The Heritage Foundation

2021 INDEX OF
U.S. MILITARY STRENGTH

edited by
Dakota L. Wood

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Contents

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Acknowledgments

The contributions of a great many people make this type of publication possible. Among them, a few special contributors have that extra talent, work ethic, and willingness to go the extra mile that make the *Index of U.S. Military Strength* a remarkable and uniquely special undertaking.

James Di Pane, Research Associate in the Center for National Defense, ably shouldered the major task of shepherding production of the *2021 Index of U.S. Military Strength*. He worked with the authors, editors, and graphics and production professionals to make this *Index* a reality, both in print and on the web.

Once again, Senior Editor William T. Poole reprised his central role in maintaining a consistent tone, impeccable accuracy, and a fresh approach to conveying essential information throughout this multi-author document, and Research Editor Kathleen McCann Scaturro applied her keen editorial eye to the topical essays. Data Graphics Services Manager John Fleming and Data Graphics Designer Luke Karnick sustained their impressive contributions in giving visual life to text and statistics to convey a message with maximum impact, working with the authors to explore more creative ways to convey important information. Senior Designer and Web Developer of Research Projects Jay Simon, Digital Strategy Director Maria Sousa, and Digital Content Producer Augusta Cassada ensured that the presentation of *Index* materials was tuned to account for changes in content delivery as our world becomes increasingly digital, portable, and driven by social media. Finally, the guidance and coordination provided by Director of Research Editors Therese Pennefather ensured the creation of a cohesive finished product.

We believe that this *Index* helps to provide a better-informed understanding and wider appreciation of America's ability to "provide for the common defence"—an ability that undergirds The Heritage Foundation's vision of "an America where freedom, opportunity, prosperity, and civil society flourish." The *Index* continues to be cited and referenced across government—by Congress, the executive branch, and officials within the Department of Defense and supporting government agencies—as well as the media, academia, and policy institutes and among the public. We remain encouraged that so many Americans are similarly concerned about the state of affairs in and the multitude of factors affecting our country.

The Heritage Foundation seeks a better life for Americans, which requires a stronger economy, a stronger society, and a stronger defense. To help measure the state of the economy, our Institute for Economic Freedom and Opportunity publishes the annual *Index of Economic Freedom*; to help guide Congress in its constitutional exercise of the power of the purse, Heritage scholars analyze federal spending across all sectors of the economy and put forward recommendations throughout the year urging Congress to be better stewards of taxes paid by all Americans; and to help Americans everywhere more fully understand the state of our defenses, our Kathryn and Shelby Cullom Davis Institute for National Security and Foreign Policy is publishing this seventh annual edition of the *Index of U.S. Military Strength*.

In addition to acknowledging all of those who helped to prepare this edition, very special recognition is due to the Heritage members and donors whose continued support has made this *2021 Index of U.S. Military Strength* possible.

Finally, as always, The Heritage Foundation expresses its enduring appreciation to the members of the U.S. armed forces who continue to protect the liberty of the American people in an increasingly challenging world.

Preface

As Americans, we understand that we are fortunate to live in a country with unparalleled peace, prosperity, and freedom. We also understand that these things have come at a high cost and that they are maintained only through eternal vigilance. Our powerful, ready, and valiant military has prevented our adversaries—from Communist dictatorships to terrorist state and non-state actors—from destroying what so many lives and so much treasure have been sacrificed to preserve.

President Ronald Reagan aptly called it "peace through strength."

At a time when the nation is reeling from a deadly disease outbreak, racial unrest, and economic upheaval, we must avoid the tendency to turn inward and ignore the many looming outside threats to our security.

The U.S. has maintained military superiority for so long that many take it for granted, but it is far from guaranteed. Though our men and women in uniform use what we have provided them effectively, they are still using decades-old ships, planes, tanks, and other equipment that desperately need upgrading—all while the capabilities of those who would do us harm continue to grow.

The governments of Russia and Communist China are openly hostile to the United States and have attempted to influence our elections, have threatened our allies, and have spread propaganda through our media. They continue to build up their militaries, including their nuclear capabilities, which they use for aggression, not for maintaining peace. In its quest to dominate the world, China is growing military spending by more than 6 percent a year while the U.S. defense budget is not even keeping up with inflation.

If our adversaries ever gained the upper hand against us militarily, it would take years for us to catch up, and by that time, it would be too late. When they've had the upper hand with other nations, they've shown their propensity to use it.

We must ensure that the bad actors who desire to dominate and destroy other nations—including our own—never win this competition, but the United States can be assured of that only if we have a defense budget that is sufficient to support our current troops and equip them for the future.

When addressing West Point graduates in 1981, President Reagan stated, "A truly successful army is one that—because of its strength and ability and dedication—will not be called upon to fight, for no one will dare to provoke it." No one wants war, and we should make every effort to deter future wars, but deterrence is premised on being able to credibly demonstrate the ability to cause potential opponents to regret their actions.

We Americans carry insurance on our vehicles, homes, and health because we know that bad things can happen despite our best efforts to prevent them. The U.S. armed forces are America's insurance policy against emerging dangers from around the world. Just as it is too late to buy a homeowner's policy after your house is on fire, when something inevitably happens that threatens our country, our people, and our way of life, it will be too late to build the military we suddenly find that we desperately need.

It is the constitutional obligation of our government to provide for the common defense, and it is our individual responsibility to hold our government accountable for doing so. This *2021 Index of U.S. Military Strength* is The Heritage Foundation's contribution to informing our leaders and the American public about the status of our military in relation to our adversaries.

We take that responsibility very seriously, and we hope that this report card on the U.S. armed forces helps decision-makers to be better informed and helps citizens to hold their elected representatives accountable for providing adequately for our nation's defense. In doing so, we can all play our part in ensuring that America's founding promises of peace, prosperity, and freedom remain promises kept—both for this generation and for generations of Americans yet to come.

Kay C. James, President
The Heritage Foundation
October 2020

Introduction

The United States maintains a military force primarily to protect the homeland from attack and to protect its interests abroad. There are obvious secondary uses—assisting civil authorities in times of emergency, for example, and maintaining the perception of combat effectiveness to deter enemies—that amplify other elements of national power such as diplomacy or economic initiatives, but America's armed forces exist above all else so that the U.S. can physically impose its will on an enemy and change the conditions of a threatening situation by force or the threat of force.

The Heritage Foundation's *Index of U.S. Military Strength* gauges the ability of the U.S. military to perform its missions in today's world and assesses how the condition of the military has changed during the preceding year.

The United States prefers to lead through "soft" elements of national power—diplomacy, economic incentives, and cultural exchanges—but soft power cannot substitute for raw military power. When soft approaches like diplomacy work, their success often owes much to the knowledge of all involved that U.S. "hard power" stands ready, however silently, in the diplomatic background. Soft approaches cost less in manpower and treasure than military action costs and do not carry the same risk of damage and loss of life, but when confronted by physical threats to U.S. national security interests, it is the hard power of the U.S. military that carries the day. In fact, the absence of military power or the perception that one's hard power is insufficient to protect one's interests will frequently—and predictably—invite challenges that soft power is ill-equipped to address. Thus, hard power and soft power are complementary and mutually reinforcing.

The decline of America's military hard power, historically shown to be critical to defending against major military powers and to sustaining operations over time against lesser powers or in multiple instances simultaneously, is thoroughly documented and quantified in this *Index*. It is harder to quantify the growing threats to the U.S. and its allies that are engendered by the perception of American weakness abroad and doubts about America's resolve to act when its interests are threatened.

The anecdotal evidence is consistent with direct conversations between Heritage scholars and high-level diplomatic and military officials from countries around the world: The perception of American weakness—in the aging and shrinking of America's military forces and in their reduced presence in key regions since the end of the Cold War—is contributing to destabilization in many parts of the world and prompting old friends to question their reliance on America's assurances. For decades, the perception of American strength and resolve has helped to deter adventurous bad actors and tyrannical dictators. Regrettably, both that perception and, as a consequence, its deterrent effect are eroding.

Recognition of this problem is growing in the U.S. and was forcefully addressed in the 2018 National Defense Strategy (NDS), which called for a renewal of America's military power. However, spending on defense must be commensurate with the interests the defense establishment is called upon to protect, and there continues to be a significant gap between

the two. Meanwhile, America's allies continue to underinvest in their military forces, and the United States' chief competitors are hard at work improving their own. The result is an increasingly dangerous world threatening a significantly weaker America.

This can seem odd to many observers because U.S. forces have dominated on the battlefield in tactical engagements with enemy forces over the past 30 years. Not surprisingly, the forces built to battle those of the Soviet Union have handily defeated the forces of Third-World dictators and terrorist organizations. These military successes, however, are quite different from lasting political successes and have masked the deteriorating condition of the military, which has been able to undertake such operations only by "cashing in" on investments made in the 1980s and 1990s. Unseen by the American public, our military readiness has been consumed at a rate that has not been matched by corresponding investments sufficient to replace the equipment, resources, and capacity used up since September 11, 2001.

It is therefore critical that we understand the condition of the United States military with respect to America's vital national security interests, the threats to those interests, and the context within which the U.S. might have to use hard power. It is likewise important to know how these three areas—operating environments, threats, and the posture of the U.S. military—change over time, given that such changes can have substantial implications for defense policies and investments.

The U.S. Constitution opens with a beautiful passage in which "We the People" state that among their handful of purposes in establishing the Constitution was to "provide for the common defence." The Constitution's enumeration of limited powers for the federal government includes the powers of Congress "To declare War," "To raise and support Armies," "To provide and maintain a Navy," "To provide for calling forth the Militia," and "To provide for organizing, arming, and disciplining, the Militia" and the power of the President as "Commander in Chief of the Army and Navy of the United States, and of the Militia of the several States, when called into the actual Service of the United States."

With such constitutional priority given to defense of the nation and its vital interests, one might expect the federal government to produce a standardized, consistent reference work on the state of the nation's security. Yet no such single volume exists, especially in the public domain, to allow comparisons from year to year. Recently, the Department of Defense has moved to restrict reporting of force readiness even further. Thus, the American people and even the government itself are prevented from understanding whether investments in defense are achieving their desired results.

What is needed is a publicly accessible reference document that uses a consistent, methodical, and repeatable approach to assessing defense requirements and capabilities. The Heritage Foundation's *Index of U.S. Military Strength*, an annual assessment of the state of America's hard power, fills this void, addressing both the geographical and functional environments relevant to the United States' vital national interests and threats that rise to a level that puts or has the strong potential to put those interests at risk.

Any assessment of the adequacy of military power requires two primary reference points: a clear statement of U.S. vital security interests and an objective requirement for the military's capacity for operations that serves as a benchmark against which to measure current capacity. Top-level national security documents issued by a long string of presidential Administrations have consistently made clear that three interests are central to any assessment of national military power:

- Defense of the homeland;

- Successful conclusion of a major war that has the potential to destabilize a region of critical interest to the U.S.; and

- Preservation of freedom of movement within the global commons: the sea, air,

outer-space, and cyberspace domains through which the nations of the world conduct their business.

Every President has recognized that protecting America from attack is one of the U.S. military's fundamental reasons for being. While going to war has always been controversial, the decision to do so has been based consistently on the conclusion that one or more vital U.S. interests are at stake.

This *Index* embraces the requirement for the U.S. military to be able to handle two major wars or two major regional contingencies (MRCs) successfully at the same time or in closely overlapping time frames as the most compelling rationale for sizing U.S. military forces. The basic argument is this: The nation should have the ability to engage and defeat one opponent and still have the ability to guard against competitor opportunism: that is, to prevent someone from exploiting the perceived opportunity to move against U.S. interests while America is engaged elsewhere.

The *Index* is descriptive, not prescriptive, reviewing the current condition of its subjects within the assessed year and describing how conditions have changed during the previous year, informed by the baseline condition established by the inaugural *2015 Index*. In short, the *Index* answers the question, "Have conditions improved or worsened during the assessed year?"

This study also assesses the U.S. military against the two-war benchmark and various metrics explained further in the military capabilities section. Importantly, the *Index* measures the hard power needed to win conventional wars rather than the general utility of the military relative to the breadth of tasks it might be (and usually is) assigned in order to advance U.S. interests short of war.

Assessing the World and the Need for Hard Power

The assessment portion of the *Index* is composed of three major sections that address the aforementioned areas of primary interest: the operating environments within or through which America's military must be employed, threats to U.S. vital national interests, and the U.S. military services themselves. For each of these areas, the *Index* provides context, explaining why a given topic is addressed and how it relates to understanding the nature of America's hard-power requirements.

The authors of this study used a five-category scoring system that ranges from "very poor" to "excellent" or "very weak" to "very strong" as appropriate to each topic. This approach was selected as the best way to capture meaningful gradations while avoiding the appearance that a high level of precision was possible given the nature of the issues and the information that was publicly available.

Some factors are quantitative and lend themselves to discrete measurement; others are very qualitative in nature and can be assessed only through an informed understanding of the material that leads to an informed judgment call.

By themselves, purely quantitative measures tell only part of the story when it comes to the relevance, utility, and effectiveness of hard power. Assessing military power or the nature of an operating environment using only quantitative metrics can lead to misinformed conclusions. For example, the mere existence of a large fleet of very modern tanks has little to do with the effectiveness of the armored force in actual battle if the employment concept is irrelevant to modern armored warfare. (Imagine, for example, a battle in rugged mountains.) Also, experience and demonstrated proficiency are often so decisive in war that numerically smaller or qualitatively inferior but well-trained and experienced forces can defeat a larger or qualitatively superior adversary.

The world is still very much a qualitative place, however digital and quantitative it has become thanks to the explosion of advanced technologies, and judgment calls have to be made in the absence of certainty. We strive to be as objective and evenhanded as possible in our approach and as transparent as possible in our methodology and sources of information

so that readers can understand why we reached the conclusions we reached—and perhaps reach their own as well. The result will be a more informed debate about what the United States needs in terms of military capabilities to deal with the world as it is. A detailed discussion of scoring is provided in each assessment section.

In our assessment, we begin with the operating environment because it provides the geostrategic stage upon which the U.S. attends to its interests: the various states that would play significant roles in any regional contingency; the terrain that enables or restricts military operations; the infrastructure—ports, airfields, roads, and rail networks (or lack thereof)—on which U.S. forces would depend; and the types of linkages and relationships the U.S. has with a region and major actors within it that cause the U.S. to have interests in the area or that facilitate effective operations. Major actors within each region are identified, described, and assessed in terms of alliances, political stability, the presence of U.S. military forces and relationships, and the maturity of critical infrastructure.

Our assessment focuses on three key regions—Europe, the Middle East, and Asia—because of their importance relative to U.S. vital security interests. This does not mean that we view Latin America and Africa as unimportant. It means only that the security challenges within these regions do not currently rise to the level of direct threats to America's vital security interests as we have defined them. We addressed their condition in the *2015 Index* and will provide updated assessments when circumstances make such reassessments necessary.

Next is a discussion of threats to U.S. vital interests. Here we identify the countries that pose the greatest current or potential threats to U.S. vital interests based on two overarching factors: behavior and capability. We accept the classic definition of "threat" as a combination of intent and capability, but while capability has attributes that can be quantified, intent is difficult to measure. We concluded that

"observed behavior" serves as a reasonable surrogate for intent because it is the clearest manifestation of intent.

We based our selection of threat countries and non-state actors on their historical behavior and explicit policies or formal statements vis-à-vis U.S. interests, scoring them in two areas: the degree of provocative behavior that they exhibited during the year and their ability to pose a credible threat to U.S. interests irrespective of intent. For example, a state full of bluster but with only a moderate ability to act accordingly poses a lesser threat, and a state that has great capabilities and a pattern of bellicose behavior that is opposed to U.S. interests still warrants attention even if it is relatively quiet in a given year. The combination eliminates most smaller terrorist, insurgent, and criminal groups and many problematic states because they do not have the ability to challenge America's vital national interests.

Finally, we address the status of U.S. military power in three areas: capability (or modernity), capacity, and readiness.

- Do U.S. forces possess operational capabilities that are relevant to modern warfare?

- Can they defeat the military forces of an opposing country?

- Do they have a sufficient amount of such capabilities?

- Is the force sufficiently trained and its equipment materially ready to win in combat?

All of these are fundamental to success even if they are not de facto determinants of success (something we explain further in the section). We also address the condition of the United States' nuclear weapons capability, assessing it in areas that are unique to this military component and critical to understanding its real-world viability and effectiveness as a strategic deterrent, and provide a descriptive overview of current U.S. ballistic missile

defense capabilities and challenges. The *Index* does not assess the U.S. Space Force, the newest of the military services. There are no viable metrics at this point by which to measure the service's capacity, capability, or readiness, and it is not yet clear how one would assess the Space Force's role in measuring "hard combat power," the focus of this publication.

Topical Essays

Since January 2018, when then-Secretary of Defense James N. Mattis released the 2018 NDS, the military establishment has focused its efforts on the NDS's major theme: a return to great-power competition. Secretary Mattis noted that a quarter of a century after the Soviet Union had collapsed and 17 years after the terrorist attacks of September 11, 2001, world events had brought the United States back into direct, long-term competition with major powers, China and Russia in particular.

This context provides the theme for the essays in this edition of the *Index*. Our essayists address great-power competition and its implications for the United States from various perspectives.

- Lieutenant General Sean B. MacFarland, U.S. Army (Ret.), writes about the war-winning importance of "Joint Force Experimentation for Great-Power Competition." Each of the services is developing new concepts for how to use military power in an evolving multi-actor world in which threats advance rapidly as new technologies such as artificial intelligence, robotics, cyber, hypervelocity platforms, and information sharing are harnessed to improve weapons, defenses, and sensors. While each service is focused on its own efforts and readily acknowledges that it will need the support of and be able to contribute to the efforts of the other services, the level of Joint Force experimentation is less than it was in previous decades. In his essay, General MacFarland explores the status of Joint Force experimentation and its implications for combat

effectiveness in current and projected combat environments.

- Before World War II, the U.S. was already emerging as a major industrial power and had the luxury of expanding its capacity for war before it actually entered the war. The end of the Cold War a half-century later led to a dramatic contraction of America's defense industrial base, with just a few major companies producing every major platform and weapon system. If war were to occur with one or more major competitors, what challenges would need to be overcome to expand industrial capacity to meet war demands? What risks does the U.S. currently run in this regard, and how might this influence national security policies? Dr. John "Jerry" McGinn answers these questions in "Building Resilience: Mobilizing the Defense Industrial Base in an Era of Great-Power Competition."

- In "Strategic Mobility: The Essential Enabler of Military Operations in Great-Power Competition," John Fasching describes the strategic advantage the U.S. has had over all other competitors in its ability to move forces, equipment, and supplies great distances and to sustain operations over time with critical logistics lines that span continents and oceans. But as the overall size of the Joint Force has declined since the end of the Cold War, so too has the mobility community, and all of the major platforms essential to strategic lift have aged rapidly. This essay looks at the status of strategic mobility across the Joint Force, how it compares to historical use, and what this portends for the ability of the U.S. military to respond to potential future conflict.

- David R. Shedd takes a hard look at "The Intelligence Posture America Needs in an Age of Great-Power Competition." During the Cold War, the U.S. intelligence

community (IC) developed a sophisticated, deeply immersed community of Sovietologists who worked for decades to understand the nature, motivations, and intent of America's chief competitor. This body of expertise was disestablished following the collapse of the USSR. Since September 11, 2001, the IC has focused on terrorist and other non-state actors and has struggled to reprise the equivalent of its old expertise and apply it to a greater number of state actors: China, Russia, Iran, and North Korea. What are the implications of a return to great-power competition that now includes several major state threats?

- Arguably, much of the success of America's military operations hinges on the support and contributions provided by allies and partners. American forces must have access to foreign-controlled ports, bases, and airfields, and the political support of allies can be indispensable. But what if the actual ability to provide credible military support is lacking? Dr. Andrew A. Michta addresses all of this in "U.S. Alliances: Crucial Enablers in Great-Power Competition."

Scoring U.S. Military Strength Relative to Vital National Interests

The purpose of this *Index* is to make the national debate about defense capabilities better informed by assessing the U.S. military's ability to defend against current threats to U.S. vital national interests within the context of the world as it is. Each of the elements can change from year to year: the stability of regions and access to them by America's military forces; the various threats as they improve or lose capabilities and change their behavior; and the United States' armed forces themselves as they adjust to evolving fiscal realities and attempt to balance readiness, capacity (size and quantity), and capability (how modern they are) in ways that enable them to carry out their assigned missions successfully.

