategy, plans, and preparations are essentially unilateral."[44]

The Defense Department's 1993 Bottom-Up Review did not mention burden sharing and referred to allied capabilities almost as an afterthought. Over a decade later, the 2005 National Defense Strategy assumed that the United States would have no global peer competitor and remain unmatched in military capabilities.[45] In the last year of the Bush (forty-three) administration, the 2008 National Defense Strategy focused on a global struggle against violent extremist ideologies. The focus was on "certain low-risk missions such as peacekeeping and humanitarian assistance."[46] There was no premium placed on integrating higher-end capabilities with allies and partners.

Even as the Obama administration affirmed that the United States would "defend the territorial integrity of every single Ally," the reality was that the United States would likely have trouble fulfilling that pledge.[47] Several war games conducted around that time found that NATO would not be able to

defend the territory of the Baltic states in the face of aggression by Russia.[48] The challenges have only grown more complex over the past decade, particularly as China continues to modernize its military and develop its power projection capabilities.

DoD Challenges

The strategic advantages to be gained through coalition operations depend on the ability to operate in a truly integrated manner with high-end capabilities. This will require additional resources, focused attention, and a commitment to reducing stubborn obstacles. Improvements in the ability to fight together are needed across at least five key areas.

First, significant communications challenges exist at the tactical, operational, and strategic levels. At the company and battalion levels, for example, radios must be able to operate inside challenging cyber or electronic warfare environments. At the operational and strategic levels, allies must share a common operating picture (COP) and improve their command-and-control architectures amidst diverse devices and operating systems.[49] In Asia, in particular, US alliances lack the type of structures that NATO has to support integrated command and control and to drive multilateral operations.[50] As a former US military attaché to Japan observed, "Until the US III MEF commander and the local Japanese commander have the same COP on a screen somewhere, any talk of a secure alliance is just a lot of talk."[51] Another retired US military officer explained, "better digital integration is critical."[52]

Second, high-end combined warfare requires that allies integrate their digital fires. The radar of one country needs to be able to relay targeting information to the fire direction center and then onto weapons systems tasked with strike or counter-fire missions. "If you can't do that in a very short amount of time, then you're never going to be able to strike back at who's shooting at you," observed now-retired US Army General Ben Hodges.[53] In artillery or rocket exchanges in Europe, the United States and its allies must shoot back at adversary missile launchers before they can move. This creates a situation in which US forces might track enemy fires using radar systems in one country, relay information to a command post in a second country, and fire back with weapons systems in a third country. This "kill chain" might require three minutes to execute, and it must be connected by secure networks.

Third, the United States must reduce the byzantine bureaucracy of Foreign Military Sales (FMS) that prevents the timely provision of equipment,

weapons, and services to its partners. The backlog of FMS orders is immense. In one of the most important theaters in the world, Taiwan, equipment delays are so great that they threaten the ability to execute operational plans to defend the island. There is a three-year backlog in the delivery of $14.2 billion worth of military equipment, including everything from F-16 fighters to the components needed for Patriot missile systems.[54] Sales of the F-16s were approved in 2019 but Taipei does not expect delivery until 2026.[55] The DoD has blamed the backlog on COVID-19, but delays like these have been problematic for years all around the world, and they create budget inefficiencies as well as a mismatch between appropriated funds and actual security outcomes.[56]

Related to these FMS problems are outdated laws—such as the International Traffic in Arms Regulations—that prevent Washington from sharing information with key allies such as Australia and the United Kingdom. Without updates to these laws, for example, Australia cannot service US-made helicopters and naval fighter jets or even receive bolts for US-made aircraft that are flown by the Australian military.[57] As several experts put it, these outdated laws are "unintentionally handing a technological and military advantage to adversaries."[58] And as the US struggles with streamlining its FMS processes, China has become the fourth largest global arms exporter.[59]

Finally, integration will become even harder as the United States comes to depend upon AI to fight what Alex Karp has called "algorithmic warfare."[60] Uneven adoption of AI across coalitions could threaten interoperability.[61] Not all states will develop military applications of AI at the same rate, and many will be sensitive to sharing information, which means even more difficulty coordinating.[62]

Addressing these deficiencies will have budgetary implications. Too many allies and partners have taken a holiday from defense training and procurement, or worse, even effectively disarmed during the post–Cold War period. If we are to deter today's revisionist great powers, US allies and partners must rearm. However, it is essential that they do so in a war that enables integrated combined operations. This means the United States must work with them to agree on how we will fight—we need an agreed concept of operations in each theater and sub-theater—and then must build forces that can communicate and operate seamlessly together. We have not been in this business for decades. We must step up to the task, and it will require new expenditures across our alliances.