Each region of the world has its own set of characteristics that include terrain; man-made infrastructure (roads, rail lines, ports, airfields, power grids, etc.); and states with which the United States has relationships. In each case, these factors combine to create an environment that is either favorable or problematic when it comes to the ability of U.S. forces to operate against threats in the region.

Various states and non-state actors within these regions possess the ability to threaten—and have consistently behaved in ways that threaten—America's interests. Fortunately for the U.S., these major threat actors are few in number and continue to be confined to three regions—Europe, the Middle East, and Asia—thus enabling the U.S. (if it will do so) to focus its resources and efforts accordingly.

As for the condition of America's military services, they continue to be beset by aging equipment, shrinking numbers, rising costs, and problematic funding (which make their improvements in current readiness quite remarkable achievements). These four elements interact in ways that are difficult to measure in concrete terms and impossible to forecast with any certainty. Nevertheless, the exercise of describing them and characterizing their general condition is worthwhile because it informs debates about defense policies and the allocation of resources that are necessary if the U.S. military is to carry out its assigned duties. Further, as seen in this *2021 Index*, noting how conditions have changed during the preceding year helps to shed light on the effect that policies, decisions, and actions have on security affairs that involve the interests of the United States, its allies and friends, and its enemies.

It should be borne in mind that each annual *Index* assesses conditions as they are for the assessed year. This *2021 Index of U.S. Military Strength* describes changes that occurred during the preceding year, with updates current as of mid-September 2020.

Assessments for Global Operating Environment, Threats to Vital U.S. Interests, and U.S. Military Power are shown in the Executive Summary. Factors that would push things

CHART 1

Defense Spending Hindered by Budget Acts

Spending Needed to Implement National Defense Strategy

5% growth from 2016

3% growth from 2016

Actual Spending
Due to the Budget Control Act and Bipartisan Budget Act

$800 BILLION

$750

$700

$650

$600

2016   2017   2018   2019   2020   2021
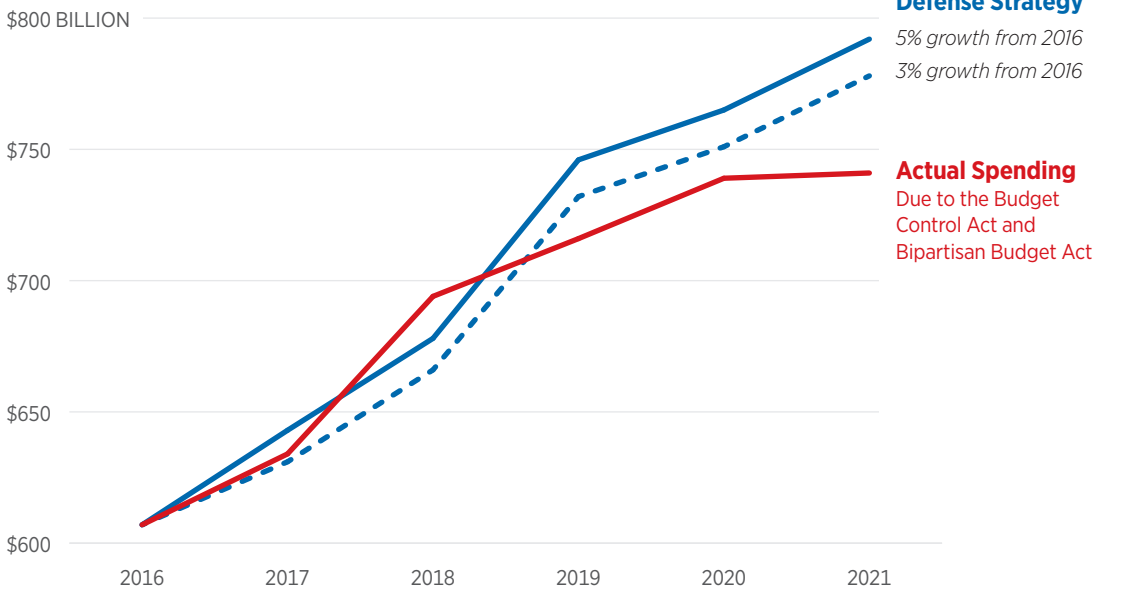
SOURCE: Frederico Bartels (ed.), "How the 2021 National Defense Authorization Act and the Defense Appropriations Act Can Prepare the U.S. for Great Power Competition," March 23, 2020, Heritage Foundation *Special Report* No. 222, https://www.heritage.org/defense/report/how-the-2021-national-defense-authorization-act-and-the-defense-appropriations-act.

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toward "bad" (the left side of the scale) tend to move more quickly than those that improve one's situation, especially when it comes to the material condition of the U.S. military.

Of the three areas measured—Global Operating Environment, Threats to Vital U.S. Interests, and U.S. Military Power—the U.S. can directly control only one: its own military. The condition of the U.S. military can influence the other two because a weakened America arguably emboldens challenges to its interests and loses potential allies, while a militarily strong America deters opportunism and draws partners to its side from across the globe.

Conclusion

During the decades since the end of the Second World War, the United States has underwritten and taken the lead in maintaining a global order that has benefited more people in more ways than at any other period in history. Now, however, that American-led order is under stress, and some have wondered whether it will break apart entirely as fiscal and economic burdens (exacerbated by the costs incurred in dealing with the COVID-19 pandemic) continue to plague nations, violent extremist ideologies threaten the stability of entire regions, state and non-state opportunists seek to exploit upheavals, and major states compete to establish dominant positions in their respective regions.

America's leadership role remains in question, and its security interests are under significant pressure. Challenges continue to grow, long-standing allies are not what they once were, and the U.S. is increasingly bedeviled by debt that constrains its ability to sustain its forces commensurate with its interests.

Informed deliberations on the status of America's military power are therefore desperately needed. It is our hope that this *Index of U.S. Military Strength* will help to facilitate those deliberations.

Executive Summary

"As currently postured, the U.S. military is only marginally able to meet the demands of defending America's vital national interests."

The United States maintains a military force primarily to protect the homeland from attack and to protect its interests abroad. There are secondary uses—for example, to assist civil authorities in times of emergency or to deter enemies—but this force's primary purpose is to make it possible for the U.S. to physically impose its will on an enemy when necessary.

It is therefore critical that the condition of the United States military with respect to America's vital national security interests, threats to those interests, and the context within which the U.S. might have to use "hard power" be understood. Because such changes can have substantial implications for defense policies and investment, knowing how these three areas change over time is likewise important.

Each year, The Heritage Foundation's *Index of U.S. Military Strength* employs a standardized, consistent set of criteria, accessible both to government officials and to the American public, to gauge the U.S. military's ability to perform its missions in today's world. The inaugural 2015 edition established a baseline assessment on which each annual edition builds, assessing the state of affairs for its respective year and measuring how key factors have changed during the preceding year.

The *Index* is not an assessment of what *might* be, although the trends that it captures may well imply both concerns and opportunities that can guide decisions that are germane to America's security. Rather, the *Index* should be seen as a report card for how well or poorly conditions, countries, and the U.S. military have evolved during the assessed year. The past cannot be changed, but it can inform, just as the future cannot be predicted but can be shaped.

What the *Index* Assesses

The *Index of U.S. Military Strength* assesses the ease or difficulty of operating in key regions based on existing alliances, regional political stability, the presence of U. S. military forces, and the condition of key infrastructure. Threats are assessed based on the behavior and physical capabilities of actors that pose challenges to vital U.S. national interests. The condition of America's military power is measured in terms of its capability or modernity, capacity for operations, and readiness to handle assigned missions successfully. This framework provides a single-source reference for policymakers and other Americans who seek to know whether our military power is up to the task of defending our national interests.

Any discussion of the aggregate capacity and breadth of the military power needed to protect U.S. security interests requires a clear understanding of precisely what interests must be defended. Three vital interests have been specified consistently and in various ways by a string of Administrations over the past few decades:

- **Defense** of the homeland;

- **Successful conclusion** of a major war that has the potential to destabilize a region of critical interest to the U.S.; and

- **Preservation** of freedom of movement within the global commons (the sea, air, outer-space, and cyberspace domains) through which the world conducts its business.

To defend these interests effectively on a global scale, the United States needs a military force of sufficient size, or what is known in the Pentagon as capacity. The many factors involved make determining how big the military should be a complex exercise, but successive Administrations, Congresses, and Department of Defense staffs have managed to arrive at a surprisingly consistent force-sizing rationale: an ability to handle two major conflicts simultaneously or in closely overlapping time frames.

At its root, the current National Defense Strategy (NDS) implies the same force requirement. Its emphasis on a return to long-term competition with major powers, explicitly naming Russia and China as primary competitors,[1] reemphasizes the need for the United States to have:

- Sufficient military capacity to deter or win against large conventional powers in geographically distant regions,

- The ability to conduct sustained operations against lesser threats, and

- The ability to work with allies and maintain a U.S. presence in regions of key importance sufficient to deter behavior that threatens U.S. interests.

No matter how much America desires that the world be a simpler, less threatening place more inclined to beneficial economic interactions than violence-laden friction, the patterns of history show that competing powers consistently emerge and that the U.S. must be able to defend its interests in more than one region at a time. Consequently, this *Index* embraces the two-war or two-contingency requirement.

Since its founding, the U.S. has been involved in a major "hot" war every 15–20 years.

Since World War II, the U.S. has also maintained substantial combat forces in Europe and several other regions while simultaneously fighting major wars as circumstances demanded. The size of the total force roughly approximated the two-contingency model, which has the inherent ability to meet multiple security obligations to which the U.S. has committed itself while also modernizing, training, educating, and maintaining the force. Accordingly, our assessment of the adequacy of today's U.S. military is based on the ability of America's armed forces to engage and defeat two major competitors at roughly the same time.

We acknowledge that absent a dramatic change in circumstances such as the onset of a major conflict, a multitude of competing interests that evolve during extended periods of peace and prosperity will cause Administrations and Congresses to favor spending on domestic programs rather than investing in defense. Consequently, garnering sufficient support to increase defense spending to the level needed for a force with a two-war capacity is problematic. But this political condition does not change the patterns of history, the behavior of competitors, or the reality of what it takes to defend America's interests in an actual war.

This *Index*'s benchmark for a two-war force is derived from a review of the forces used for each major war that the U.S. has undertaken since World War II and the major defense studies completed by the federal government over the past 30 years. We concluded that a standing (Active component) two-war–capable Joint Force would consist of:

- **Army:** 50 brigade combat teams (BCTs);

- **Navy:** 400 battle force ships and 624 strike aircraft;

- **Air Force:** 1,200 fighter/ground-attack aircraft;

- **Marine Corps:** 30 battalions; and

- **Space Force:** metric not yet established.

This recommended force does not account for homeland defense missions that would accompany a period of major conflict and are generally handled by Reserve and National Guard forces. Nor does it constitute the totality of the Joint Force, which includes the array of supporting and combat-enabling functions that are essential to the conduct of any military operation: logistics; transportation (land, sea, and air); health services; communications and data handling; and force generation (recruiting, training, and education), to name only a few. Rather, these are combat forces that are the most recognizable elements of America's hard power but that also can be viewed as surrogate measures for the size and capability of the larger Joint Force.

The Global Operating Environment

Looking at the world as an environment in which U.S. forces would operate to protect America's interests, the *Index* focused on three regions—Europe, the Middle East, and Asia— because of the intersection of our vital interests and actors able to challenge them.

Europe. Overall, the European region remains a stable, mature, and friendly operating environment. Russia remains the preeminent military threat to the region, both conventionally and unconventionally, but the threat posed by Chinese propaganda, influence operations, and investments in key sectors is also significant and needs to be addressed. Both NATO and many European countries apart from those in the alliance have reason to be increasingly concerned about the behavior and ambitions of both countries, although agreement on a collective response to these challenges remains elusive.

America's closest and oldest allies are located in Europe, and the region is incredibly important to the U.S. for economic, military, and political reasons. Perhaps most important, the U.S. has treaty obligations through NATO to defend the European members of that alliance. If the U.S. needs to act in the European region or nearby, there is a history of interoperability with allies and access to key logistical infrastructure that makes the operating environment in Europe more favorable than the environments in other regions in which U.S. forces might have to operate.

The past year saw continued U.S. reengagement with the continent, both militarily and politically, along with modest increases in European allies' defense budgets and capability investments. Despite allies' initial concerns, the U.S. has increased its investment in Europe, and its military position on the continent is stronger than it has been for some time.

The coronavirus caught the U.S. and Europe off-guard, led to disrupted or cancelled exercises, and caused Europe's armed forces to take on new and unexpected roles in assisting with the response to the pandemic. The pandemic's economic, political, and societal impacts are only beginning to be felt and will undoubtedly have to be reckoned with for years to come, in particular with respect to Europe's relationship with China. NATO employed a host of resources in responding to the pandemic while continuing to ensure that the pandemic did not undermine the alliance's collective defense.

NATO's renewed emphasis on collective defense has resulted in a focus on logistics, newly established commands that reflect a changed geopolitical reality, and a robust set of exercises. NATO's biggest challenges derive from capability and readiness gaps among many European nations, continuing improvements and exercises in the realm of logistics, a tempestuous Turkey, disparate threat perceptions within the alliance, and the need to establish the ability to mount a robust response to both linear and nonlinear forms of aggression.

For Europe, scores this year remained steady, as they did in 2019 (assessed in the *2020 Index*), with no substantial changes in any individual categories or average scores. The *2021 Index* again assesses the European Operating Environment as "favorable."

The Middle East. For the foreseeable future, the Middle East region will remain a key focus for U.S. military planners. Once considered relatively stable, mainly because of the ironfisted rule of authoritarian regimes, the

Global Operating Environment: Summary

VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT

Operating Environment: Europe

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Alliances				✔	
Political Stability				✔	
U.S. Military Posture				✔	
Infrastructure				✔	
OVERALL				✔	

Operating Environment: Middle East

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Alliances			✔		
Political Stability		✔			
U.S. Military Posture			✔		
Infrastructure			✔		
OVERALL			✔		

Operating Environment: Asia

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Alliances				✔	
Political Stability			✔		
U.S. Military Posture				✔	
Infrastructure				✔	
OVERALL				✔	

Global Operating Environment

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Europe				✔	
Middle East			✔		
Asia				✔	
OVERALL				✔	

area is now highly unstable and a breeding ground for terrorism.

Overall, regional security has deteriorated in recent years. Even though the Islamic State (or at least its physical presence) appears to have been defeated, the nature of its successor is unclear. Iraq has restored its territorial integrity after the defeat of ISIS, but the political situation and future relations between Baghdad and the U.S. will remain difficult as long as a government that is sympathetic to Iran is in power. The regional dispute with Qatar has made U.S. relations in the region even more complex and difficult to manage, although it has not stopped the U.S. military from operating.

Many of the borders created after World War I are under significant stress. In countries like Iraq, Libya, Syria, and Yemen, the supremacy of the nation-state is being challenged by non-state actors that wield influence, power, and resources comparable to those of small states. The region's principal security and political challenges are linked to the unrealized aspirations of the Arab Spring, surging transnational terrorism, and meddling by Iran, which seeks to extend its influence in the Islamic world. These challenges are made more difficult by the Arab–Israeli conflict, Sunni–Shia sectarian divides, the rise of Iran's Islamist revolutionary nationalism, and the proliferation of Sunni Islamist revolutionary groups. COVID-19 will likely exacerbate these economic, political, and regional crises, which could destabilize the post-pandemic operational environment for U.S. forces.

Thanks to its decades of military operations in the Middle East, the U.S. has tried-and-tested procedures for operating in the region. Bases and infrastructure are well established, and the logistical processes for maintaining a large force forward deployed thousands of miles away from the homeland are well in place. Moreover, unlike in Europe, all of these processes have been tested recently in combat. The personal links between allied armed forces are also present. Joint training exercises improve interoperability, and U.S. military

educational courses regularly attended by officers (and often royals) from the Middle East allow the U.S. to influence some of the region's future leaders.

America's relationships in the region are based pragmatically on shared security and economic concerns. As long as these issues remain relevant to both sides, the U.S. is likely to have an open door to operate in the Middle East when its national interests require that it do so.

Circumstances in all measured areas vary throughout the year, but in general terms, the *2021 Index* assesses the Middle East Operating Environment as "moderate," although the region's political stability remains "unfavorable."

Asia. The Asian strategic environment is extremely expansive, as it includes half the globe and is characterized by a variety of political relationships among states that have wildly varying capabilities. The region includes long-standing American allies with relationships dating back to the beginning of the Cold War as well as recently established states and some long-standing adversaries such as North Korea.

American conceptions of the region must recognize the physical limitations imposed by the tyranny of distance and the very real differences in relationships among regional powers that both make Asia so different from Europe and influence America's relationships with both regions. Moving forces within the region (never mind to it) will take time and require extensive strategic lift assets as well as sufficient infrastructure, such as sea and aerial ports of debarkation that can handle American strategic lift assets, and political support. At the same time, because of the complicated nature of intra-Asian relations, especially unresolved historical and territorial issues of the type repeatedly exhibited in tensions between South Korea and Japan, the United States cannot necessarily count on support from all of its regional allies in responding to any given contingency, at least not in the opening days of a crisis.

Further, the lack of an integrated, regional security architecture along the lines of NATO

means that there is no single standard to which all of the local militaries aspire, in addition to which most Asian militaries have limited combat experience, particularly in high-intensity air or naval combat. Although U.S. relations with countries such as the Philippines have been challenged by China's aggressive outreach, especially on trade and infrastructure development projects, China's increasingly aggressive posture (most recently demonstrated in its extension of security laws to Hong Kong) has caused countries to reconsider the risk of becoming too distant from the United States.

We continue to assess the Asian operating environment as "favorable" to U.S. interests in terms of alliances, overall political stability, militarily relevant infrastructure, and the presence of U.S. military forces.

Summarizing the condition of each region enables us to get a sense of how they compare in terms of the challenge the U.S. would have in projecting military power and sustaining combat operations in each one. As a whole, the global operating environment currently maintains a score of "favorable," meaning that the United States should be able to project military power anywhere in the world as necessary to defend its interests without substantial opposition or high levels of risk.

Threats to U.S. Interests

Our selection of threat actors discounted troublesome states and non-state entities that lacked the physical ability to pose a meaningful threat to vital U.S. security interests. This reduced the population of all potential threats to a half-dozen that possessed the means to threaten U.S. vital interests and exhibited a pattern of provocative behavior that should draw the focus of U.S. defense planning. This *Index* characterizes their behavior and military capabilities on five-point, descending scales.

All of the six threat actors selected—Russia, China, Iran, North Korea, and terrorist groups in the Middle East and Afghanistan—remained actual or potential threats to U.S. interests over the past year. All amply demonstrated a commitment to expanding their capabilities to pursue their respective interests that directly challenged those of the U.S.

Compiling the assessments of threat sources, the *2021 Index* again rates the overall global threat environment as "aggressive" and "gathering" in the areas of threat actor behavior and material ability to harm U.S. security interests, respectively, leading to an aggregated threat score of "high."

Just as there are American interests that are not covered by this *Index*, there may be additional threats to American interests that are not identified here. The *Index* focuses on the more apparent sources of risk and those that appear to pose the greatest threat.

Russia remains the primary threat to American interests in Europe and is the most pressing threat to the United States. Moscow remains committed to massive pro-Russia propaganda campaigns in Ukraine and other Eastern European countries, has continued its active support of separatist forces in Ukraine, regularly performs provocative military exercises and training missions, and continues to sell and export arms to countries that are hostile to U.S. interests (its sale of the S-400 air defense system to Turkey being a prime example). It also has increased its investment in modernizing its military and has gained significant combat experience while continuing to sabotage U.S. and Western policy in Syria and Ukraine.

The *2021 Index* again assesses the threat emanating from Russia as "aggressive" in its behavior and "formidable" (the highest category on the scale) in its growing capabilities.

China, the most comprehensive threat that the U.S. faces, continues to modernize and expand its military and pay particular attention to its space, cyber, and artificial intelligence capabilities. The People's Liberation Army continues to extend its reach and military activity beyond its immediate region and engages in larger and more comprehensive exercises, including live-fire exercises in the East China Sea near Taiwan and aggressive naval and air patrols in the South China Sea. Its ongoing probes of the South Korean and Japanese

Threats to U.S. Vital Interests: Summary

SEVERE	HIGH	ELEVATED	GUARDED	LOW

Behavior of Threats

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Russia		✔			
Iran		✔			
Middle East Terrorism		✔			
Af-Pak Terrorism			✔		
China		✔			
North Korea			✔		
OVERALL		✔			

Capability of Threats

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Russia	✔				
Iran		✔			
Middle East Terrorism			✔		
Af-Pak Terrorism			✔		
China	✔				
North Korea		✔			
OVERALL		✔			

Threats to U.S. Vital Interests

	SEVERE	HIGH	ELEVATED	GUARDED	LOW
Russia		✔			
Iran		✔			
Middle East Terrorism		✔			
Af-Pak Terrorism			✔		
China		✔			
North Korea		✔			
OVERALL		✔			

air defense identification zones have drawn rebukes from both Seoul and Tokyo, and its statements about Taiwan and its exercise of military capabilities in the air and sea around the island have grown more belligerent.

The *2021 Index* assesses the threat emanating from China as "aggressive" in the scope of its provocative behavior and "formidable" for its capability.

Iran represents by far the most significant security challenge to the United States, its allies, and its interests in the greater Middle East. Its open hostility to the United States and Israel, sponsorship of terrorist groups like Hezbollah, and history of threatening the commons underscore the problem it could pose. Today, Iran's provocations are mostly a concern for the region and America's allies, friends, and assets there. Iran relies heavily on irregular (to include political) warfare against others in the region and fields more ballistic missiles than any of its neighbors. The development of its ballistic missiles and potential nuclear capability also mean that it poses a long-term threat to the security of the U.S. homeland. Iran has also continued its aggressive efforts to shape the domestic political landscape in Iraq, adding to the general instability of the region.

The *2021 Index* extends the *2020 Index* assessment of Iran's behavior as "aggressive" and its capability as "gathering."

North Korea's military poses a security challenge for American allies South Korea and Japan, as well as for U.S. bases in those countries and Guam. North Korean officials are belligerent toward the United States, often issuing military and diplomatic threats. Pyongyang also has engaged in a range of provocative behavior that includes nuclear and missile tests and tactical-level attacks on South Korea.

North Korea has used its missile and nuclear tests to enhance its prestige and importance domestically, regionally, and globally and to extract various concessions from the United States in negotiations over its nuclear program and various aid packages. Such developments also improve North Korea's military posture.

U.S. and allied intelligence agencies assess that Pyongyang has already achieved nuclear warhead miniaturization, the ability to place nuclear weapons on its medium-range missiles, and an ability to reach the continental United States with a missile.

This *Index* therefore assesses the overall threat from North Korea, considering the range of contingencies, as "testing" for level of provocation of behavior and "gathering" for level of capability.

In the **Afghanistan–Pakistan (AfPak) region,** non-state terrorist groups pose the greatest threat to the U.S. homeland and the overall stability of the South/Southwest Asia region. Pakistan represents a paradox: It is both a security partner and a security challenge. Islamabad provides a home and support to terrorist groups that are hostile to the U.S., to other U.S. partners in South Asia like India, and to the government in Afghanistan, which is particularly vulnerable to destabilization efforts. Both Pakistan and Afghanistan are already among the world's most unstable states, and the instability of the former, given its nuclear arsenal, has a direct bearing on U.S. security. Afghanistan's inability to control many parts of the country and Pakistan's willingness to host and support terrorist groups provide opportunity to entities such as al-Qaeda, the Haqqani Network, the Taliban, and affiliates of the Islamic State to operate.

This *Index* therefore assesses the overall threat from AfPak-based actors to the U.S. and its interests as "testing" for level of provocation of behavior and "capable" for level of capability.

A broad array of **terrorist groups** remain the most hostile of any of the threats to America examined in the *Index*. The primary terrorist groups of concern to the U.S. homeland and to Americans abroad are the Islamic State of Iraq and al-Sham (ISIS) and al-Qaeda. Al-Qaeda and its branches remain active and effective in Syria, Yemen, Iraq, and the Sahel of northern Africa. Thought no longer to be a territory-holding entity, ISIS also remains a serious presence in the Middle East, in South and

Southeast Asia, and throughout Africa, posing threats to stability as it seeks to overthrow governments and impose an extreme form of Islamic law. Its ideology continues to inspire attacks against Americans and U.S. interests. Fortunately, Middle East terrorist groups remain the least capable threats facing the U.S., but they cannot be dismissed.

Our combined score for threats to U.S. vital interests is "high," the fourth on a five-level scale, just below "severe."

The Status of U.S. Military Power

Finally, we assessed the military power of the United States in three areas: capability, capacity, and readiness. We approached this assessment by military service as the clearest way to link military force size; modernization programs; unit readiness; and (in general terms) the functional combat power (land, sea, and air) represented by each service.

We treated the United States' nuclear capability as a separate entity because of its truly unique characteristics and constituent elements, from the weapons themselves to the supporting infrastructure that is fundamentally different from the infrastructure that supports conventional capabilities. And while not fully assessing cyber and space as we do the Army, Navy, Air Force, and Marine Corps, we also acknowledge the importance of these new tools and organizations that have become essential to deterring hostile behavior and winning wars.

These three areas of assessment (capability, capacity, and readiness) are central to the overarching questions of whether the U.S. has a sufficient quantity of appropriately modern military power and whether military units are able to conduct military operations on demand and effectively.

As reported in all previous editions of the *Index*, the common theme across the services and the U.S. nuclear enterprise is one of force degradation and the effort needed to rebuild after such degradation, which has been caused by many years of underinvestment, poor execution of modernization programs, and the

negative effects of budget sequestration (cuts in funding) on readiness and capacity in spite of repeated efforts by Congress to provide relief from low budget ceilings imposed by the Budget Control Act of 2011. Pursuant to new guidance provided by then-Secretary of Defense James Mattis in the 2018 NDS, the services undertook efforts to reorient from irregular warfare to large-scale combat against a peer adversary, but such shifts take time and even more resources.

While the military has been heavily engaged in operations, primarily in the Middle East but elsewhere as well, since September 11, 2001, experience in warfare is both ephemeral and context-sensitive. Valuable combat experience is lost as the servicemembers who individually gained experience leave the force, and it retains direct relevance only for future operations of a similar type: Counterinsurgency operations in Iraq, for example, are fundamentally different from major conventional operations against a state like Iran or China. The withdrawal of U.S. military forces from Iraq, in general, in 2011 (now nearly a decade in the past) and the steady reduction of forces in Afghanistan have amplified the loss of direct combat experience across the Joint Force. Thus, although portions of the current Joint Force are experienced in some types of operations, the force as a whole lacks experience with high-end, major combat operations toward which it has only recently begun to redirect its training and planning, and it is still aged and shrinking in its capacity for operations even if limited quantities of new equipment like the F-35 Lightning II fighter are gradually being introduced.

We characterized the services and the nuclear enterprise on a five-category scale ranging from "very weak" to "very strong," benchmarked against criteria elaborated in the full report. These characterizations should not be construed as reflecting either the competence of individual servicemembers or the professionalism of the services or Joint Force as a whole; nor do they speak to the U.S. military's strength relative to other militaries around the world. Rather, they are assessments of the institutional,

U.S. Military Power: Army

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✔			
Capability			✔		
Readiness					✔
OVERALL			✔		

U.S. Military Power: Navy

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✔			
Capability			✔		
Readiness			✔		
OVERALL			✔		

U.S. Military Power: Air Force

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✔		
Capability			✔		
Readiness			✔		
OVERALL			✔		

U.S. Military Power: Marine Corps

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✔		
Capability			✔		
Readiness			✔		
OVERALL			✔		

U.S. Military Power: Space (not assessed this year)

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity					
Capability			n/a		
Readiness					
OVERALL			n/a		

U.S. Military Power: Nuclear

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Nuclear Stockpile				✓	
Delivery Platform Reliability				✓	
Warhead Modernization			✓		
Delivery Systems Modernization				✓	
Nuclear Weapons Complex			✓		
National Labs Talent			✓		
Force Readiness				✓	
Allied Assurance				✓	
Nuclear Test Readiness		✓			
OVERALL			✓		

programmatic, and material health or viability of America's hard military power.

Our analysis concluded with these assessments:

- **Army as "Marginal."** The Army's score remains "marginal" in the *2021 Index*. The Army has fully committed to modernizing its forces for great-power competition, but its programs are still in their development phase, and it will be a few years before they are ready for acquisition and fielding. It remains "weak" in capacity with 70 percent of the force it should have but has significantly increased the readiness of the force, scoring the highest level of "very strong" in 2020. The Army has a better sense of what it needs for war against a peer, but funding uncertainties could threaten its ability to realize its goals.

- **Navy as "Marginal," Trending Toward "Weak."** The Navy's overall score remains "marginal" in the *2021 Index* but is trending toward "weak" in capability and readiness and remains "weak" in capacity. The technology gap between the Navy and

its peer competitors is narrowing in favor of competitors, and the Navy's ships are aging faster than they are being replaced. The Navy sustained its focus on improving readiness in 2020, but it has a very large hole to fill, its fleet is too small relative to workload, and supporting shipyards are overwhelmed by the amount of repair work needed to make more ships available.

- **Air Force as "Marginal."** The USAF scores "marginal" in all three measures but is trending upward in capability and capacity. The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the amount and quality of combat air power that would be needed to meet wartime requirements. Although it could eventually win a single major regional contingency (MRC), the time needed to win that battle and the attendant rates of attrition would be much higher than they would be if the service had moved aggressively to increase high-end training and acquire the fifth-generation weapon systems required to dominate such a fight.

In the aggregate, the United States' military posture is rated "marginal" and features both positive and negative trends: progress in bringing some new equipment into the force, filling gaps in manpower, and rebuilding stocks of munitions and repair parts alongside worrisome trends in force readiness, declining strength in key areas like trained pilots, and continued uncertainty across the defense budget. **The *2021 Index* concludes that the current U.S. military force is likely capable of meeting the demands of a single major regional conflict** while also attending to various presence and engagement activities but that it would be very hard-pressed to do more and certainly would be ill-equipped to handle two nearly simultaneous MRCs, a situation made more difficult by the generally weak condition of key military allies.

The military services have prioritized readiness and have seen improvement over the past couple of years, but modernization programs continue to suffer as resources are redirected toward current operations, sustainment of readiness levels, and heavy investment in research and development programs to prepare the force for potential use 10 or 20 years in the future. The services have also normalized reductions in the size and number of military units, and the forces remain well below the level needed to meet the two-MRC benchmark.

Congress and the Administration took positive steps to stabilize funding for fiscal years 2018, 2019, and 2020 through the Bipartisan Budget Agreement of 2018, and the Bipartisan Budget Act of 2019 sustained support for funding above the caps imposed by the Budget Control Act of 2011 (BCA). While this allayed the most serious concerns about a return to the damaging levels of the BCA, more will be needed in the years to come to ensure that America's armed services are properly sized, equipped, trained, and ready to meet the missions they are called upon to fulfill.

As currently postured, the U.S. military is only marginally able to meet the demands of defending America's vital national interests.

- **Marine Corps as "Marginal."** The score for the Corps' capacity was raised to "marginal" from "weak" but only because this *Index* has changed the threshold, lowering it from 36 infantry battalions to 30 battalions in acknowledgement of the Corps' argument that it is a one-war force that also stands ready for a broad range of smaller crisis-response tasks. However, the Corps intends to reduce its number of battalions further from 24 to 21, which would return it to a score of "weak." The service is moving ahead aggressively with a redesign of its operating forces, but it continues to be hampered by old equipment, and problematic funding continues to constrain its deployment-to-dwell ratio to 1:2 (too few units for its workload), forcing it to prioritize readiness for deployed and next-to-deploy units at the expense of other units across the force.

- **Space Force as "Not Assessed."** The Space Force was formally established on December 20, 2019, as a result of an earlier proposal by President Trump and legislation passed by the Congress.[2] As of mid-2020, the Space Force is still in the

process of being established. Personnel numbers are small. Given the nascent state of the Space Force, we do not render an assessment of the service in the *2021 Index*. We hope to assess the strength of the service in future editions, but this will be complicated by the classified nature of the service.

- **Nuclear Capabilities as "Marginal," Trending Toward "Strong."** It should be emphasized that "trending toward strong" assumes that the U.S. maintains its commitment to modernization of the entire nuclear enterprise—from warheads to platforms to personnel to infrastructure—and allocates needed resources accordingly. Without this commitment, this overall score will degrade rapidly to "weak." Continued attention to this mission is therefore critical. Although a bipartisan commitment has led to continued progress on U.S. nuclear forces modernization and warhead sustainment, these programs remain seriously threatened by potential future fiscal uncertainties. The infrastructure that supports nuclear programs is very aged, and nuclear test readiness has revealed troubling problems within the forces.

Endnotes

1. James Mattis, Secretary of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, p. 2. https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf (accessed August 12, 2020).

2. See "Text of Space Policy Directive-4 (SPD-4), Establishment of the United States Space Force," The White House, February 19, 2019, https://www.whitehouse.gov/presidential-actions/text-space-policy-directive-4-establishment-united-states-space-force/ (accessed August 12, 2020), and S. 1790, National Defense Authorization Act for Fiscal Year 2020, Public Law 116-92, 116th Cong., December 20, 2019, Title IX, Subtitle D, https://www.congress.gov/bill/116th-congress/senate-bill/1790 (accessed August 12, 2020). President Trump's February 2019 directive established the Space Force as part of the Department of the Air Force (DOAF). The FY 2020 NDAA established the force as the fifth uniformed service within the Department of Defense and the second service within the DOAF. The service will reside under the direction and leadership of the Secretary of the Air Force. The NDAA specifies that a four-star general will serve as Chief of Space Operations (CSO) and a full member of the Joint Chiefs of Staff.

Joint Force Experimentation for Great-Power Competition

Sean MacFarland

The war game at the Naval War College came to a frustrating conclusion for the "blue" players representing the U.S. Their attempted dash across the Pacific with powerful naval forces to reinforce positions near the enemy homeland had been stopped well short of their destination by shore-based airpower. Friendly losses due to the enemy's pre-war investment in anti-access/area denial capabilities had been staggering. A quick American victory would not be possible, and a new strategy would be needed to defeat this potential adversary.

Although the location of this war game might not surprise you, the date and opponent might. It took place in 1934, and the adversary was Japan ("Orange" in the war game). Fortunately, the U.S. Navy, informed by the results, changed its war plan in time, and the rest, as the saying goes, is history. In fact, the war game was so prescient that after the war, Fleet Admiral Chester Nimitz said that "the war with Japan had been enacted in the game rooms at the War College by so many people and in so many different ways that nothing that happened during the war was a surprise—absolutely nothing except the kamikaze tactics toward the end of the war. We had not visualized these."[1]

War games and large-scale exercises like those conducted before the Second World War played an important role in our military history, and they are poised to do so again. At the direction of the Chairman of the Joint Chiefs of Staff, General Mark Milley, the Naval War College recently war-gamed a real-world scenario against potential adversaries. It was a good start, and more such war games are expected to follow as are other forms of experimentation. If they do, these opportunities to learn will once again play a vital role in the development of a joint doctrine that supports our National Defense Strategy, addresses the challenges and opportunities created by technological change, and responds to rising threats to both national and global security. If fully supported, they will help America's defense establishment to make cost-effective investments and reduce strategic risk by tapping into America's greatest asymmetric advantage: our ability to innovate.

Global Challenges

In his article "The Thucydides Trap," Graham Allison observed that a rising power and a dominant power do not usually exchange places peacefully. This is the trap into which Athens, as a rising power, and Sparta, as the dominant power, fell.[2] How can the United States, as the world's dominant power, avoid the fate of Sparta, which defeated Athens but was so weakened that it also soon collapsed? The first requirement, of course, is to recognize threats and—just as important—their nature.

The fastest-rising power in the world today is China, which has embarked on what Michael Pillsbury calls a "hundred-year marathon"[3] to

displace the United States as global hegemon. Although most observers agree that Beijing does not wish to use direct force to overthrow the American order and establish itself as the new "sun in the sky," China is clearly arming itself in a way that is meant to challenge American power in the Western Pacific. It is also seeking to compete with the United States through diplomatic, information, and economic means. The implications of these efforts are profound not just for the United States, but also for the entire world.

From the end of the Cold War until recently, we have lacked a clearly defined pacing threat: a nice problem to have had but a problem no longer. A resurgent Russia and a rising China took note of how the U.S. rapidly overwhelmed the Iraqi military in conventional warfare in 1991 and again in 2003. Since then, both nations have embarked on acquisition strategies designed to neutralize our joint warfighting advantages, now enabled by new technologies like unmanned aerial systems and stealth aircraft. By investing in relatively low-cost systems that are designed to prevent us from projecting our forces, our adversaries are now challenging our ability to achieve overmatch against our opponents on the battlefield. This asymmetric approach is called anti-access/area denial (A2/AD).

This renewed geostrategic competition is unfolding amid a revolution that has the potential to rival the Industrial Revolution in its impact. The technological revolution driving these changes in the character of war will change the 21st century battlefield as much as the Industrial Revolution changed the battlefield in the 20th century. Space, which became accessible in the latter half of the 20th century, is growing ever more congested and contested in the 21st.

America, which pioneered space travel, no longer enjoys assured access to it, removing it as one of our asymmetric advantages over our enemies. Cyberspace, which the United States also pioneered, is now shared by the entire world and has joined space as a new domain of warfare along with the more traditional domains of air, sea, and land. As our dependence on space and cyberspace has grown, so too have our vulnerabilities. The globe-spanning reach of these new domains has expanded the battlefield to the homelands of our adversaries as well as to our own "forts and ports," rendering our Atlantic and Pacific moats ineffective.

Advances in weapon technology are potentially game-changing as well. Stealth, or low-observable technology, directed energy for weapons, sensors and communications, remote-controlled vehicles, and hypersonic weapons are accelerating the speed of war from supersonic to hypersonic and beyond, to the speed of light. As if this were not mind-boggling enough, advances in artificial intelligence (AI), powered by big data and information operations that exploit social media platforms, are creating additional challenges and opportunities.

The ability of the human mind to close the OODA (observe, orient, decide, act) loop in a timely manner in response to these technological changes is increasingly at risk. The "cognitive domain" of war is not new, but its character has changed along with the other domains, perhaps making it the most significant domain of all.

To undermine U.S. power, our adversaries are employing other asymmetric means that stop short of traditional acts of war, blurring the line between peace and conflict. The so-called Russian gray zones, China's civil–military integration, Iran's proxy forces, and cyber-attacks by non-state actors have thickened the fog of war. Doctrinal discussions have moved away from the "pre-conflict phase" in favor of a continuum of conflict that encompasses competition and hostilities. We are competing with our peer adversaries and have been for a while, whether we realized it or not. Twenty-first century conflict, then, has expanded not only spatially, but also temporally.

Our Doctrinal Response

Our adversaries have reacted to our actions, and now it is our turn to counteract by

developing a new doctrine that leverages our asymmetric strengths to degrade, penetrate, and ultimately disintegrate A2/AD measures and restores our strategic reach and ability to fight on favorable terms. Our response must address both geostrategic and technological changes. It must be sufficiently compelling to achieve broad support both among U.S. policymakers and among our allies. It must also be affordable. The U.S. used a cost-imposition strategy to defeat the Soviet Union during the Cold War. We cannot allow ourselves to be driven down an unsustainable path in a similar way, as A2/AD would have us do.

To answer all of these challenges, the U.S. Department of Defense (DOD) is developing a doctrine called Joint All Domain Operations (JADO). It is still only a concept, but it builds on the work started by the U.S. Army, joined by the Marine Corps, in developing the warfighting Multi-Domain Operations (MDO) concept. It will also incorporate subsequent work done by the Air Force on the Joint All Domain Command and Control (JADC2) concept and eventually will include concepts from the Navy and Space Force as well. JADO recognizes the new domains of conflict and is intended to exploit them with cross-domain effects and will leverage our armed forces' unique and proven ability to orchestrate joint operations at all echelons.

But choosing the right doctrine is only the beginning. Multi-domain effects, by definition, transit through more than one domain. To fight and win in all domains, our joint doctrine must achieve harmony across all services and across all elements of doctrine, organization, training, materiel, leadership, personnel, and facilities (DOTMLPF) as well as policy (as in "DOTMLPF-P"). As we modernize our forces, new platforms and systems must be designed with cross-domain effects in mind.

As former Secretary of Defense Donald Rumsfeld famously observed, "You go to war with the army you have, not the army you might want or wish to have at a later time."[4] We need to ensure that the Joint Force we have is the one we want. The policy aspect is also important, particularly in the space and cyber domains where management of the electromagnetic spectrum and networks in the competition phase of conflict will mean striking a balance between civil and military requirements.