Preserving Freedom of Action in Space

> *The US built a glass house before the invention of stones. . . . The shifting of space from a benign environment to being a warfighting environment requires different capabilities.*[63]

The Shift

Since the United States launched satellites to track and monitor nuclear missiles during the Cold War, it has relied on its space infrastructure to protect its national security. For much of the post–Cold War period, the United States was optimistic that it would enjoy advantages in space capabilities across all mission areas; the DoD believed that these advantages would be maintained by "staying at least one technology generation ahead of any foreign or commercial space power."[64] Space was populated by only a handful of countries, home to relatively few satellites, and largely free from threats.[65] Looking back at that period, Air Force Secretary Frank Kendall observed that it was a time when the United States could "put up expensive systems in space and not worry about them."[66]

Close to ninety countries now have space programs. Some US experts believe that China will overtake the US as the dominant space power by 2032.[67] The space domain is now a critical commercial as well as a warfighting domain. And it's highly contested.

Secure and sustained access to space is essential to US military operations at all levels. Space-based assets provide units on the ground with intelligence, surveillance, and reconnaissance capabilities; satellites are the basis for networked communications across the joint force and are central to concepts such as Joint All-Domain Command and Control.[68] In the strategic realm, our nuclear command-and-control infrastructure depends upon space.

Commercially, space plays a critical role in the US economy. In 2019, the space sector accounted for some $366 billion in revenue.[69] Technologies such as satellite communications and precision navigation and timing play central roles in health care, transportation, communications, energy grids, financial systems, and more. Companies such as SpaceX and Blue Origin have driven down the costs of space launches and developed new technologies and products, but these developments have also led to more congestion and orbital debris.[70] In addition, as the DoD increases its work with private-sector actors in conflict contingencies (as in Ukraine), these interactions will complicate deterrence and military planning.

China and Russia have also dramatically expanded their capabilities in space. Both countries aim to exploit the US reliance on space-based systems.[71] Each has its own space force and is "integrating space scenarios into their military exercises."[72] Both are modernizing and increasing capabilities in nearly all major space categories, including satellite communications, remote sensing, and navigation-related technologies.[73] In the period between 2015 and 2018, China and Russia increased their combined satellite fleets by more than 200 percent.[74] China has also conducted several counterspace capability demonstrations, including the test of a hypersonic glide vehicle.

DoD Challenges

Given that space plays a central role in US economic and national security, the Defense Department must maintain and upgrade its capabilities in at least four primary mission areas. These missions and the required capabilities are interrelated; there are certainly different ways to categorize them, but this is one approach. All have defense budgetary implications.

First, the DoD must be able to provide situational awareness to track activities in space and to warn against incoming ballistic missile and hypersonic threats. Absent timely and reliable missile warnings, Washington risks having only minutes to respond to a crisis. Since the Cold War, the United States has relied on a constellation of satellites in geostationary orbit—about twenty-two thousand miles above the Earth's surface—to warn of a nuclear attack. Two key developments have made this mission much harder. One is that China and Russia now have the ability to threaten these geostationary satellites; another is that both are developing hypersonic weapons that are much harder to track than ballistic missiles. The DoD is pursuing two simultaneous approaches to address these new threats. It is replacing the existing constellation of geostationary and polar-orbiting satellites ("the last of their kind," said the director of the Space Development Agency) and also developing a resilient, layered system of satellites in low Earth orbit and medium Earth orbit.[75] The simultaneous pursuit of these systems will cost billions but offer significant increases in hypersonic missile tracking capabilities.[76]

A second key mission for the DoD is to ensure that its assets in space, and related ground-based infrastructure, are survivable. There are four broad types of counterspace weapons, including kinetic and nonkinetic ones.[77] They have different effects, vary in how easy they are to detect and attribute, and differ in terms of the technology and resources needed to develop and field them.[78] So the US must be able to protect against kinetic threats as well

as nonkinetic threats such as radio frequency interference (jamming, spoofing) and cyberattacks.