Getting the services to align doctrines and acquisition programs and to integrate operationally across domains is hard but not impossible. We came close in the final years of the Cold War under the rubric of AirLand Battle (ALB). The Army aligned all elements of DOTMLPF to support ALB, and—critically—so did the Air Force, making the vision of a seamless dual-domain operational concept a reality. Although we did not have the benefit of sophisticated computer modeling tools then, we were able to test some ALB assumptions during the massive annual REFORGER exercises in Europe. We also benefitted from the very real and bloody lessons gleaned from the 1973 Arab–Israeli War. Acquisition efforts in the Army were tailored to ALB and vice-versa.

Thus, the "Big Five" Army weapons programs still widely in use today were ideally suited to the doctrine, and the integration of joint effects in training and exercises became the norm. In the end, we were able to catch doctrinal lightning in a bottle, as proven in Operation Desert Storm against a combat-seasoned, Soviet-trained, and Soviet-equipped enemy.

The Role of Joint Experimentation

America's armed forces are again racing to refashion themselves and adjust to technological innovations, just as they did before World War II when the U.S. shifted from a constabulary Army mounted on horseback and a battleship-centric Navy to a Joint Force that is able to project airpower around the world in support of amphibious and mechanized land forces. Today, we are shifting our focus from counterinsurgency to competition against peer adversaries in peacetime and seeking to achieve overmatch against them in all domains in conflicts.

Experiments like the recent war game in Newport, Rhode Island, will play a vital role

in helping America's military to reshape itself effectively and efficiently. Experimentation through war games and exercises is conducted in a mixture of live, virtual, or constructive environments. In virtual environments, live people interact with simulated systems, as in a flight simulator. In a constructive environment, simulated people interact with simulated systems, as in a command post exercise. The degree to which each environment is present in a war game or exercise depends on the purpose of the exercise. Each form has advantages and disadvantages, and when used for the purpose for which it is best suited, each form can provide useful insights for the development and implementation of JADO.

In the past, each service conducted its own experiments, developed its own respective warfighting concepts or doctrines, and then acquired the capabilities required to execute them—and, of course, it sometimes happened the other way around. In either case, the role played by the Joint Chiefs and the Office of the Secretary of Defense (OSD) resembled that of a referee, ensuring that the services played by the rules. To fulfill the promise of JADO, the role of the Secretary of Defense and the Chairman of the Joint Chiefs should be more like that of a coach, directing the game plan for the services' modernization efforts. The playbook, however, must be informed by the lessons learned through experimentation, and those must be properly resourced. In addition, as any coach will tell you, there is no gain without pain.

As important as modernization might be, the Secretary of Defense and the Joint Chiefs of Staff have many other responsibilities and cannot devote their full attention to it. Since the 2011 inactivation of the United States Joint Forces Command (USJFCOM) as a cost-saving measure, the Joint Staff Directorate for Joint Force Development (J7) has assumed many functions related to modernization. It is responsible for doctrine, education, concept development and experimentation, training, exercises, and lessons learned. But as a staff directorate, it has no forces of its own, nor does it have teams of experienced observers schooled in joint doctrine or dedicated opposing forces ("red teams") trained to think differently. To the extent that these assets exist, they reside for the most part in the services. Nevertheless, by leveraging two initiatives called Globally Integrated Exercises and Globally Integrated Wargames, the J7 is doing a great deal to innovate and validate joint warfighting concepts.

Any attempt to achieve change, however, will encounter resistance. To help overcome parochial service perspectives, the Joint Chiefs have created a cross-functional team to study JADO. The Joint Chiefs have also tasked the services with examining "orphan" functions. The Air Force is studying command and control, the Navy has the lead for fires, the Marines are responsible for Joint Concept for Information Advantage, and the Army is analyzing the logistics requirements for this Joint Warfighting Concept. The intent of this division of labor is to help break down stovepipes and create consensus.

Exercises as Experiments. The results of these studies must be tested somehow. Despite the growing cost associated with deploying live forces, exercises conducted under realistic field conditions are still the best way to test some theories, particularly organizational designs. This will remain true as long as our ability to simulate cross-domain effects in the constructive environment is limited.

As with war gaming, America has a history of organizational experimentation during exercises that goes back to the years preceding its entry into the Second World War. Perhaps the most famous example from this time period would be the Louisiana Maneuvers (LaM), which the Army conducted to test the doctrine and weaponry it would need to face modern adversaries such as Germany. This massive exercise placed experimental armored and mechanized units and the Army Air Corps into a scenario that helped leaders understand the potential of mechanized warfare and how to integrate airpower over vast operational distances.

Large-scale exercises like the LaM provide an unmatched opportunity to fully understand the capabilities and limitations of experimental organizations and new systems. However, the larger the exercise, the greater the competition to prioritize exercise goals. Such goals might include validating a portion of a war plan, improving interoperability with regional partner forces, demonstrating a new capability as a deterrent to adversaries, or all the above. Sometimes, that does not leave much room for experimentation.

A more recent example of a large-scale experimental exercise is Millennium Challenge 2002 (MC02), sponsored by the then newly formed JFCOM. MC02 featured emerging doctrinal concepts such as "dominant battlespace knowledge" and "rapid decisive operations." It also introduced "leap ahead technologies" that were not yet fielded to the force, such as the V-22 Osprey. The director of the exercise said that it would be a key to military transformation. It cost approximately $250 million and involved over 13,000 servicemembers at nine live-force training sites and 17 simulation centers. To justify the expenditure and the commitment of so many forces, additional exercise objectives were added. Not surprisingly, the exercise was unable to fulfill all of them.

MC02 was supposed to be a free play exercise, but when red (enemy) asymmetric tactics inflicted unexpectedly heavy losses on blue (friendly) forces in the opening turn of the game, the director had to intervene. Most of the U.S. naval task force was "re-floated" so that the rest of the exercise could continue and achieve other objectives such as unit live-fire training. In other words, experimentation had to give way to training. Many lessons were learned from this experience, but perhaps the biggest is that it is difficult for large exercises to achieve every goal.[5]

Organizational Experimentation. This is not to say that large exercises are not useful for experimentation. Combatant Command (COCOM)–level exercises such as DEFENDER-Europe and Pacific Sentry have served as valuable opportunities for the development

or validation of concepts and capabilities. For example, the Army created the Multi-Domain Task Force (MDTF) in the Pacific to test MDO doctrinal concepts. It combined units capable of long-range precision fires with a provisional Intelligence, Information, Cyber, Electronic Warfare, and Space (I2CEWS) Battalion. The MDTF then participated in the most recent Rim of the Pacific (RIMPAC) exercise. This went well enough that another MDTF is being created in Europe.

The services are experimenting with organizational designs in a variety of exercises, large and small. Each service has multiple examples, but two of them indicate their diversity and level of investment. The 88th Air Base Wing at Wright Patterson Air Force Base in Dayton, Ohio, is researching how the Air Force can best defend its strategic infrastructure—our homeland "forts and ports"—against attacks in the emergent domains of warfare. Meanwhile, the Navy's Surface Development Squadron ONE (SURFDEVRON ONE) will experiment with unmanned surface vessels and *Zumwalt*-class ships. Vice Admiral Richard Brown, Commander, Naval Surface Force, U.S. Pacific Fleet, described SURFDEVRON ONE's role as "developing warfighting capabilities and experimentation." It will also "[d]evelop material and technical solutions to tactical challenges" and "[c]oordinate doctrine, organization, training, material, logistics, personnel and facilities requirements for unmanned surface systems."[6]

Sometimes, an operational environment is the only way to stress test a concept or capability. Last year, the Navy embarked a full squadron of Marine F-35B Joint Strike Fighters on the amphibious assault ship USS *America*, converting it into a mini-aircraft carrier, or "Lightning Carrier," capable of conducting sea-control operations.

Service-Led Experimentation. After numerous unsuccessful attempts to find a solution to an experiment, Thomas Edison said, "I have gotten lots of results! I know several thousand things that won't work!"[7] Many live, virtual, and constructive exercises are conducted around the globe each year. They can and do

serve as laboratories; their results help us to find out more efficiently what will or will not work. Smaller-scale exercises sponsored by the services provide low-cost opportunities to generate feedback from lower echelons. Some of these are done primarily for training and readiness; others are intended as experiments with collateral training benefits. In either case, if the number of objectives is manageable, they can all generally be achieved.

For example, the Baltic Operations (BALTOPS) fleet exercises led by the recently reactivated U.S. Second Fleet have helped to iron out interoperability issues with allied navies and have enabled experimentation with concepts for Arctic operations and trans-Atlantic convoy tactics, among other benefits. Although these are not new types of operations, the Navy is learning how to conduct them in a multi-domain environment and in the more accessible Arctic Ocean.

Each year, the Air Force brings units from around the world to participate in its Red Flag Exercise at Nellis Air Force Base, Nevada. Against a tough, well-trained "aggressor" unit, the Blue forces learn how to employ space, cyberspace, and stealth to defeat integrated enemy air defenses such as those that characterize A2/AD environments. These exercises do a good job of combining training with concept development even though they are not specifically designed for the latter.

The Army conducts an annual exercise called the Joint Warfighting Assessment (JWA) that is designed specifically for experimentation. As the commander of 1st Armored Division at Fort Bliss, Texas, I have seen its value firsthand. JWAs are coordinated by the Joint Modernization Command, formerly known as the Brigade Modernization Command. As an aside, it is noteworthy that the word "Army" does not appear in the title of the exercise or its sponsoring agency. This makes sense, however. The purpose of the JWAs is to find solutions to multi-domain operational challenges in a joint context.

For several years, an entire Brigade Combat Team (BCT) was dedicated to experimentation,

testing new equipment and doctrines in harsh field conditions at Fort Bliss and White Sands Missile Range. Cyber operations by and against a sophisticated and robust cyber opposing force were a recurring feature of these exercises. The cyber warriors tested the participants to their limits—and sometimes beyond them—because failure is often a better teacher than success. Although it was not the principal reason for the exercise, the rest of the division gained training value from supporting and participating in the JWAs, particularly because the Air Force, Marine Corps, and our allies were also involved. Today, the JWAs have moved from Fort Bliss and alternate between Europe and the Pacific and are now "coming to a theater near you" in order to test concepts and capabilities in possible theaters of operation against peer adversaries.

Even routine training exercises serve as opportunities for experimentation. As commander of the U.S. Army's III Corps at Fort Hood, Texas, I was able to test a concept during a major command post exercise and improve the corps' combat readiness at the same time. We employed a Stryker Brigade Combat Team that had been reorganized and retrained to perform in the role of a cavalry regiment in support of the corps during a Warfighter Exercise. The purpose of the exercise was to train corps-level and division-level staffs and prepare them for upcoming operations, which it did in full. The experimental objective did not hinder our training in the least. In fact, in some ways, it helped. Despite its focus on unit training, the exercise yielded important results by validating the requirement for restoring a corps-level reconnaissance and security brigade or regiment. It did not validate the Stryker Brigade solution, but like Edison, we did not fail; we just found out what did not work.

Collecting the insights from all of this exercise-based experimentation across the Joint Force and then applying them to the joint concept development process is a challenge. Although it is a good problem to have, the J7 has its work cut out for it, sorting through the results to find the golden nuggets. These

exercises are yielding a great deal of innovation, and it is important that this innovation is properly considered and exploited by the appropriate organization.

War Games as Experiments. Although exercises are becoming increasingly joint and have begun to explore cross-domain challenges, the models, simulations, and war gaming (MS&G) that support experimentation offer a better opportunity to test concepts and capabilities rapidly. MS&G is not without risk, however. Professor Robert Rubel of the Naval War College has identified several "wargaming pathologies" that are failures in purpose, politics (for example, preordained outcomes), design, assessment, and analysis.[8] Given the complexity and tempo of all-domain war games as well as what is at stake, it will take a significant effort to avoid such pathologies.

As the noted British statistician George Box put it, "[A]ll models are wrong, but some are useful." If the COVID pandemic has taught us anything, it is that Mr. Box knew what he was talking about. Naturally, the early predictions about how the virus would spread were off, but some of the most influential models were off by an order of magnitude, leading to governmental decisions that could have effects equal to or worse than the disease itself. The medical profession tries to live by the code "first, do no harm." Similarly, military doctrines need not be exactly right, but they must at least avoid being "too badly wrong," as British military historian Sir Michael Howard so memorably put it. As pandemics and military history have proven, failure by either medical or military professionals to heed these cautionary words can have fatal consequences.

Avoiding a joint warfighting doctrine that is "too badly wrong" requires useful models designed to replicate multi-domain conflict as accurately as possible. An apocryphal cautionary tale about the use of computer models circulated during the Vietnam War. In 1969, Pentagon staffers asked a computer when the United States would win based on all measurable military data. It quickly answered: "You won in 1964!"

An actual and well-documented example of the war-game design pathology occurred in 1990 when military models vastly overestimated the number of U.S. casualties during Operation Desert Storm. Once word leaked out, widespread concern led to some changes in the plan. A RAND paper published just before the Gulf War predicted the discrepancy, saying that "in many cases the models are built on a base of sand."[9] Unfortunately, despite significant DOD expenditures on models and simulations—nearly $300 million in 2017 alone—the problem persists.[10]

Some important simulations still rely on Lanchester equations to estimate combat losses. Frederick Lanchester, a British engineer, developed the equations in 1916 to conceptualize aerial combat and warned at the time that they were not applicable to ground combat.[11] Perhaps we should have listened to him. Although updated to account for the effects of modern weapons, Lanchester-derived equations used by pre–Desert Storm modelers failed to fully appreciate the dynamics of AirLand Battle and the use of precision-guided munitions in a desert environment. This led to a miscalculation of *multiple* orders of magnitude (fortunately, in our favor). Presumably, the equations' accuracy will not improve when applied to non-kinetic cross-domain effects against logistics or command and control functions.

Obviously, this is an area begging for research and development, and DOD is not blind to the need. In February 2015, then-Deputy Secretary of Defense Robert Work issued a memorandum titled "Wargaming and Innovation" in which he argued that war games can "spur innovation and provide a mechanism for addressing emerging challenges, exploiting new technologies, and shaping the future security environment."[12] Later that year, he co-authored an article with then-Vice Chairman of the Joint Chiefs of Staff (VCJCS) General Paul Selva titled "Revitalizing Wargaming Is Necessary to Be Prepared for Future Wars."[13] He also implemented some MS&G innovations, such as forming the Defense Wargame Alignment Group (DWAG), the Wargame

Repository, and the Wargame Incentive Fund (WIF), which was funded at $10 million. These initiatives helped to gain efficiencies across the enterprise, but the sort of fundamental changes required by all-domain joint warfighting will require a larger effort and a new way of doing business on the part of DOD.

Clearly, new MS&G software will be needed to address the challenges of all-domain joint warfare. Unfortunately, as current VCJCS General John Hyten said during his confirmation hearings, the process of developing military software is "a nightmare across the board" compared to the commercial process as practiced by American companies like Google, Amazon, and Microsoft.[14]

Spending money on new simulations is only half the battle, though. To achieve the best designs and avoid the other war-gaming pathologies, the MS&G community will need to be populated and led by a cadre of officers and civilians who fully understand the state of the art and the warfighter's requirements. The Naval Postgraduate School has created a field of study, in which classes in war-game design are exclusively electives, that can serve as a starting point for the rest of the Joint Professional Military Education (JPME) enterprise. Today, the Army is the only service with a career field dedicated to simulations, and Functional Area 57 (FA 57) officers are assigned to all major Army headquarters at the division level and above. This is a best practice that the other services should consider emulating while the Army assesses whether its FA 57 officers are getting the right training.

Ideally, in addition to learning the art of federating simulations for distributed exercises, MS&G leaders would also learn how to avoid or mitigate the other war-gaming pathologies. To do this, they must understand the capabilities and limitations of both software and wetware: that is, the human element. Seminar-style war games known as BOGSATTs (Bunch of Guys Sitting Around a Table Talking), in which a roll of the dice is used as the stochastic method to replicate uncertainty, can play a role in identifying novel concepts, but they are not

well-suited to adjudicating (solving) them. The Army's Unified Quest (UQ) seminars have played an important part in helping to identify challenges related to Multi-Domain Operations (MDO), but they have not been used for adjudication. One of the key tasks throughout the UQ 2019 study year was how to operationalize artificial intelligence in support of MDO,[15] but adjudication of this automation-related question will require a more automated war game.

As Alexander Kott, chief scientist at the Army Research Laboratory, has observed, "[t]he actions of human actors teaming with robots and other intelligent agents will be pervasive in the complex operational environments of the future."[16] In other words, human–machine interaction will no longer be limited to training scenarios: We have reached the point at which we will need to use machines to help us learn how to use machines.

The Marine Corps may be leading the way toward this brave new world. War-gaming experts at Quantico, Virginia, are working on what they call the Next Generation Wargame (NGW). The NGW will attempt to leverage narrow applications of artificial intelligence for "in-stride adjudication," which would allow a war game to unfold without the traditional "turns." This would literally be a game changer, allowing war games to replicate the temporal aspects of conflict, which is increasingly relevant in an age of AI, hypersonics, and speed-of-light weapons.

The other services are taking steps in the right direction.

- The Army's Center for Army Analysis (CAA), the Army War College, and The Research and Analysis Center (TRAC) at Fort Leavenworth are leading the Army's war-game innovation efforts. They are incorporating all domains into the Army's models and evaluating various scenarios against potential adversaries.

- The Army Capabilities Integration Center (ARCIC) has been renamed the Futures

and Concepts Center and absorbed into a major new Army Futures Command. Supported by CAA and TRAC, the Futures and Concepts Center has been involved in selecting and war-gaming potential future technologies for ground combat. The results will be used to conduct additional, more detailed modeling.

- The Air Force Research Laboratory and LeMay Center are leading the charge for the Joint Force in the development of Joint All Domain Command and Control (JADC2).

- The Navy's Center for Naval Analysis (CNA) uses the same model as the one used by CAA, which is called the Joint Wargame Analysis Model (JWAM), another indicator of joint thinking among the services.

- The granddaddy of all war-gaming centers, the Naval War College Wargame Center, continues to refine its methods. While it has retained analysis of competing hypotheses as the core of its methodology, the Wargame Center is now using technology to enable joint, semi-autonomous forces.

Another step in the right direction is the Army's attempt to help bridge the gap between the military and industry by repurposing one if its reserve component training commands. The 75th Innovation Command's mission is to drive "operational innovation, concepts, and capabilities to enhance the readiness and lethality of the Future Force by leveraging the unique skills, agility, and private sector connectivity of America's Army Reserve."[17] These efforts can help to connect the civilian gaming "ecosystem" with the military's war-gaming ecosystem. The latter is a robust community of practice spread across the services, which are busily refining their models to include all six domains of warfare and applying themselves to the challenges of future conflict.

At the 2018 meeting of the National Training and Simulation Association, Tony Cerri, then Director of Data Science, Modeling and Simulation for the Army's Training and Doctrine Command G2, said that "if we can marry big data and AI with [modeling and simulation]...that's an unbeatable advantage."[18] Cerri is right, of course, but the converse of his statement is also true. Russia and China are investing vast amounts of money in AI with the aim of achieving superiority over the U.S. by 2030 in what they perceive to be a strategically important field. If our adversaries can experiment more realistically, faster, and less expensively than we can, there is no denying that we will be at a competitive disadvantage against them.

As stated previously, Russia has been joined by China as a peer threat to the United States, and we will need more sophisticated models if we are to understand the nature of the challenge that each poses. Chess, which requires the player to think multiple moves in advance to win, is a popular game in Russia. Not so in China, where a game called Go—based on deception and encirclement rather than direct attack—is preferred. In the early days of AI, IBM's Deep Blue learned to play chess well enough to defeat grandmaster Gary Kasparov in 1997. It took nearly two more decades before Google's AlphaGo was able to teach itself how to win against the world's top Go player, Lee Sedol of South Korea. In fact, it learned so well that Lee retired after the match.

Chris Nicholson, founder of a deep-learning startup, said at the time, "You can apply [this software] to any adversarial problem—anything that you can conceive of as a game where strategy matters. That includes war...."[19] It seems the Russians and Chinese have figured this out. We must as well.

A Guiding Hand

The MS&G community is spread across the Department of Defense. In some ways, this is a strength as it has led to a large and diverse community of interest, but it also hinders our ability to share information and act efficiently. Within OSD, the Office of Net Assessment

(ONA) conducts war games to see decades into the future, and Cost Assessment and Program Evaluation (CAPE) uses models to evaluate alternative capabilities and force structures. Responsibility for coordinating the development, validation, and verification of modeling and simulation software rests with a small organization called the Defense Modeling and Simulation Coordination Office (DMSCO). Within the Joint Staff, both the J7 and J8 conduct modeling and simulation. Naturally, each service has its own requirements and capabilities for MS&G.

Meanwhile, our closest allies are experimenting too. The European Defense Agency is studying the applications of AI and big data in training and simulations and using war gaming to analyze how to deal with complex scenarios such as hybrid warfare. There are many other examples.

Unfortunately, we no longer have JFCOM to bring all these efforts together to acquire the necessary resources and make the necessary changes to develop JADO. So who can coordinate interservice MS&G development to enable better, faster, and less expensive experimentation through war gaming? Who can ensure that we are taking full advantage of America's edge in commercial software innovation? Who can find the right applications for big data, artificial intelligence, and cloud computing for MS&G? And who will spearhead the joint DOTMLPF-P effort needed to implement JADO? Important changes that have been made indicate that the Joint Chiefs of Staff, supported by OSD and the services, could succeed in leading the charge. There are at least two reasons for optimism.

First, the J7 is not attempting to experiment alone. The Vice Chairman of the Joint Chiefs of Staff is an essential player in turning JADO into a fully developed and resourced joint warfighting doctrine. In his traditional role as chairman of the Joint Requirements Oversight Council (JROC), the VCJCS has embraced the original intent of the 1986 Goldwater–Nichols Act and is using his position to push more of a top-down acquisition process in support

of JADO. General Hyten said that the JROC will set its attributes and "the services will build to those" attributes, flipping the current bottom-up acquisition approach to one in which the Joint Chiefs "send[] a 'demand signal' to the services."

> The service then will be responsible for building the pieces and coming back to us, and then we have to make sure it fits all together.... That's what the JROC is *supposed* to do, [but] that is something we haven't done yet....

The JROC tended to be a receiver of requirements from services, not a generator of requirements for the services to meet.... That's not what was intended by Congress when it was established, by the processes we put in place, but that's what we've come to. And so that's going to require some discipline at the senior level to make sure that we are actually putting the demand signal out.[20]

If General Hyten applies this thinking to MS&G research, design, and development, the U.S. will be able to develop the right capabilities to experiment with JADO concepts and systems.

Second, and just as important, General Hyten said that he will try to steer the JROC away from being overly prescriptive, which can increase program costs and cause delays. Rather, he sees the council's role as blessing "the attributes of the capabilities that we need to have and then monitor[ing] the service's ability to build that."[21]

This is an important acknowledgment, as no one solution fits all domains equally well. The Army and Marine Corps tend to operate in dirtier environments than do the Navy and Air Force, while the Army has the additional requirement that it be able to scale any solutions to accommodate a force that is much larger than the other services. A continuous flow of information and feedback through the JROC members is the only way these concerns can be resolved. The approach will also allow these MS&G capabilities to evolve more quickly.

That said, the VCJCS and J7 will need some help from OSD, the services, industry, and our allies. Recently, the U.S. Army created its first new four-star command in a generation, the Army Futures Command, to lead its modernization efforts. The reactivation of JFCOM is unrealistic and perhaps even unnecessary, but a joint counterpart for AFC, an all-domain experimentation joint task force (ADE JTF) led by a four-star general or admiral, would be able to focus exclusively on acquiring the resources and generating the momentum needed to realize JADO's full potential. It would be able to supervise the efforts of the JADO cross-functional team and the services' studies of its four "orphan" functions. It could address policy issues with interagency partners, collaborate with allies, and coordinate the efforts of OSD with those of the services. It could distribute experiments between exercises and war games, perhaps even sponsoring some of the latter, and serve as the repository for their results. The J7 is already doing much of this, and the purpose of the ADE JTF would not be to replicate its role, but rather to complement and support it.

Conclusion

A radically new approach to joint acquisition is already underway. If it is supported by an organization dedicated to joint experimentation with the necessary resources and authorities, perhaps the U.S. can avoid the multi-domain equivalent of the surprise we encountered at Okinawa. As Admiral Nimitz conceded, the Plan Orange war games failed to anticipate the Japanese kamikaze attacks that cost the U.S. Navy dearly at Okinawa, sinking 34 ships, damaging 368 others, killing 4,900 sailors, and wounding nearly 5,000 more.

Perhaps someday, a future American commander may be able not only to paraphrase Admiral Nimitz and say that our Joint All Domain Operation Doctrine and Plans were enacted in games and exercises throughout the Defense Department and around the world by so many people and in so many different ways that nothing that happened during the war was a surprise, but also to exceed Nimitz's boast and say that this *included* the enemy's asymmetric cross-domain tactics toward the end of the war. More important still, robust joint experimentation may allow the United States to avoid the Thucydides Trap entirely.

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Building Resilience: Mobilizing the Defense Industrial Base in an Era of Great-Power Competition

Jerry McGinn, PhD

Increasing national security concerns about China's military capabilities and mercantilist economic policies, the growth of commercial technologies like artificial intelligence and robotics, and now a global pandemic have put a spotlight on the U.S. defense industrial base. A robust, secure, and resilient defense industrial base has been an important national priority in recent years. High-level reviews, increased investments, new legislative authorities, and efforts to encourage new entrants have been undertaken to grow and strengthen this industrial base.

How are we faring? Does our industrial base have enough capability and capacity for this era of strategic competition? And how resilient would our industrial base be in response to a national emergency?

The response to the current COVID-19 pandemic has given us a partial answer to these questions. Although the public health focus is obviously different from a military threat, the tools and authorities that are available to respond to this national emergency are essentially the same. Despite the glaring weaknesses in our public health supply chain that the pandemic has exposed, and despite the initially chaotic (albeit massive) response from government agencies and companies across the country, the ability of the U.S. to mobilize its industrial base to meet national emergencies has improved significantly. There is, however, still much work to be done.

Examining how the defense industrial base has mobilized to meet crises from the 20th century to more recent efforts, including the response to COVID-19, can help us to separate fact from myth and start to identify best practices for the future.

Nature and Structure of the U.S. Defense Industrial Base

The defense industrial base is an essential element of the country's national security and can even be considered a central component of the military force structure. The industrial base develops and produces systems and provides services that enable our warfighters to protect our homeland and to deter and defeat adversaries on the ground, at sea, in the air and space, and in cyberspace.

The defense industrial base is comprised principally of private and publicly traded companies that range widely in size and composition. In general, these firms fit within three major categories:

- A small number of large companies that serve as prime contractors and integrators on major weapons systems;

- A larger number of mid-tier companies that manufacture major subsystems or provide technical services to Department of Defense (DOD) customers; and

- A very large number of small companies that manufacture spare parts or provide material serving both commercial and defense customers, serve as nontraditional start-ups developing innovative technologies, or are focused on a particular defense segment or customer set.

All told, the number of firms that contribute in some way to the U.S. industrial base likely well exceeds 100,000, according to Vice Admiral David Lewis, director of the Defense Contract Management Agency.[1] These firms all work closely with government customers to field capabilities for the national defense.

In addition to these private and publicly traded companies, there is a much smaller component of government-owned facilities that produce and service systems: the organic industrial base. These facilities include shipyards, arsenals, maintenance depots, and ammunition plants.[2] Their capabilities include the expertise to "perform deep repair, the means to provide repair parts to the shop floor, and the ability to deliver repaired systems to the time and place of the fight [that] accompanies every military ship, plane, vehicle, and weapon."[3]

The "reemergence of long-term strategic competition" with China and Russia articulated in the 2017 National Defense Strategy (NDS) has led to substantial changes in DOD investment priorities that have shaped the efforts and even the composition of the defense industrial base. The NDS further notes that "[m]aintaining the Department's technological advantage will require changes to industry culture, investment sources, and protection across the National Security Innovation Base."[4] The term "National Security Innovation Base" was introduced in the 2017 National Security Strategy to reflect the broad "network of knowledge, capabilities,

and people" that "protects and enhances the American way of life."[5]

The NDS definitely reinforced the emphasis on increasing the number of commercial entrants in the defense industrial base that had begun with efforts such as the Defense Innovation Unit (DIU), self-described as a DOD organization that "strengthens our national security by accelerating the adoption of commercial technology throughout the military and growing the national security innovation base." Specifically, "[w]ith offices in Silicon Valley, Boston, Austin, and the Pentagon, DIU connects its DoD partners with leading technology companies across the country."[6] The military departments have launched similar initiatives such as AFWERX and Army Futures Command.[7] The overall thrust of these efforts has been to focus on commercial innovation because that is the nature of such key NDS technology focus areas as artificial intelligence, robotics, autonomy, and quantum computing.

Whatever its ultimate composition, the defense industrial base must have the ability to mobilize to meet the country's national security needs. This mobilization is driven by three principal components:

- **Capability.** Do we have the defense industrial capabilities we need? Are we investing in the right technologies and building the systems necessary to face both current and future national security challenges?

- **Capacity.** How much redundancy and industrial capacity are appropriate? Are we developing enough manufacturing competency to meet surge requirements in the event of protracted conflict?

- **Resilience.** How can the United States fully mobilize the capabilities and capacities of the defense industrial base to meet future contingencies? How quickly, for example, can we ramp up production lines or adjust to emerging industrial requirements in the middle of a major crisis?

All three components are crucial. None of them is fixed, of course. Any of these components can be increased or decreased through attention and resources. At the same time, however, getting the balance of capabilities and capacities right is key because it takes time to change direction. As former Secretary of Defense Donald Rumsfeld famously quipped, "You go to war with the army you have, not the army you might want or wish to have at a later time."[8]

The key outcome of this balance of capability and capacity is resilience. Resilience determines whether the defense industrial base can ultimately produce and deliver in response to a true national crisis. Let us examine how the defense industrial base has performed over time to put that balance in context.

Mobilization in the 20th Century

World War I. By the start of the 20th century, the United States had become a true industrial power. In the early 1900s, U.S. industrial capacity surpassed that of major European powers like the United Kingdom, France, and Germany, but the United States was focused solely on commercial enterprises, and there was very little defense-focused industrial capacity apart from a limited number of arsenals and shipyards.[9] As tensions in Europe grew and war approached, countries formed alliances and began to mobilize their industries to build rifles, trucks, artillery, airplanes, and other vehicles. Barbara Tuchman's riveting account of German and other European military planners' detailed mobilization plans in preparation for war in her famous work *The Guns of August* vividly depicts this mobilization.[10]

This high state of alert was certainly not present in the United States in 1914, when the Army was a very modest force of just over 127,000 soldiers and there was little appetite for war. In fact, President Woodrow Wilson won reelection in 1916 in large measure because of his slogan, "He Kept Us out of War."[11]

That changed in 1917 when the United States entered World War I. Businesses and business leaders stepped forward dramatically to help the war effort. This is illustrated most notably by the War Industries Board (WIB). The WIB was an emergency agency created and largely led by industry executives—so-called dollar-a-year men—on loan from their respective companies to help oversee war production. While private enterprise played a significant role in war mobilization, this rapid effort also included some heavy government intervention such as an "excess profits tax." In addition, the government exercised what historian Mark Wilson calls "government coercion" and assumed control of private enterprises like Smith & Wesson for periods of time to overcome labor disputes or to direct production.[12]

The results of these efforts were significant. The crash mobilization efforts ultimately succeeded in building a sufficient number of cargo ships to move all of the men and materials needed for the war, including 2 million rifles, 80,000 trucks, and 12,000 airplanes, in less than two years. Unfortunately, however, most of this equipment arrived too late. General John J. Pershing's American Expeditionary Forces, totaling almost 2 million men, used a fair number of British rifles and machine guns as well as French airplanes during the Great War. As Arthur Herman notes in his dramatic account (devoted principally to World War II mobilization), "Of the 10,000 75mm artillery pieces the War Department ordered, only 143 ever reached the front—and not one American-made tank."[13]

After the November 1918 Armistice, the United States quickly dismantled the WIB in 1919, and the industrial base returned to its prewar focus. The Great War experience, however, did significantly inform American mobilization efforts in World War II.

World War II. The United States watched during the 1930s as tensions again rose in Europe. Domestic attitudes remained hostile toward involvement in another European war, and American industrial efforts reflected that posture of neutrality. President Franklin D. Roosevelt, who had served as Assistant Secretary of the Navy during World War I, clearly

TABLE 1

Comparing Peacetime and Wartime Production During World War II

Product	Prewar Baseline Output	Wartime Peak Output	Peak/Baseline
Synthetic rubber	3,200 long tons (1940)	922,000 long tons (1945)	288.1
Aviation gasoline	4,000 barrels/day (June 1940)	520,000 barrels/day (March 1945)	130
Merchant ships	0.3 million dw tons (1939)	18 million dw tons (1943)	60
TNT	100,000 lbs./day (June 1940)	4 million lbs./day (Dec. 1942)	40
Airframes	20.3 million lbs. (1940)	797.1 million lbs. (1944)	39.3
Magnesium	12 million lbs. (1940)	368 million lbs. (1943)	30.7
Aluminum	327 million lbs./year (1939)	2.3 billion lbs./year (late 1943)	7
Electric power	28 million kilowatts (1940)	44 million kilowatts (April 1944)	1.6
Steel	82 million net tons (1940)	96 million net tons (1945)	1.2

SOURCE: Mark R. Wilson, *Destructive Creation: American Business and the Winning of World War II* (Philadelphia: University of Pennsylvania Press, 2016), p. 79.

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recognized the domestic political constraints, but he benefited from the need of the British and French governments to buy aircraft and ships in the late 1930s to confront the growing Nazi threat.

Congress passed the $1.1 billion Fleet Expansion Act in May 1938 to address these international orders as well as increasing domestic orders for ships.[14] Although the United States continued to remain neutral after war began in Europe in September 1939, the need for increased industrial mobilization had become clear. In May 1940, General George C. Marshall, the U.S. Army Chief of Staff, convinced President Roosevelt to increase the Army's 1940 appropriation request dramatically from $24 million to $700 million.[15] These significant actions helped to create the conditions for "the great arsenal of democracy" that Roosevelt famously announced as his goal for America in a December 1940 fireside chat.[16]

This arsenal would be built by a diverse set of characters that represented an underappreciated cohort of the Greatest Generation. They included new dollar-a-year men like General Motors President Bill Knudsen, known as the "Big Dane," who resigned his position after a phone call from President Roosevelt in mid-1940 requesting that he come to Washington; industrialists such as the colorful Henry Kaiser, a high school dropout who became a production wizard; government officials such as former cotton broker and head of the Reconstruction Finance Corporation Jesse H. Jones; and even New Dealers such as the President's close adviser Harry Hopkins.[17]

Despite often being at odds with one another, these leaders achieved tremendous results in establishing industrial capacity in such areas as materials, steel, ships, tanks, and aircraft. They directed or oversaw significant government investment through the alphabet soup of government organizations created during the war such as the War Production Board, its successor Office of Production Management, the Reconstruction Finance Corporation, and many more. Success was accomplished principally through public investment to create new shipyards and manufacturing plants that were run by private companies. These

government-owned and contractor-operated (GOCO) facilities were the largest investment in manufacturing capacity during the war and became a successful business model that continues today.[18]

Most important, these GOCOs produced. As Knudsen and his successor, former Sears, Roebuck executive Don Nelson, worked with the President to establish ambitious production goals each year, the base would inevitably meet and exceed these goals. The sheer numbers and scale are breathtaking. Mark Wilson's analysis lays out the magnitude of this increase in Table 1.

This level of production simply swamped that of America's adversaries. "In 1943," notes Arthur Herman, "American war production was twice that of Germany and Japan combined."[19]

The private-sector companies that produced the output of the arsenal represented all aspects of American manufacturing. The largest government contractors were major existing businesses like Bethlehem Steel, Chrysler, General Motors, Ford, Sperry Gyroscope, and Wright Aeronautical, which expanded or modified their production lines to support the war effort.[20] Thousands of other small and midsize companies similarly converted their operations or were formed to meet the tremendous war demand. Among the most dynamic and innovative sectors during the war was aircraft manufacturing, with such companies as Lockheed Aircraft, the Curtiss-Wright Corporation, the Glenn L. Martin Company, the Allison division of General Motors, Pratt and Whitney, Boeing, and the fledgling Grumman Aircraft in Long Island, New York, producing aircraft and engines throughout the war.[21]

Not surprisingly, though, there were at times significant challenges in this mobilization. Government seizures of companies, labor unrest, and tensions between government and industry over price controls and profit margins were also regular features during the war.[22] Numerous production efforts struggled or spectacularly failed. The B-29 superbomber, for example, was a tremendous struggle for prime contractor Boeing, government program managers, and the defense industrial base, but through the persistent efforts of all involved, the B-29 came into service and at the end of the war played a pivotal role that included dropping atomic bombs on the Japanese cities of Hiroshima and Nagasaki.[23]

The extraordinary results of the overall effort, however, speak for themselves. When the war ended, the United States was undeniably the world's principal industrial power. But the end of the war also led to rapid demobilization of the armed forces and the start of industrial "reconversion." The government disposed of many GOCOs through privatization, a trend that continued across the defense sector.[24] That, plus conflict on the Korean Peninsula and the onset of the Cold War, helped to shape the defense industrial base for the remainder of the 20th century.

Korea and the Defense Production Act. The Soviet establishment of puppet regimes in Eastern Europe in the aftermath of World War II and the North Korean invasion of the South in 1950 led Congress to enact the Defense Production Act (DPA), which was modeled on the authorities of World War II. President Harry S. Truman used the DPA principally to prioritize and direct production efforts. He continued, for example, the practice of government seizures of private companies, although this practice came to an end after the Youngstown steel strike of 1952. Concerned about the impact of the strike on the war effort, the President issued an executive order in April to force the steel mills to stay open. The Supreme Court, however, ruled that Truman's seizure of the steel industry was unconstitutional.[25]

Despite the Supreme Court ruling, the DPA took shape over time. The law gave the President broad authority to ensure the timely availability of essential domestic industrial resources to support defense requirements. Congress continued to reauthorize three of the original DPA titles, which were used regularly throughout the Cold War and in the decades following the fall of the Berlin Wall.

- Title I is focused on the distribution and allocation of goods and services. The distribution authority of Title I permits the government to prioritize contracts to meet priority government needs. The Defense Prioritization and Allocation System (DPAS), overseen by the Department of Commerce, uses this authority regularly to prioritize orders and rate contracts to meet government-mandated critical infrastructure requirements.[26]

- The allocation authority of Title I permits the government to prioritize industrial efforts to meet national defense priorities. This authority was rarely used in the aftermath of the 1952 steel strike, but it was central to the establishment of the Civil Reserve Air Fleet (CRAF). CRAF, managed by the Department of Transportation, gave the President the ability to mobilize specific aircraft for government use in the event of national emergency.[27] CRAF planning efforts focused for example, on surge requirements to deploy U.S. troops and equipment to Europe to help the North Atlantic Treaty Organization (NATO) defend Europe in the case of Soviet military aggression.

- Title III focuses on the ability to "create, maintain, protect, expand, or restore industrial base capabilities essential for national defense" through grants, loans, purchases, and purchase commitments.[28] The President delegated authority to the Department of Defense to manage this authority. Over time, Title III became focused almost exclusively on grants— principally congressional earmarks—to increase industrial capacity in areas of industrial base weakness such as complex forgings for naval propulsion shafts and the creation of a domestic production facility for beryllium.[29]

- Title VII focuses on voluntary agreements between the private sector and government to "help provide for the national defense" in times of crisis.[30] Only one voluntary agreement on the maritime industry currently exists, and it is managed by the Department of Transportation. Foreign direct investment is also covered under Title VII and is governed by the Committee on Foreign Investment in the United States (CFIUS). CFIUS is an interagency committee that, led by the Department of the Treasury, reviews foreign investment transactions for national security concerns. CFIUS was added to Title VII in 1988 through the Exon–Florio amendment to the DPA but received little public attention until the Dubai Ports transaction in 2007.[31] This transaction, which proposed the foreign purchase of six U.S. ports, led Congress to pass the Foreign Investment and National Security Act to create CFIUS in statute.[32]

Industrial Base and Industrial Policy Trends. The privatization of the defense industrial base (which President Dwight D. Eisenhower famously dubbed the military–industrial complex in his 1961 farewell address) continued during the Cold War.[33] Throughout decades of East–West confrontation, dozens of major defense contractors developed ships, aircraft, and ground vehicles for the Department of Defense.