Third, since space is a warfighting domain, the United States must be able to conduct offensive as well as defensive operations. Offensive counterspace operations include the ability to "negate an adversary's use of space capabilities, reducing the effectiveness of adversary forces in all domains."[79] Increased investments to respond to counterspace capabilities are required by the 2023 NDAA.[80]

Finally, the DoD has overall responsibility for a space infrastructure that provides reliable services to all aspects of American life. These include next-generation GPS, internet infrastructures, and assets related to imaging, tracking, and cellular services. In the near future, the DoD will oversee the replacement of current GPS satellites. Not only is this complex in and of itself, but it means that all weapons systems that rely on GPS will need to be updated so that they can "talk" to the new navigation system.[81]

The new space force, numbering some eighteen thousand, is charged with recruiting and training personnel and applying new acquisition tools to acquire needed space systems.[82] The DoD's 2023 budget includes $24.5 billion for the US Space Force and the Space Development Agency—about $5 billion more than what Congress enacted in 2022.[83] This is likely to continue to grow. While the objectives are sound, it will take years to rectify the problems. For over a decade, most of the DoD's major space programs have experienced significant cost and schedule increases, with major programs routinely late by three to nine years and over cost.[84]

Upgrading the Defense Industrial Base

The Shift

During the Cold War, the strength of the US industrial base was not in question. It was considered a source of long-term strategic advantage for the United States. It produced the bombers and missiles on which nuclear deterrence rested and armed the US military with world-class weapons and reliable guided munitions that were cheap enough to be employed in large numbers.[85]

With the dissolution of the USSR and the absence of a peer competitor, the concept of "rapid decisive operations" emerged, leading to the view that wars would be short and that the United States could coerce or defeat the enemy "without a lengthy campaign."[86] Underlying this view was a certainty about war. H.R. McMaster, a colonel at the time, criticized the belief that the US could achieve "near certainty" in war and warned that this type of thinking

could lead to bad planning assumptions.[87] By assuming that wars would be short, the United States avoided planning for protracted wars.[88]

The collapse of the Soviet Union also increased pressures to reduce the defense budget and led to the reallocation of a large portion of the budget from national security to other national needs.[89] At the time, the CBO acknowledged that cuts could result in job losses from six hundred thousand to 1.4 million jobs and that industries "readily identified with defense" would suffer.[90] These developments led to the consolidation of defense firms, setting the foundation for the situation today. The government took a hands-off approach to the industrial base, leading to supplier monopolies or duopolies, which in turn began to erode competition.[91] Over time, the DoD became reliant on a smaller number of contractors for critical defense capabilities. Over the last three decades, the number of suppliers in major weapons system categories has declined substantially: tactical missile suppliers declined from thirteen to three, fixed-wing aircraft suppliers declined from eight to three, and 90 percent of missiles come from three sources.[92]

Other trends also contributed to the erosion of the Defense Innovation Board (DIB). These included decisions about manufacturing based on efficiencies over security; an increasingly onerous regulatory environment that, for example, made it hard, if not impossible, for US firms to mine for critical minerals in the United States; and the consistent underfunding of procurement, which led to undersourcing capacity and the recapitalization of legacy systems.[93]

The weaknesses of the defense industrial base came to a head with Russia's attack on Ukraine. As the United States and other NATO allies supplied Ukraine with Javelins and other comparable man-portable missile systems, concerns grew about whether the United States itself had sufficient long-range, precision-strike munitions for even a short conflict, much less a drawn-out one.[94]

DoD Challenges

There are differences between producing and sustaining "advanced weapon systems" and munitions like Javelins, but the five areas discussed below are relevant to a range of weapons systems.[95] They are not in order of priority.

First, the Pentagon needs to increase suppliers, which will only happen if well-known procurement problems are addressed. It has recently called for more competition, arguing that it is an important indicator of the ability to deliver products and key technologies. The DoD has noted that insufficient

competition may leave gaps and result in higher costs since firms can "leverage their market position to charge more and raise barriers for new entrants." But over the past decade, despite new initiatives, it remains very difficult for new entrants. In fact, there have been drops in new entrants of vendors to the DoD.[96] Small businesses actually receiving contract awards plummeted 43 percent from 2011 to 2022.[97]

Second, while the DoD continues to call attention to the problem of supply chain security—in areas from advanced batteries to microchips—a shift in these supply chains could take decades.[98] Many obstacles to relocating manufacturing remain—from the lack of situational awareness on highly complex supply chains (the GAO estimated that the US industrial base consisted of over two hundred thousand companies) to bureaucratic and regulatory obstacles that can add years to meaningful shifts.[99]

Third, maintenance delays have a direct impact on combat capabilities, since aircraft or ships are not available when needed. If the purpose of the DIB is to supply the military with equipment, this counts. One report found that from 2015 to 2019, maintenance delays on aircraft carrier and submarine repairs meant that vessels were not available for operations for close to eight thousand days—that's about twenty years![100] As one retired senior officer put it, it's "the equivalent of losing half an aircraft carrier and three submarines each year."[101] Last year, the GAO noted that the budgetary cost of the backlog of navy restoration and modernization projects increased by over $1.6 billion in the last five years.[102] In addition, the average age of capital equipment continues to increase, and half the equipment is already past its expected service life. The navy's effort to address some of these deficiencies, the Shipyard Infrastructure Optimization Plan, is estimated to cost $21 billion and will take some twenty years to implement. Even if the cost is acceptable, the time period is not. Similar stories abound across the services.