The existential threat of nuclear war and the militarized border between NATO and Soviet bloc forces led to a consistently large U.S. defense budget—generally over 5 percent of gross domestic product—throughout the Cold War.[34] This changed dramatically after the fall of the Berlin Wall and Secretary of Defense William Perry's "Last Supper" meeting with major defense company CEOs, which sparked a significant round of industrial consolidation within the defense sector as budgets declined after the Cold War ended.[35]

Inside government, meanwhile, there was little coordinated focus on industrial policy or planning. The Office of War Mobilization, which performed this function during World

War II, was abolished immediately after the war. President Truman created a comparable entity, the Office of Defense Mobilization, during the Korean War, but President Eisenhower greatly reduced the stature of this office in favor of a market approach.[36]

Much of this was purposeful because of long-standing American bias against industrial policy. As the late Jacques Gansler noted, "[t]he U.S. economy is built on the strong assumption of the benefits of free-market operation and has long been averse to industrial planning, even in the defense sector."[37] Unlike Cold War adversaries like the Soviet Union and China, the United States did not put great stock in five-year plans to achieve industrial results. Instead, U.S. leaders believed that, much like the perceived experience during World War II, the dynamic nature of the U.S. economic system and the strength of the overall industrial base would be able to respond to any national crisis.

Mobilization in the 21st Century

As the nation moved into the second decade of the 21st century, national security officials began to rethink many of their assumptions about mobilization and the defense industrial base.

Post-9/11 Conflicts and the MRAP. The conflicts in Afghanistan and then Iraq in the wake of 9/11 spurred industrial mobilization efforts that were substantially different from those that had arisen in response to previous conflicts. During the early 2000s, most of the industrial base focused on developing capabilities to fight insurgents.

Particularly in Iraq, improvised explosive devices (IEDs) became the greatest threat to American forces. U.S. armored vehicles had been very effective in toppling the Taliban and Saddam Hussein regimes but were much less suited to protecting soldiers against IEDs. Large and small companies focused on developing systems to counter IEDs as well as additional force protection for individuals and vehicles. Overall, the defense industrial base was up to the task, developing more advanced body armor for soldiers and additional armor for

vehicles. DPA Title I was even used to help prioritize the production of body armor.[38] Despite these improvements in force protection, however, deaths from IEDs continued to mount.

The Mine-Resistant, Ambush-Protected Vehicle (MRAP) ultimately became the force protection solution for American forces, but its development and deployment were not without challenges. As James Hasik points out in his forthcoming book, the foremost challenge with respect to the MRAP was getting it established as a true acquisition priority. The MRAP was a radical departure in armored vehicle design, and it competed with other priorities.

Prioritization changed with the arrival of Robert Gates as Secretary of Defense in 2007, but challenges to the industrial base were not insignificant. There were initial industrial bottlenecks for ballistic glass, axles, tires, and spare parts, but the biggest challenge was steel plate. With extremely limited domestic capacity to produce steel plate for the MRAP, DOD qualified foreign-owned and foreign sources to meet the demand. Secretary Gates also used the highest DPA Title I DPAS rating, DX, to prioritize steel plate procurement. Eventually, these challenges were overcome, and tens of thousands of MRAPs were produced and delivered to Iraq, contributing significantly to the dramatic reduction in IED casualties by 2008.[39]

Sharpening Focus on the Defense Industrial Base. The proliferation of high-tech commercial technology and the shifting of manufacturing and production to meet the demands of the global economy have had tremendous economic benefits for the United States and countries around the world, but they also have given rise to trends and practices that would be problematic in war. The limits of these approaches, which include just-in-time manufacturing and global supply chain optimization, became increasingly visible in the defense industrial base as the country entered the second decade of the new century and troop levels in the Middle East decreased.

While national security priorities and Buy America laws ensured that the vast majority of the development and production of defense

systems occurred in the United States, the production of some critical subcomponents and materials migrated overseas. DOD's annual *Industrial Capabilities* reports to Congress identified many of these weaknesses in the industrial base.[40] They noted, for example, that the production of microelectronics and materials such as rare earth elements as well as specialty chemicals and energetics used in explosives were increasingly produced only outside of the United States—in some cases, almost exclusively in China. These components and materials are used overwhelmingly for commercial purposes in electronics such as computers and smartphones, but they also are essential components in critical advanced defense systems such as radars and precision-guided munitions (PGMs).

The short-lived 2010 Chinese embargo of rare earth elements following the Japanese seizure of a Chinese fishing vessel brought attention to the dominant position that China had achieved, largely through state industrial policy, in rare earth mining and processing. Although the crisis quickly passed, the lack of U.S. domestic rare earth capacity and consequent dependence on a foreign source of supply remained.[41]

DOD's focus on the industrial base sharpened during this period as a result. The Office of Industrial Affairs, which had been demoted in stature in the early 2000s, was elevated and eventually strengthened further in 2013 with the creation of the Office of Manufacturing and Industrial Base Policy (MIBP). In addition to the traditional focus on industrial base assessment, anti-trust reviews of defense-related mergers and acquisitions, and DPA Title III, the responsibility for CFIUS was transferred to MIBP. This reorganization and a direct-report relationship to the Under Secretary of Defense for Acquisition, Technology, and Logistics gave DOD a stronger focal point for industrial base analysis and mitigation efforts across the department.

This sharpened focus played a significant role in addressing the changing nature of foreign direct investment as the country of origin in CFIUS transactions began to shift substantially after 2010. From 2007–2009, for example, acquisitions originating from companies in the United Kingdom, Canada, France, Australia, and Israel—traditional U.S. allies—accounted for 57 percent of 358 covered transactions. Transactions originating from Chinese firms were less than 4 percent of the total. In less than a decade, those ratios shifted dramatically. From 2016–2018, transactions originating from China were the largest proportion of cases filed: 26.5 percent. Moreover, the nature of the Chinese transactions drew increased scrutiny because the vast majority of these proposed acquisitions (84 percent) were focused on the manufacturing, finance, information, and services sectors.[42]

This shift drew significant bipartisan congressional and executive branch concern about the impact of increased levels of Chinese ownership or control in such critical sectors of the industrial base as microelectronics. On August 13, 2018, the President signed into law the National Defense Authorization Act (NDAA) for Fiscal Year 2019, which included the Foreign Investment Risk Review Modernization Act of 2018 (FIRRMA).[43] FIRRMA was the most significant reform of CFIUS since the Foreign Investment and National Security Act (FINSA) of 2007 and helped to modernize national security reviews of financial transactions by "expand[ing] the scope and jurisdiction of CFIUS," refining CFIUS procedures, and requiring "actions by CFIUS to address national security risks related to mitigation agreements."[44]

2017–2018 White House Defense Industrial Base Review. The galvanizing point for sustained action in the defense industrial base was the 2017–2018 whole-of-government review launched by President Donald J. Trump's Executive Order 13806, "Assessing and Strengthening the Manufacturing and Defense Industrial Base and Supply Chain Resiliency of the United States," signed on July 21, 2017.[45] Initiated by the White House Office of Trade and Manufacturing Policy and led by the DOD Office of Industrial Policy, this interagency effort identified five macro forces shaping the

industrial base that included the decline of U.S. manufacturing capability and capacity as well as U.S. government business practices. These macro forces manifest themselves in what the final report called "risk archetypes" in the defense industrial base, ranging from single and sole sources of supply to fragile suppliers and markets as well as dependence on foreign suppliers and the erosion of U.S.-based infrastructure.[46]

The report reinforced many previous efforts, but one finding in particular—the "surprising level of foreign dependence on competitor nations"—stood out and became the focus for implementation.[47] Of principal concern were areas in which Chinese firms had become single or sole-source suppliers of critical materials well down the supply chain through mercantilist economic policies and general global supply chain trends. In response, the Administration initiated a significant number of DPA Title III and Industrial Base Analysis and Sustainment program projects to address these shortcomings. These resulted in Presidential Determinations and funding opportunities for capabilities such as small unmanned aerial systems, critical chemicals for missiles and munitions, and heavy and light rare earth separation and processing.[48]

Adapting the Defense Industrial Base to Meet NDS Objectives. The defense industrial base has been financially healthy for most of the past two decades with substantial defense budgets and strong market valuations in the wake of the 9/11 attacks, subsequent long-term military operations in the Middle East, and growing security threats from China and in cyberspace. The basic structure of the industry has similarly remained stable with a handful of large prime contractors that enjoy annual revenues exceeding $15 billion, a larger number of mid-tier companies that are major subsystems suppliers, and a much larger cohort of small businesses and component suppliers. Mergers and acquisitions have continued throughout the industrial base with the exception of consolidation among the top system integrators.

The NDS focus on renewed great-power competition led to significant changes in investment priorities across DOD. In addition to high-tech investment, the overall DOD budget increased, and existing major acquisition programs were overhauled to align with NDS objectives. After almost two decades focused on counterterrorism, however, there were questions about whether the defense industrial base would have the resilience for a rapid ramping up of production in complex major systems such as satellites, aircraft, and ships in the event of a crisis. As noted in the White House 13806 report and the annual industrial capability reports to Congress, there are numerous sectors of the industrial base, such as advanced radars, aircraft, shipbuilding, ground vehicles, and rocket motors, where there often are just two prime contractors.[49]

In addition to these efforts to add capability and capacity to the defense industrial base, there have been a number of initiatives to simplify and increase the speed of the DOD acquisition system. Congressional efforts through the NDAA in the past several years have created authorities, for example, to facilitate the greater use of Other Transactions Authority (OTA) contracts[50] and to create a middle-tier acquisition authority approach.[51] The rationale behind these changes has been to encourage greater innovation and more prototyping both in research and development and in major acquisition programs to help build resilience to meet the dynamic challenges of today's security environment. DOD has put together an Adaptive Acquisition Framework (AAF) to outline these and other "pathways" for acquisition professionals "to develop acquisition strategies and employ acquisition processes that match the characteristics of the capability being acquired" in support of the NDS.[52]

Supply chain security has been a persistent challenge in the defense industrial base. Beyond the entry of companies from adversary countries into lower levels of the supply chain, two principal challenges stand out.

The first of these challenges is supply chain visibility. DOD does its business through contracts with prime contractors, and those contracts hold the prime contractors accountable

for having their subcontractors deliver. As a result, DOD does not have direct visibility into the defense supply chain beyond the prime or tier-one or tier-two levels. Similarly, prime contractors do not have tremendous visibility beyond one or two levels further down the supply chain. Most of the time, this is not an issue, but in certain cases, it can be very difficult. In 2017, for example, a fifth-tier supplier that provided a voltage control switch used in PGMs was purchased, and a subsequent end-of-life buy was insufficient to meet operational demands.[53] This resulted in the rationing of PGMs being used in an operational theater at the time until a longer-term solution was devised.

The second persistent challenge is cybersecurity. The threat to U.S. national security secrets and the damage caused by intellectual property theft in the defense industrial base are well documented and have played a central role in the establishment of DOD's Cybersecurity Maturation Model Certification (CMMC) effort.[54] CMMC is being implemented in 2020 with the goal of full implementation by 2025.

With these changes in investment and in how DOD acquires goods and services, the question remained as to whether the defense industrial base could deliver in the event of major conflict. The unexpected COVID-19 pandemic early in 2020 has provided a partial answer.

The Response to COVID-19

In many ways, the current COVID-19 pandemic has been a testing ground for the ability of the U.S. industrial base to respond to a national emergency because, not surprisingly, the challenges to public health supply chains are similar in many ways to those faced by defense supply chains. For example, while innovation and research and development are strong domestically, the production of personal protective equipment (PPE) and many pharmaceuticals has largely moved offshore.

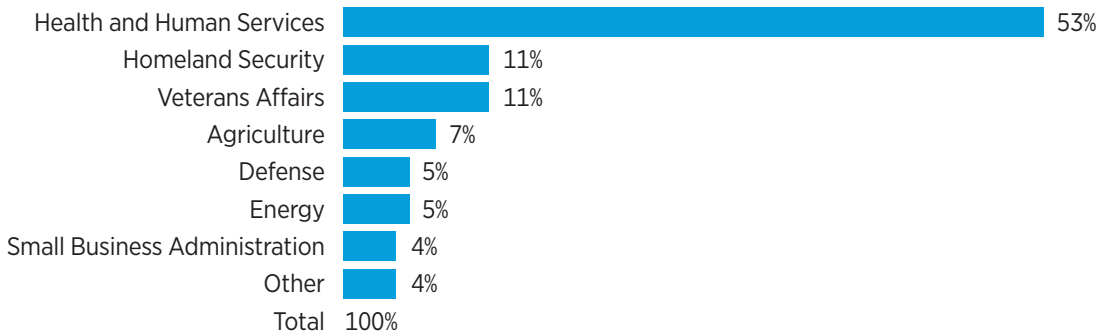The limitations of this approach were exposed in the early days of the pandemic when media reports revealed that Chinese firms produce over 50 percent of the world's N95 masks and that they had temporarily halted their mask exports as the virus spread in China.[55] Furthermore, there was the troubling revelation that more than 90 percent of the global production of antibiotics also takes place in China.[56] Much like the White House defense industrial base review, the pandemic has demonstrated the problematic nature of dependent economic relationships with nontransparent economies and undemocratic countries like China for items of strategic importance.[57]

The initial federal response to the pandemic was chaotic, as it would be in any major crisis, but it was clear from the outset that the White House and all U.S. government agencies were pursuing an all-of-the-above approach to acquiring the PPE and equipment needed to treat COVID patients across the country. The Coronavirus Task Force and federal agencies led by the Department of Health and Human Services (HHS) worked with existing producers of ventilators and other health care equipment to surge production to unprecedented levels, and agencies began to release quick-turnaround—even same-day-response—solicitations to purchase PPE from all sources. Some also issued competitions to seek alternative solutions from suppliers that had never before produced health care equipment.[58] Meanwhile, White House advisers such as Director for Trade and Manufacturing Policy Dr. Peter Navarro got on the phone with leaders of commercial firms to find companies willing to adjust production efforts to develop additional sources of ventilators and PPE to meet the exploding number of COVID cases in late March.[59]

On March 13, the President announced that he was invoking the DPA's Title I distribution authority to enable HHS to speed the procurement of PPE and other items. The executive order gave HHS the authority to prioritize contracts and orders to meet national defense and emergency preparedness program requirements, specifically in the "areas of health and medical resources needed to respond to the spread of COVID-19, including personal

CHART 2

Federal Obligations Focused on COVID-19

SHARE OF TOTAL OBLIGATIONS AS OF JUNE 2, 2020, BY DEPARTMENT

Department	Share
Health and Human Services	53%
Homeland Security	11%
Veterans Affairs	11%
Agriculture	7%
Defense	5%
Energy	5%
Small Business Administration	4%
Other	4%
Total	100%

NOTE: Department of Defense data are not fully represented due to standard 90–day lag in reporting.
SOURCE: Federal Procurement Data System–Next Generation, https://www.fpds.gov/fpdsng_cms/index.php/en/ (accessed July 10, 2020).

🔔 heritage.org

protective equipment and ventilators."[60] In short order, there were heated debates about whether the President should invoke the DPA Title I allocation authority to direct ventilator production—an action that he largely resisted.[61]

Debates about how various aspects of the DPA might be used in response to the public health crisis tended to dominate media reporting, but these masked the real work that was underway. Government agencies responded immediately to the pandemic by invoking emergency clauses in the Federal Acquisition Regulation (FAR) to delegate approval authority, increase the use of streamlined commercial contracting processes, and increase thresholds to help speed efforts.[62] Funding opportunities in such areas as 3D printing, biofabrication, and textiles[63] as well as collaborative projects between biomedical technology companies and the Army[64] also emerged rapidly. Companies across the spectrum responded to those opportunities to provide solutions during this time of crisis.

The results coming out of the industrial base were dramatic. In just the final week of March, federal obligations focused on COVID-19 rocketed from $636 million on March 24 to just shy of $2 billion by March 31.[65] Cumulative obligations reached over $7 billion as of April 21 and $14 billion by the start of June. Chart 2 breaks down these obligations by government agency.

The Coronavirus Aid, Relief, and Economic Security (CARES) Act further accelerated the immediate response and facilitated medium-term efforts to rebuild the domestic public health supply chain. For the longer-term resilience of that supply chain, the CARES Act added $1 billion to the DPA Fund and removed funding restrictions on individual Title III projects.[66] The tremendous infusion into the DPA Fund was its largest-ever appropriation, and some of these funds have already been used as the Administration has greatly accelerated Title III projects. Whereas, for example, it has taken 18 months to get rare earth Title III projects to the point of award, two COVID-19 pandemic-focused Title III projects, each over $120 million, have been started in less than a month utilizing those DPA funds.[67]

Most important, the impacts of these industrial base efforts were felt in the hospitals on the front lines of the fight against COVID-19. Despite frightening projections and spiking cases in early April, few hospitals suffered lasting shortages of PPE or ventilators, and numerous temporary field hospitals that were constructed were not even used for coronavirus patients.

Building Resilience: Lessons for the Future

COVID was an important testing ground in several aspects, but it was not as challenging to the defense industrial base as, for instance, the development of the B-29 or the atomic bomb were during World War II. Certainly, should the U.S. find itself in a longer-term conflict with an adversary such as China, the ability of our defense industrial base to respond to the destruction or disabling of our F-35 fighters or satellites would present a greater challenge. While DOD investment priorities and contracting approaches continue to prioritize capabilities and capacities focused on great-power competition, the essential question is whether we are building the real resilience that the nation requires to address today's—and tomorrow's—defense challenges.

Overall, our defense industrial base is well postured on at least two fronts.

- The basic authorities, regulations, structures, and tools available to government are solid. Despite some initial hiccups, this structure enabled an effective response to the multifaceted nature of the COVID-19 crisis. Many tools such as OTAs and DPA Title III that are supporting NDS priorities have similarly been deployed effectively during the current crisis.

- Companies across the spectrum are getting involved. Many commercial start-ups and nontraditional contractors engaged with DIU and AFWERX, and other DOD organizations immediately turned their efforts to support pandemic response efforts. One of those companies, for example,

pursued and won a series of COVID-19 contracts that began in early April.[68]

There are still gaps and weaknesses that need to be addressed, however. The lack of robust capacity in areas of numerous industrial base sectors such as ground vehicles, shipbuilding, radars, and rocket motors, for instance, raises concerns for potential NDS contingencies. In these and other sectors, there is often one contractor with a preeminent market position and one or more other firms that struggle to keep up. Creating more opportunities for firms to compete for prototype contracts through middle-tier acquisition authority efforts or through OTAs, such as the Army is doing in its revamped timeline for the Optionally Manned Fighting Vehicle, is one way to build industrial capacity to meet NDS objectives.[69]

A recent analysis of the defense industrial base by a major defense trade association and fast-rising analytics firm gave the base a "C" grade based on "a business environment characterized by highly contrasting areas of concern and confidence."[70] Areas of concern included workforce, intermediate goods and services, and raw materials. While the middling overall grade is not terribly surprising, coming as it does from a trade association, it is very interesting to note that some of the highest scores in the report related to the industrial base's productive capacity and surge readiness.[71]

Turning back to the three components that are key for mobilizing the defense industrial base, there are several areas that are ripe for additional action in the coming months:

Capability
- Incentivizing new defense industrial base entrants will continue to be crucial. The trends in commercial technology are only accelerating, so DOD needs to continue to develop and scale business relationships with nontraditional suppliers.

- Eliminating industrial base dependence on China or another competitor nation

is imperative. Utilizing DPA Title III and other authorities or programs to address this dependence will be critical to enabling future crisis responses.

- Increasing the ability of companies and agencies to use rapid and flexible contracting mechanisms will be essential to successful responses to future crises. Carefully assessing the rugby scrum of contracting efforts used in the COVID-19 response, for instance, will help to determine which efforts are most successful at rapidly developing, producing, and delivering the needed capabilities at the needed time so that we are prepared for the future.

Capacity

- Developing DPA Title VII voluntary agreements could help to build the latent capacity of the defense industrial base to address future mobilization efforts.

- Prototyping efforts through OTAs as well as Section 804 middle-tier acquisition authority can help to create additional industrial base capacity akin to that of the numerous aircraft companies in World War II by increasing these prototyping efforts and linking them with production programs.

- Increasing visibility into defense supply chains through an independent third-party mechanism will help to identify capacity challenges in the defense industrial base as they develop and mitigate them before they have an operational impact.