Further complicating maintenance problems is the need to upgrade to advanced manufacturing. As one retired admiral put it, while we need to improve existing physical infrastructure, we also need to take the "opportunity to build the digital infrastructure required to accelerate our readiness advantage."[103] While this may save money over the long term, in the shorter term, capital costs will be high.[104]

Fourth, conceptually, the DoD needs to consider stockpiling as a strategic necessity, since it provides strategic depth. This means it must increase its procurements of systems and weapons to build these stockpiles. Multiyear

contracts are central to this effort.[105] Not only are there deterrent benefits, since adversaries can see preparations, but there are cost benefits as well. Multiyear contracts reduce weapons costs significantly.[106] Yet, every time the Pentagon wants to contract for longer than one year, it needs specific approval from the appropriations committees—even with the current need for sustained purchases of munitions for Ukraine, no multiyear procurements were approved in the tranches of aid passed by Congress since the start of the war.[107]

These problems are compounded when it comes to our allies and partners, all of whom must make qualitative and quantitative overhauls of their munitions stockpiles. A former top official at the German defense ministry stated that no NATO country other than the US has sufficient stockpiles or the industrial capacity to create the necessary reserves to fight a major artillery war.[108] The Royal United Services Institute found that at the height of the fighting in the Donbas area in Ukraine, Russia was using "more ammunition in two days than the entire stock of the British military."[109] This crisis extends to Japan and Australia as well. It's a good sign that the US and Japan are holding talks on stockpiles, but the timeline matters, and as discussed previously, the current process for FMS could take years of negotiation before production can even begin.[110]

The United States does not seek to fight a protracted war. But as defense scholar Andrew Krepinevich explains, the "best way to avoid these costs is to demonstrate to great-power rivals that the United States is capable of prevailing in a protracted conflict."[111] This in turn requires the capabilities to produce and deliver weapons systems and equipment to military forces. Yet well before China was designated a pacing threat and before the war in Europe, experts across the defense enterprise have been sounding warnings about everything from critical mineral vulnerabilities to manufacturing facilities that dated from World War II. Over twenty-five years ago, DoD leaders expressed concerns that due to reductions in procurement, the DoD would lose a "particular supplier or a particular capability."[112] Fifteen years ago, the 2006 Defense Science Board report argued that the DoD must develop a National Security Industrial Vision, and several external studies highlighted problems as well.[113]

Problems exist at all layers: the experts needed to produce weapons systems; the material components of these systems; the factories needed to assemble them; and the companies willing and able to produce them. The problem is now glaring and could very well decide the fate of Ukraine. While it has garnered welcome and high-level Pentagon attention, the roots of the

situation are much deeper and will take more investments, and more than a few years, to fix.

Cross-Cutting Challenges

> *The battlegrounds tell the story of a larger paradox of a techno-economic superpower suffering from strategically significant technological vulnerabilities.*[114]

Improvements across the four operational areas discussed in this paper will depend significantly on the sustained adoption of software upgrades. Software resides in virtually every piece of electronic, from weapons systems to business systems.[115] As one defense tech investor observed, software is taking over the battlefield: autonomous systems, networked weapons, and cyber weapons are all powered by software.[116] Without modernized software, the United States will not be able to derive tactical, operational, and strategic advantages, which could lead to failure in war. As noted in the 2018 National Defense Strategy, the United States needs to be able to "deliver performance at the speed of relevance."[117] Processes for software acquisitions are very different from those for traditional acquisitions, and current DoD processes are "not responsive to need."[118] Thus, the latent power of the US technology ecosystem is not currently being harnessed for national purposes.[119]