- Stockpiling is a cost-effective way to build capacity in the defense industrial base. Building on the expansion of the Strategic National Stockpile in the CARES Act, DOD should explore ways to build additional capacity by stockpiling resources that are relevant for great-power competition.

Resilience

- Planning and organizing in advance will help to speed future mobilizations of the defense industrial base. Detailed plans and standing organizations are in no way solutions by themselves, but clearly outlining and aligning DPA and other authorities, policies, and responsibilities for future crises and taking an informed approach to planning will help to bring the best aspects of industrial policy to bear for the defense industrial base.

- Finally, the industrial base has clearly become an extended part of the battlefield in today's environment. A catastrophic cyberattack, an antisatellite attack destroying our Global Positioning System network, or a deadly second wave of COVID could cripple facilities or large parts of the defense industrial base with little or no warning. Thus, efforts such as CMMC will be crucial to building longer-term resilience in the defense industrial base.

Conclusion

This examination of past, recent, and ongoing national crises and changes in the national security environment has demonstrated the tremendous dynamism and resilience of our defense industrial base. When the chips are down, our private and public sectors clearly can deliver. From the global conflicts of the 20th century and the post-9/11 world to today's COVID-19 response and era of great-power competition, companies across the industrial base develop and produce systems and solutions to meet our national defense needs. Government agencies and Congress have similarly formed organizations and adjusted policies, created and aligned authorities, and otherwise worked toward the same goal.

Building resilience across our defense industrial base is a national security imperative. The dramatic federal spending on COVID-19 has led to speculation that future defense budget cuts are coming. Given the threats facing the nation and the inherent "stickiness" of

defense budgets, significant cuts (at least in the near term) are not likely.[72] Defense leaders need to use this time to build resilience in our industrial base for the future. Laws, regulations, plans, and policies can enable or inhibit how well the country can mobilize critical assets. There is no silver bullet, but the key is for government and industry to collaborate effectively and transparently to meet our evolving security needs.

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Strategic Mobility: The Essential Enabler of Military Operations in Great-Power Competition

John Fasching

"If everyone is thinking alike, then somebody isn't thinking."

—General George S. Patton

America's military instrument of national power has prevailed over those of our adversaries because of an unparalleled ability to project and sustain dominant force levels rapidly around the globe. In concert with the diplomatic, information, and economic instruments of national power, the military helps to implement America's national security and defense strategies,[1] but success in great-power competition and future conflict will require a reinfusion of innovation and resources.

Traditionally, the Department of Defense (DOD) has invested in a set of strategic mobility enablers that can move war-winning levels of combat forces, equipment, and supplies to sustain military operations at the time and place, and for the duration of, our choosing. DOD has developed and resourced the necessary strategic mobility–related doctrine, organizations, training, materiel, leadership and education, personnel, facilities, and policy (DOTMLPF-P) in order to meet the force-flow requirements of geographic combatant commanders in executing their operational war plans. This commitment is demonstrated by the four-star-level, joint United States Transportation Command (USTRANSCOM), which orchestrates American strategic mobility operations in concert with interagency, intergovernmental, multinational, nongovernmental, and commercial stakeholders.

Growing Critical Challenges

At the same time, however, America's competitors and adversaries have been making their own investments in an effort to offset American strategic mobility overmatch in future armed conflicts. Our recent military successes have been against nation-states that were not capable of global competition or non-state actors with little to no ability to disrupt our strategic mobility capabilities. The nature of the competition through the conflict continuum vis-à-vis China, Russia, Iran, North Korea, and even the fight against terrorism, or likely combinations thereof, in an era of great-power competition and conflict demands strategic mobility–enabling processes and capabilities

that are different from those we have now. Our current deployment process must be enhanced, particularly for "early" deployers in contested environments, because it is predictable and inadequate for ever-compressing, adequate military-response timelines and threat capabilities for disruption of our force flow.

Adversaries with advanced (and in some cases superior) weaponry, lethal global reach, and strategic mobility programs and capabilities of their own have combined to force us to acknowledge the contested nature of our military operating environments and adjust our concepts, strategies, plans, and capability development efforts. Concentrations of forces and supplies create target-rich environments, and our operations must become more and more distributed to increase our survivability and resilience as we move further away from benign operating environments.

Our most recent concerted, top-down directed strategic mobility investment occurred in the 1990s with nearly $50 billion directed by Congress and applied across DOTMLPF-P. It garnered strategic military air and sealift platforms and access to commercial lift capacities, globally prepositioned military equipment and supplies, deployment training exercises, railcars and equipment, deployment infrastructure, management systems, process improvements, and other deployment enablers. Over the 30 years since then, our deployment capability has declined relative to the anti-access/area denial (A2/AD) strategies and investments made by our adversaries to counteract our long-standing strategic mobility overmatch.

While operating in Iraq and Afghanistan, we deferred most investments in the modernization of strategic mobility enablers, and much of our current strategic mobility solution set now faces critical near-term age-out and obsolescence challenges. Our domination of the air, land, maritime, cyber, and space warfighting domains, which enabled unmatched force projection capabilities, has atrophied as we have had the operational luxury of largely uncontested, long-lead-time, rotational,

and contractor-enabled deployments to Iraq and Afghanistan. While we accepted risk in deferring modernization, adversaries were developing their own global-reach capabilities that threaten to disrupt deployment operations both in America and en route to theaters of operation the next time we deploy a campaign-quality force in support of large-scale combat operations (LSCO). Our adversaries have invested heavily in A2/AD capabilities that directly threaten American strategic mobility.

There are cultural challenges that stand in the way of the necessary shift in our thinking about what our strategic mobility solution set should look like and how it should be prioritized to ensure the successful execution of our national security and defense strategies. Undoubtedly, fiscal pressure and competition for resources will limit significant investments in truly transformational programs of strategic mobility capability development, so we must refocus our attention on reconfiguring our existing strategic mobility solution set in affordable ways for little-to-no-notice, rapid, expeditionary, contested deployments against astute and dynamic great-power adversaries.

The $50 billion investment made 30 years ago has served us well, but it has run its course, and existing lift platforms and infrastructure should be reconfigured with the enabling of future, contested LSCO in mind. As the overall size of America's Joint Force has declined since the end of the Cold War, so too has the strategic mobility enterprise. Major portions of our strategic sealift and airlift platforms, rail deployment enablers, and deployment infrastructure have reached or are fast approaching the end of their serviceable lives, and spending for modernization has been either woefully inadequate or deferred entirely. These deferrals have created a gathering tsunami of strategic mobility–related funding requirements. In addition, our aging strategic mobility enabler set was designed for deployment operations and conditions that are vastly different from the operational challenges that we face today and will face in the near term. Combat vehicle

weights and dimensions have increased to improve fire power and crew survival rates; however, this trend affects a key performance parameter for new equipment development: the ability to transport and rapidly employ these vehicles.

This constant friction between weapon system lethality and survivability versus transportability and the cumulative impacts on strategic mobility is intensifying as military operating environments become more and more lethal. We are at an inflection point in the history of America's dominance in strategic mobility capability and overdue for another hard look at how to transform America's strategic mobility capability not only across America's joint military organizations, but also within the context of the interagency, intergovernmental, multinational, and commercial partners that are critical to our strategic mobility operations in any conflict.

The Strategic Mobility Triad

According to DOD's joint doctrine:

> Strategic mobility is the capability to deploy and sustain military forces worldwide in support of national strategy. Beyond the intrinsic capability of some US forces to self-deploy, the bulk of our nation's strategic mobility requirements are met through common-user sealift, common-user airlift, and pre-positioned stocks, known as the strategic mobility triad....[2]

Modernizing this triad requires planning, prioritization, coordination, and resourcing among joint, interagency, intergovernmental, multinational, and commercial (JIIM-C) partners.

Joint organizations that contribute to strategic mobility operations include the Navy, Air Force, Army, Marine Corps, geographic, and functional combatant commands. Since America's air and naval forces largely self-deploy, the strategic mobility triad predominantly supports the rapid movement of land-domain personnel, equipment, and sustainment from the Army and Marine Corps into conflict areas. Prepositioning some of their equipment, supplies, and ammunition allows some early deployers to fly in, draw equipment, and rapidly organize for combat, providing a deterrent effect through the rapid buildup of combat power in a theater of operations. Recent efforts to "combat configure" prepositioned stocks lessen the time it takes to issue the gear, thus "priming the pump" and accelerating the delivery of combat-ready forces to combatant commanders.

The four services plan, resource, coordinate, and synchronize their independent capability development efforts for strategic mobility, and the United States Transportation Command (USTRANSCOM) orchestrates the joint deployment process when forces are alerted to deploy.

- The Navy's Military Sealift Command (MSC), a component of USTRANSCOM, operates and maintains the 125 ships that sustain maritime domain operations and transport Army and Marine Corps forces. These MSC ships, which perform a wide variety of missions that provide all manner of logistics support to maritime assets, include hospital, cargo, underway fuel and dry cargo replenishment, and rescue and salvage ships.

- The Air Force operates aerial refueling and transport aircraft to support strategic mobility through its Air Mobility Command (AMC), also a USTRANSCOM component command.[3] The current air transport fleet includes 428 C-130 Hercules, 222 C-17 Globemaster, and 52 C-5 transport aircraft.[4]

- The Army's USTRANSCOM component command is the Military Surface Deployment and Distribution Command (SDDC). SDDC integrates and synchronizes surface deployment and distribution capabilities to project and sustain U.S. forces,

primarily through road, rail, and seaport operations and transportation engineering assessments, coordinating the movement of equipment from a unit's home station to its seaport of debarkation.

Interagency Partners and Strategic Mobility

Interagency partners play a critical role in strategic mobility's underpinning of U.S. national security by rapidly introducing military capabilities either domestically or abroad. The herculean effort involved in deploying campaign-quality forces and sustaining them for the duration of combat operations requires a vast network of non-military partners, starting with interagency organizations. In this context, the joint doctrinal definition of strategic mobility fails to account adequately for and describe enabling capabilities provided by the other "IIM-C" entities. Joint and service concepts under development must account for the fact that America's deployment process is only as reliable, fast, and effective as the JIIM-C stakeholders that enable it.

Using sealift as an example, the Army can be ready to deploy its equipment and initial sustainment stocks to seaports of embarkation in time to load aboard ships, but if the ships are not on par with their own readiness rates and abilities to meet force-flow synchronization timelines, the force will arrive late to the theater of operations, giving our adversaries more time to fortify defenses and further delay our deployment process while undermining the will of the American people to continue prosecuting military operations. Conversely, if Army units do not make it to the port on time, the sailing schedule will be delayed, causing delays all along the joint deployment process and negatively affecting the combatant commander's ability to execute his plan according to operational timelines.

The role of America's interagency partners in facilitating force deployments includes coordination by the Department of State in obtaining diplomatic clearances, basing rights, and overflight rights and building coalitions for military operations. Interagency support also includes heavy reliance on Department of Transportation (DOT) capabilities such as those provided by the United States Coast Guard to ensure maritime and port security. Another DOT interagency partner, the Maritime Administration (MARAD), provides multiple types of ships to deploy and sustain military operations through three programs that underpin the National Defense Reserve Fleet (NDRF): the Maritime Security Program (MSP); Voluntary Intermodal Sealift Agreement (VISA); and Voluntary Tanker Agreement (VTA). These three programs collectively give MARAD access to 185 ships. "At its height in 1950," however, "the NDRF consisted of 2,277 ships."[5]

In contrast to the decline in America's maritime capability, "China is seen as striving to overtake the U.S. as the dominant naval power in Asia and already boasts the world's largest navy in numbers of vessels."[6] Even with fewer U.S.-flagged ships, the need to find trained and qualified U.S. mariners, resources to recapitalize ships, and the necessary naval combatant ship escorts in the event of an LSCO puts our maritime-domain strategic readiness at unacceptable levels of operational risk. As aptly summarized by national security expert Loren Thompson:

> Washington...is not sending the right message to Moscow and Beijing if its goal is to deter aggression by demonstrating the means to respond quickly and forcefully. Lack of sealift could prevent the world's most capable ground force from getting to the fight in time to make a difference—or being able to sustain an effective defense over time without resorting to use of nuclear weapons. To put it bluntly, America could lose a Eurasian war for lack of timely sealift.[7]

On the Military Sealift Command side of the equation, our maritime readiness shortfalls were underscored during USTRANSCOM's most recent TURBO ACTIVATION (TA)

readiness exercise: "Of the 61 ships assigned to the Organic Surge Fleet at the start of TA 19+, a total of 63.9% (39 of 61 ships) were ready for tasking (RFT)."[8] Given that about 90 percent of the deploying equipment and sustainment stocks are moved to a contingency on sealift, the negative trends in U.S. sealift capability, capacity, resiliency, and readiness must be reversed.

Intergovernmental (civilian) and multinational (military) cooperation and agreements provide basing and prepositioning sites, overflight rights, customs and transportation clearances, and access to other required infrastructure for coordinated global deployments. U.S. forces flow through host-nation commercial seaports and airports and clear them using distribution infrastructure alongside commercial cargoes. Commercial cargo operations must be balanced with military force flows to avoid both negative effects on host-nation economies and the undermining of public support for U.S. deployments abroad.

Public and geopolitical pressure can deny U.S. forces the use of planned deployment infrastructure, as when Turkey denied access to U.S. forces during Operation Iraqi Freedom.[9] Turkey's decision precluded a large-scale maneuver operation into Iraq from the north and caused a sealift logjam. It also delayed the commencement of U.S. offensive ground operations. Fortunately, Iraq lacked the long-range, precision strike capability to threaten Kuwaiti ports and could not turn the operational delay into a significant military advantage.

Today's adversaries have studied recent U.S. deployments and will precisely target the relatively few world-class seaports and airports on which U.S. forces largely depend for rapid, efficient, and effective deployment operations, thus adding to force-flow planning and execution challenges as potential host nations weigh the risks involved in granting access.

Commercial Assets and Civilian Contractors

Commercial-partner airlift and sealift capacity is made available for military deployments through the Voluntary Intermodal Sealift Agreement and Civil Reserve Air Fleet (CRAF) programs that leverage U.S.-flagged commercial strategic lift platforms to deploy and sustain military forces in times of war. The armed services have largely relied on outsourcing to commercial industry to fill capability gaps in deploying and sustaining forces during recent operations. Operations Iraqi Freedom and Enduring Freedom saw unprecedented levels of contractors on the battlefield, and those trends are extremely hard to reverse, particularly once the services have divested themselves of force structure by leveraging the support of contractors.

Given the lethality and risks inherent in the changing character of war in contested environments the likes of which we have not seen since World War II, we must reassess the tactics, techniques, and procedures associated with fully leveraging commercial assets and civilian contractors for strategic mobility capability in anticipated contested environments. We can ill afford losses on the scale of the 1,614 ships and 9,521 mariners lost by the Merchant Marine during World War II.[10] Nor can we absorb the significant losses of commercial aircraft in strategic mobility roles that, given the proliferation of advanced anti-aircraft weapons systems, are likely in fights with great-power adversaries and their proxy forces.

DOD is but one part of an extensive, complex JIIM-C team, providing strategic mobility in response to almost every type of operation, from disaster response and consequence mitigation to large-scale combat operations. The COVID-19 pandemic response highlighted how defense support to civil authorities can augment a whole-of-nation—or even a whole-world—response. It also exposed national vulnerabilities and areas where we may be accepting unreasonable risk, particularly where supply chains originate in or run through competitor or adversary nations, thus threatening our strategic mobility capabilities.

Great-power competitors and adversaries are developing and leveraging multi-domain, global reach, and strategic mobility capabilities

of their own to counter our phenomenal but aging and predictable joint deployment process and its enablers. Maintaining robust strategic mobility capabilities significantly deters rational bad actors and is part of our calculus for military courses of action when adversaries threaten U.S. national security interests.

Moreover, maintaining overmatch requires a concerted strategy and the resourcing of operational capability across JIIM-C stakeholders and enabling organizations. When the information system screens go black and information and data stop flowing because of disruptions in the space and cyber domains, our ability to operate depends on institutional memory and training in the use of pre-digitized battlefield tools, tactics, techniques, and procedures. For example, if an adversary were to deny the use of GPS, U.S. forces would have to rely on celestial, terrain-associative, or other navigational and target location techniques.

Weaknesses in the Joint Deployment Process

America's adversaries understand that America's recipe for success is its joint deployment process, and they understand the importance of contesting our strategic mobility overmatch in any future conflict. Our adversaries are fully leveraging opportunities during competition across their own instruments of national power to offset our traditional overmatch in strategic mobility.

For example, China invests heavily to gain a controlling interest in global seaports of strategic value; owns about 90 percent of the International Organization for Standardization (ISO) shipping container manufacturing market; and has constructed and is improving facilities on islands it has built as A2/AD defensive outposts in the South China Sea. China's published "Made in China 2025" strategy clearly indicates that Beijing seeks to dominate certain manufacturing industries—many of which are critical to U.S. national security and force-projection capability. According to China's English-language website:

Nine tasks have been identified as priorities: improving manufacturing innovation, integrating technology and industry, strengthening the industrial base, fostering Chinese brands, enforcing green manufacturing, promoting breakthroughs in ten key sectors, advancing restructuring of the manufacturing sector, promoting service-oriented manufacturing and manufacturing-related service industries, and internationalizing manufacturing.

The above ten key sectors are:
1. New information technology
2. High-end numerically controlled machine tools and robots
3. Aerospace equipment
4. Ocean engineering equipment and high-end vessels
5. High-end rail transportation equipment
6. Energy-saving cars and new energy cars
7. Electrical equipment
8. Farming machines
9. New materials, such as polymers
10. Biomedicine and high-end medical equipment.[11]

This list has implications for where we acquire war materiel and enablers, particularly within the maritime domain. According to Loren Thompson:

In its bicentennial year of 1976, the United States was the biggest builder of commercial oceangoing vessels in the world. Dozens of ships were under construction at domestic shipyards. The Reagan Administration wiped out the industry (and 40,000 jobs) by eliminating construction subsidies without seeking reciprocal action from other shipbuilding nations.

That was a self-inflicted wound. But then in 2006, Beijing designated commercial shipbuilding as a strategic industry and began channeling massive state

subsidies to the sector. End result: China has become by far the biggest producer of commercial ships in the world, while fewer than 200 ships in the global fleet of 44,000 oceangoing vessels are American.

The U.S. today barely manages to rank among the top 20 commercial shipbuilding nations (it's number 19), and all of the oceangoing ships built recently in America were for use on protected domestic routes. Industry experts say without that protection, the commercial shipbuilding sector and the U.S. merchant marine would literally cease to exist.[12]

In the candid words of former USTRANSCOM Deputy Commander and DOT Administrator Lieutenant General Ken Wykle (Ret.):

The ability to rapidly deploy our forces suffers from two primary deficiencies. The first is a lack of Merchant Marine ships, and the second is a lack of qualified merchant mariners.

First, the ships. This is a matter of sheer numbers. In 1951, the U.S. Merchant Marine had 1,288 ships operating in international trade. Today, there are 81 ships. This means the U.S. Merchant Marine does not have the shipping capacity our country needs to deploy and supply the most capable military in the world....

The human capital shortage may be worse than the shortage in ships. A report by the Maritime Administration to Congress highlighted the problem. The report "estimates that 11,768 qualified mariners... are available to crew the Ready Reserve Force...the estimated demand for mariners [in an emergency] is 13,607."[13]

As strategic risk to missions and forces during future crisis response operations and attrition continue to manifest, these pressures will change how we deploy and redeploy forces. We are going to have to fight our way to the fights. Combat configuration–related reviews of the entire joint deployment process, from origin to destination, should be undertaken. JIIM-C operations against adversaries with global reach and advanced weaponry in all domains require whole-of-nation and multinational approaches, investments, and planning.

It is crucial that previous assumptions about capital and combat losses be called into question. The next version of the nation's strategic mobility solution set must reflect the harsh realities of JIIM-C operating environments and how our soldiers, sailors, airmen, Marines, Coast Guardsmen, Merchant Mariners, Medical Service Corps personnel, and populations are trained and prepared to respond to periodic windows of ubiquitous battlespace and global combat operations.

The October 1, 2016, missile attack on the former MSC Expeditionary Fast Transport Ship HSV-2 Swift[14] indicates the complexities of operating in a JIIM-C-enabled, contested environment in which the lines between competition and conflict are all but indistinguishable. It also highlights how non-governmental organization actors or their proxies can complicate deployment and sustainment operations. The attack was carried out by Houthi rebels off the coast of Yemen, and the vessel was leased to the United Arab Emirates for a humanitarian aid mission—a potpourri of JIIM-C operations on both sides.