Yet software is integral to America's architecture in space, and problems can disrupt the entire ecosystem.[120] Software-dependent capabilities include satellite command and control, early detection and tracking of objects' orbits, GPS signals, and radio communication for military forces. One 2019 GAO study found that four major DoD space programs all faced challenges in using commercial software: they had used outdated software tools and had "limited knowledge" of newer software developments.[121] These programs ended up costing up to three times original estimates and had been in development for periods ranging from "five to over twenty years." As reliance on unmanned systems increases, which in turn depends on space-based assets *and* the integration of AI, these problems will become more pressing.[122]

The US nuclear arsenal also relies heavily on software. As the vice chairman of the Joint Chiefs of Staff explained, "the common thread for all missile defense systems is, can I see the threat coming at me. . . . The big piece is not shooters but sensors."[123] Fundamentally, sensors depend on software. The nuclear enterprise is rife with cybersecurity risks, and the National Nuclear Security Administration continues to struggle with this problem.[124]

Alarmingly, a 2016 GAO study found that the DoD still utilized a legacy system, which relied on eight-inch floppy disks to operate its nuclear forces.[125] Delays in modernizing the Columbia-class nuclear submarine were related to integrating a new "design software tool."[126] Similarly, the air force's long-range standoff weapon, designed to penetrate air defense systems and deliver a nuclear payload, had not acquired the most up-to-date software and as a result, its guidance and control system was approaching maturity.[127]

Software also affects virtually all levels of US and allied integrated operations, from communications to the coordination of direct fires. The war in Ukraine has made the need to develop and field an integrated battle management command-and-control system even more pressing.[128]

Some of these software integration problems are due to the DoD's fundamental ambivalence about whether it is a "consumer" or a "creator" of software.[129] Defense analysts Bryan Clark and Dan Patt have described how at times, the DoD focuses on procuring externally developed software faster. But in other cases, it aims to develop its internal expertise. Yet to fully benefit from the extraordinary advances in software by the private sector, the DoD will need to embrace its primary role as a consumer, not a creator. It must begin to think of commercial suppliers as partners or retailers and not as contractors.[130]

Conclusions

It is perhaps trite to observe how much has changed since America's relatively unmatched power during the post–Cold War period and, in particular, the loss of its relative power since that time. This paper has sought to describe just some of the sweeping changes over the past two decades, particularly those in the military and economic realms. These developments have created challenges for the defense enterprise, requiring both the development of new or refined operational concepts and additional or reallocated resources.

Yet reaffirming the scope of how the world has changed and its impacts on American power remains important if only to highlight how much of our defense infrastructure and the processes that undergird the department have *not* actually changed. Indeed, much of it remains stubbornly archaic, which is crippling America's ability to respond to new threats. The Biden administration's 2022 National Security Strategy is correct in noting that the next ten years will be the "decisive decade," one which will determine "our competitive position long into the future." I am not sure we have ten years. To buy us some time, there are three considerations that will affect the ability of policy makers to develop and implement the operational concepts required to meet

new and emerging threats. All are relevant to the much broader range of challenges the DoD faces.

First, policy makers must ask why so many past efforts to address longstanding problems have failed. Very few new officials are "present at the creation." Virtually every challenge discussed in this paper has been recommended for over a decade, if not more. Unless defense officials begin their initiatives by identifying the underlying obstacles to change and actually spend the bureaucratic capital required to reduce those obstacles, new effects are unlikely. The stakes for addressing these persistent obstacles are high. They will continue to impact the ability of the United States to field new capabilities such as hypersonics. For instance, at a recent meeting with top DoD leaders, CEOs of defense firms expressed concerns about supply chain constraints, acquisition barriers, budget instability, and access to test facilities.[131]

Second, policy makers need to consider the implications of the limited flexibility in the defense budget. In a sense, the budget is a microcosm of the characteristics of the entitlement programs John Cogan describes in his recent book, *The High Cost of Good Intentions*.[132] As one defense budget expert observed, between two-thirds and three-quarters of the budget is essentially fixed, even before the changes needed to address new threats.[133] In practice, this means few "flexible dollars" to address new requirements. And it is projected that with an inflation rate of 7 to 8 percent, the DoD would lose $100 billion of purchasing power in the next five years.[134]

Third, we might consider better ways to assess how existing categories of defense spending—categories that have been fixed for some forty years—actually come together to address operational challenges that the DoD needs to address. It is difficult to assess how the resources within each category combine to address an operational challenge since most require the integration of many types of capabilities. For instance, to develop advanced manufacturing in our defense industrial base requires investments in AI, plant facilities, and in people. These "inputs" draw from different spending categories. That is a much harder number to assess, but it is an approach that might give us better insights into the degree to which the United States is actually prepared to deter adversaries and, if necessary, to fight and win.

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