Dynamic Force Deployment

Another example of how we must change our execution of global force projection involves the joint reception, staging, onward movement, and integration phase of the joint deployment process, which concentrates critical infrastructure, equipment, and personnel into a target-rich environment. All-domain effects on civilian populations and infrastructure that enable America to mobilize and deploy its forces can demoralize and undercut the popular will to support military operations. Therefore, as part of "dynamic force employment,"

DOD is exploring how to conduct more geographically dispersed, mobile, and distributed operations to offset increased risk to mission and forces. LSCO will test the nation's character, and senior leaders must candidly address the implications of this operational shift to contested environments in their strategic messaging and testimony before Congress.

Corey New, a retired Army colonel and former commander of the Defense Logistics Agency's Susquehanna Depot, has said that "building combat power begins at origin, not in a theater of operations." Extrapolating his point, in globally contested operations, America's military may be employing combat power at origin and en route, not just in theaters of operations. How well we transition to this new paradigm correlates directly with any deterrent effect on our adversaries. Acknowledging the reality of increasingly lethal global operating environments, our national military strategy seeks to deter adversaries and win during the competition phase *before* large-scale armed conflict. If deterrence fails, our ability to fight and win decisively hinges on a robust and resilient strategic mobility set of enablers and rapid, near-term offset strategy solutions. Our challenge is to respond operationally to—and navigate "gray area" warlike acts by—competitors and adversaries as they affect all warfighting domains, as well as all instruments of United States national power (diplomatic, information, military, and economic).

The National Defense Strategy (NDS) cites "[r]esilient and agile logistics" as a key area of capability modernization and states that DOD "will prioritize prepositioned forward stocks and munitions, strategic mobility assets, partner and allied support, as well as non-commercially dependent distributed logistics and maintenance to ensure logistics sustainment while under persistent multi-domain attack."[15] Two challenges cascade from that guidance for joint operating environments and adversary capabilities:

- The lines between JIIM-C deployment and sustainment operations blur in

realistic (defense) planning scenarios and defense support to civil authorities (DSCA) potential missions, particularly when the homeland is no longer a sanctuary, and

- The American strategic mobility capability set and the joint deployment process used to execute it are JIIM-C partner–enabled, but the full complement of stakeholders have not performed all-domain, contested operations at scale and echelon since World War II.

Studying Mobility Capability Requirements

The cyclical, congressionally mandated Mobility Capability Requirements Study (MCRS) is currently underway and should ascertain strategic mobility gaps and shortfalls associated with the execution of deployment operations in support of combatant commanders' operational plans in the context of likely scenarios and adversary capabilities. In a June 2018 *Airman Magazine* interview, General Darren McDew stated:

> [I]f I had a crystal ball and talked about this new Mobility Capability Requirements Study…it will be different than all the ones we've had previous[ly] for a couple of different reasons.
>
> The biggest of which is we're acknowledging a contested environment from day one. That's huge.
>
> We're also acknowledging something that we've got to come to grips with—attrition. We've never in our history, accounted for the attrition of logistics and mobility in our war plans. For now, we've got numbers we've subscribed to for a number of years that say these are the numbers of assets we need to accomplish the mission. But, that assumes everything makes it. On time. Every time.

We don't believe that's realistic in today's environment. The character of war has changed to a place not just with bombs and bullets, but also ones and zeros. It's a reality that attrition will exist in the next war.[16]

Those involved in MCRS are underappreciated American heroes with a wicked problem to solve: informing strategic mobility decisions during persistent conflict and great-power competition with compressing response timelines and ever more complex and lethal operating environments. Contested operating environments require increased resilience across JIIM-C partner organizations. We must bolster our ability to defend key terrain and operations globally and "harden" our strategic mobility platforms, systems, and processes for better survivability and resilience. Our assessments and analysis must leverage the full power of JIIM-C enablers to deploy, redeploy, and sustain LSCO across potential conflicts involving China, Russia, North Korea, Iran, and counterterrorism efforts.

Leveraging the Navy/Marine Corps distributed lethality concept and reimagining the Army "cargo" aboard MSC and MARAD ships as taskable-en route, Army-provided, cross-domain effects–capable warfighting platforms can help to offset capability gaps and shortfalls in naval escorts by leveraging Army-assisted maritime defense and offense as a near-term approach to alleviating the risks that confront missions and forces. Reimagining the usable stowage areas on the weather decks of MSC and MARAD sealift ships as Army maneuver space in and from the maritime domain provides for the operational realities of contested logistics required to meet NDS guidance. If adversaries continue to shrink our advantages or if fiscal environments deteriorate to austerity-measure levels for DOD, the next iteration of air and sealift recapitalization will need to innovate quickly and cheaply to maintain strategic mobility overmatch and enhance joint combined arms maneuver capabilities over strategic distances.

DOD and others with a deployment mission could investigate the use of mobile, small-reactor power generators in plans for war, natural disasters, or attacks on power grids in the homeland or theaters of operations. For example, reactor generators infused with sealift recapitalization could power sealift ship enhancements to enable self-defense; conduct joint all-domain maneuver through contested maritime operations; and power directed energy, railgun, and other new weapons systems and platforms secured on sealift ships' weather decks, providing a new level of protection and offensive capability en route. Joint experimentation, training, and readiness exercises should include realistic scenarios requiring Army weapons systems live fire for cross-domain, joint combined arms maneuver, providing general-support/reinforcing fires in and/or from the maritime domain and for ship defense.

Other bolted-on or tied-down offset capabilities should be considered in the near term.[17] Mobile reactor generators could be ship-based or unit-based and power modular, ISO-container-configured life support to give combat-configured Army weapons crews a plug-and-play, scalable capability for contested JIIM-C operations. Increasingly, adversaries with strategic reach will force us to innovate and rethink how we will fight our way to the fights. Mobile reactor generators would also pay dividends if we should ever need to establish or repower portions of electrical power grids or reestablish digital connectivity and a base for stability operations after an electromagnetic pulse attack on the homeland, en route, or in theater during LSCO.

Rethinking strategic mobility would revive U.S. shipbuilding and encourage both innovative, militarily useful modifications, starting with commercial ships that DOD is considering purchasing, and focused efforts to recapitalize America's sealift fleet, industry, workforce, and supply chains. This includes U.S.-based manufacturing industries supplying materiel for strategic mobility. Similar thinking and actions must reverberate among the airlift and prepositioning communities as well.

The Secretary of Defense, Chairman of the Joint Chiefs, Commanding General USTRANSCOM, and service secretaries and chiefs have their work cut out for them. They must influence the prioritizing of precious resources by the JIIM-C enterprise as well as by each other and the National Security Council. The strategic mobility enabling team must be cohesive, self-synchronizing, and motivating with second-order, third-order, and fourth-order stakeholders understanding how to execute a complex joint deployment process effectively in a slim-margin, volatile, and hypercompetitive commercial marketplace. Commercial partners and civilians enable strategic mobility and are a part of the capital and combat loss equation.

As summarized by former Army Lieutenant General Sean MacFarland:

> Acting and reacting at the speed of multidomain warfare, executing cross domain fires and maneuver, will demand an unprecedented degree of integration between the services at multiple echelons, and therein lies the problem.
>
> A coherent force must be integrated across all elements of DOTMLPF-P (doctrine, organization, training, materiel, leadership and education, personnel, facilities and policy). However, since August 2011, when the Joint Forces Command folded its flag, no organization has had sufficient authority and resources to coordinate efforts across the services to develop joint warfighting concepts and support their implementation....[18]

The Joint Staff is continually updating and creating concepts to deal with the anticipated operating environments, but ownership and improvement of the joint deployment process, from concepts to fielded capabilities, has become a shared responsibility extending beyond the Joint Staff's authorities and responsibilities. USTRANSCOM integrates efforts of the "as is" strategic mobility capability set during

operations; however, because there is no single conductor of planning, programming, budgeting, and oversight, the services (and other JIIM-C partners) invest individually as they see fit. As a result, the U.S. strategic mobility overmatch is atrophying relative to advances in competitor and adversary capability. Services and interagency and commercial partners and allies prioritize capabilities based on their perspectives, authorities, and perceived return on investment, further adding to the difficulty of capability management.

The point of convergence for action and synchronization for JIIM-C capability development is at the National Security Council level, which implies that consideration should be given to establishing this integrating oversight function at this level of authority as well. Unfortunately (and again), legislation may be the only remedy for the strategic mobility conundrum short of failing militarily against one or more great-power adversaries as ugly scenarios unfold.

Western military strategists and planners seek paths of least resistance and courses of action that minimize capital losses (such as ships, planes, and ports) and combat losses (such as soldiers, sailors, mariners, airmen, government civilians, and contractors) in obtaining military objectives. The military's capital is blood and treasure, and our nation's military conflicts will reap a return on investment commensurate with yesterday's and today's strategic mobility resourcing priorities. Barriers that prevent the rapid provision of combat-ready forces to combatant commanders can increase risks for missions and forces exponentially by allowing adversaries more time to prepare their cross-domain defenses and/or execute offensive strike operations against the U.S. and its partners. A combat multiplier for America's military is working in concert with other strategic planners within other instruments of national power, as well as with multinational partners, and planning for disruptions all along the joint deployment process.

When Congress perceives that the resourcing being provided to project U.S. military

forces to our best advantage is inadequate, it acts—usually cyclically, as it did in the early 1990s given the risks to mission and forces during the Operation Desert Shield force buildup. Another large capital infusion from Congress, however, although critically needed, is unlikely, as are any changes in service authorities under Title 10 of the United States Code. We will therefore have to think our way through reusing, recycling, and repurposing what we have and how we use and maintain it.

In chaotic operating environments, particularly during large-scale deployments in defense of American citizens on American soil, the deployment of military forces in support of America's national security interests can rapidly become complex. Adversary efforts to offset our strategic mobility overmatch could soon manifest themselves in artificial intelligence–infused, machine-blended, bioengineered, quantum-computed, and hypersonically executed operations with effects in all domains. COVID-19 catalyzed our strategic mobility response to a biowarfare scenario in which JIIM-C capabilities were rapidly deployed and sustained in the U.S. and its territories. Deferred investments in our globally focused strategic mobility solution set invite failure in the absence of bold and audacious steps from the Pentagon, which should provide specified guidance with targeted support from the White House and Congress.

From a national power perspective, ensuring strategic mobility is the best way to ensure success in great-power competition, as speed and mobility matter more than ever. Winning rapidly in synchronization within all domains is precisely the issue on which military concept developers and future plans strategists are focusing their time and mental energy. No matter what the executives, think tanks, and concepts and futures elements of joint and military service staffs decide with respect to U.S. strategic mobility, Pentagon programmers and budgeteers must win the prioritization battles with senior leaders to fund myriad, loosely connected, military components of capability woven together with those of other crucial JIIM-C partners. American strategic mobility has always been the differentiator for our military wins and losses, and our investments in its evolution will continue to play an essential role in determining where America stands geopolitically.

Some of the nation's best and brightest minds are applying excellent foresight to America's strategic mobility challenges through the congressionally mandated MCRS. Their work produces our best realm-of-the-possible recommendations with respect to what the nation's strategic mobility solution set needs to get the military to the fight based on combatant commanders' required force-flow timelines and likely scenarios. However, the MCRS must account for U.S. forces fighting their way to the fights and how that changes the required platforms and force structures.

The MCRS could recommend joint war-gaming and experimentation to include underway, Army live-fire, sealift emergency deployment readiness exercises (SEDREs). It could also recommend that DOD expand its demonstrations of concept technology and inclusion of interagency partners such as MARAD and the USCG in bolt-on/tied-down, Army-provided, cross-domain maritime operations. Given the divestment of tanks from the Marine Corps, the Army may want to experiment with a waterborne capability analogous to its current airborne and air assault capabilities. Recent training by Army tactical units through artillery live-fire operations from the well-deck of a small Army watercraft vessel is indicative of the problem sets and solutions in the Pacific that drive fully leveraged maritime-domain approaches to complex problems.

Shifting the armed services' approaches to how they meet their mission sets requires whole-of-government capability development to maximize return on taxpayer investments ahead of audits and accountability office inquiries. Services focus on modernizing "strike" capability within their specific domains of operation, but investments in "lift" or (more important) "movement and maneuver" capability must also keep pace.

The MCRS offers near-term context for a useful USTRANSCOM product that looks into mid-term and long-term prospects: the Future Deployment and Distribution Assessment (FDDA).[19] Senior DOD leaders and their staffs dedicate time and talent to making informed, bold, and audacious decisions to stay ahead of geopolitical waves and the operational implications of near-term, mid-term, and long-term strategic mobility. USTRANSCOM can help to lead thinking about how to improve, but stakeholders invest according to their individual risk-reward calculations and trade-offs based on their funding.

Importance of Assumptions

Assumptions are of fundamental importance to the planning of military operations and can skew the selection of the best course of action to pursue. The concepts, plans, studies, and assessments being deliberated will drive U.S. strategic mobility. In addition, the need to replace obsolescing inventory carries with it the opportunity not only to modernize equipment, but also to reimagine how our strategic mobility capabilities might better support the projection and sustainment of military power in a changed world.

Some assumptions that inform the MCRS, ongoing concept development, war-gaming and experimentation work, and future assessments must also consider the possibility of significant DOD budget austerity. Russia is proof that ingenuity is the product of austerity: Its new icebreaker ship, for example, also furnishes capability as a movement and maneuver (kinetic effect–capable) maritime-based missile launcher. More dual-purpose, covert, and nefarious coopting of traditionally benign transportation and enabling platforms for military utility, including strike capability, are forthcoming, and U.S. strategic mobility conceptualizers and planners should take note.

For Army early deployers like airborne and special operations forces, planning for contested deployments from home station to initial objectives has always been the norm, but that mindset and capability, depending on threats, risks, and

windows of opportunity, expand in the force as strategic maneuver becomes scalable. As Major General Steve Farmen has said repeatedly, we will fight by, with, and through our ports. We find ourselves in this new operational reality because our adversaries are positioning themselves for success during competition so that they can prevail if competition evolves into armed conflict. Army planners would be wise to adopt a "home station = line of departure" mindset. In the past, the line of departure in potentially clashing with enemy forces was always drawn on a linear battlefield in a distant theater of operations beyond the unit's tactical assembly area. We no longer have that luxury.

From a survivability-move perspective, agility matters; maritime lift platform recapitalization, development, and fielding must focus on strategic maneuver and multi-domain operations; and mobility will increase the odds of survival in tomorrow's highly lethal environment. Agility matters especially for a maritime nation whose adversaries are astute and dynamic at weaponizing things to affect its economy, a linchpin of which is maritime commerce. More and more, adversaries will garner global reach with hypersonic-enabled warhead delivery, or electromagnetic gun delivery, or high-powered energy delivery, or cyber-delivery, or effects creation in any of the other domains within which we operate.

An example of the coopting of a ubiquitous, global transportation platform for covert missile launches is the innovative Russian Club-K containerized missile system that can be hidden in plain sight, most likely undetected, until it is employed.[20] Imagine the scenarios that could play out with just a few globally prepositioned or mobile Club-K systems leveraging trucks, trains, and maritime platforms.

Increasing Interdependence of Processes

Any evaluation of U.S. strategic mobility and Army deployment and redeployment must account for the effects of increasingly interdependent processes among JIIM-C stakeholder operations that must be planned, coordinated, and synchronized at echelon and scale to meet

contested and ever-compressing combatant commander force-flow requirements. Adversaries use disinformation operations against vulnerable components of military operations, such as the initial phases of deployments, coopting useful conduits on social media to foment social unrest, division, and obstructionism within the U.S. and its partners. They leverage proxy and organic military forces to produce both kinetic and "soft power" effects to interrupt force flows and have positioned themselves to pressure nations economically to hinder U.S. strategic mobility operations, applying all instruments of their national power against our ability to deploy and sustain combat forces rapidly and effectively.

We must rethink strategic mobility, our development of plausible scenarios, and our assumptions with an eye to developing concepts for joint, all-domain command and control. These concepts must anticipate JIIM-C and instantaneously formed and dissolved Combined Joint Task Forces, and they must be considered with a view to the execution of broad ranges of missions, from delivering humanitarian aid, consequence-mitigation rations, and rapidly developed and manufactured vaccines or other life-sustaining supplies and equipment in Air Mobility Command or Civil Reserve Air Fleet aircraft to rapidly forming and executing task forces in support of local law enforcement or LSCO.

Our current operating environment amplifies the importance of national stockpiles, strategic reserves, and prepositioned equipment and supplies as critical enablers of strategic mobility to garner tactical effects expeditiously at global points of need. Our developers of military concepts, particularly those developing the family of joint and service concepts such as the one that will address contested logistics, must account for great-power conflict, military workload for DSCA missions, and attrition in the organic industrial base.

Many American military leaders view strategic mobility as predominantly in the sustainment or logistics portfolio. This is a philosophical error that has negatively affected the focus,

readiness, and degree of investment necessary to maintain dominance in strategic mobility on pace with adversary capabilities. Tomorrow's military operating environments will dictate a proper reconceptualization of deployment as a component of movement and maneuver—and therefore as a combat multiplier.

The first component of strategic mobility is deployment, which remains the principal task that underpins the movement-and-maneuver warfighting function, enabling a nation's forces to gain a positional advantage over those of an adversary. The strategic repositioning of the U.S. military's footprint from Europe to the United States after the end of the Cold War has made defending Eastern Europe from Russian military aggression exponentially more difficult.

With the clarity and focus of the National Security Strategy and National Defense Strategy, and given the stark realities that adversaries seek to disrupt deployment and sustainment operations across all domains, strategic mobility must be categorized within the Joint Staff as a movement-and-maneuver and force-application issue with prioritized requirements and investments commensurate with the criticality of the task. This necessary philosophical shift is resonating in the Pentagon as the realities of joint all-domain operations in great-power competition take root, and it has the potential to shape the next iterations of joint concept development.

The Joint Staff must renew its efforts to codify strategic mobility and deployment conceptually within the J/G-3 (plans and operations) staff sections rather than under the J/G-4 (logistics) staff section. Logisticians play a key, supporting role, but ownership and alignment of the "deploy" task, as a commander's first mission-essential task, must reside in the maneuver plans and operations staff sections of organizations.

Conclusion

I believe that we are training the next greatest generation of Americans not to storm distant beaches (though some levels

of amphibious assaults might be necessary), but rather to be experts in understanding and mastering the complex, interwoven "battlespace" of tomorrow's conflicts (and the condition-setting that is occurring during competition). Military planning for the next battles must take into account all of the tools and domains available to the U.S., as well as all of the ways by which they might be countered by the most sophisticated opponents.

American preeminence in the ability to deploy, employ, and sustain our military globally in concert with synchronized actions by other instruments of our national power underpins our position as a global superpower.

Clausewitz tells us that "[w]ar is not merely a political act, but also a real political instrument, a continuation of political commerce, a carrying out of the same by other means."[21] Enhancement of our strategic mobility offers us a unifying, pressing, and foundational issue upon which JIIM-C stakeholders, both in America and in other like-minded nations, can move forward. It also will have widespread benefits across all aspects of American military power and extend into and across a broad range of industrial sectors—a win-win in anyone's book and a reasonable first step to ensure America's success in great-power competition.

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The Intelligence Posture America Needs in an Age of Great-Power Competition

David R. Shedd

The United States faces an expanded national security landscape of threats that are interconnected by the rise of great-power competition from China, Russia, and their allies. The wide array of these threats to America's security will require our national defense and intelligence posture to adapt to a world that for nearly 20 years has been fixated on defeating international terrorists. For decades following the end of World War II and the onset of the Cold War, America's attention was focused almost entirely on the Soviet threat. Now our intelligence capabilities must be refocused to counter the global challenges to American national security interests from a rising China and an emboldened Russia in order to give decision-makers options for addressing the nefarious activities of these two great powers.

In the decades preceding the collapse of the Soviet Union, America's spies were almost singularly focused on collecting secrets on the USSR and its Communist allies. For the past two decades, however, U.S. intelligence agencies have been dedicated to thwarting international terrorism and supporting two long unconventional wars in Afghanistan and Iraq.

In the 1990s, intelligence capabilities were hollowed out by President Bill Clinton under the false premise of a "peace dividend" from a defeated Soviet Union. That assumption of a safer world proved false in the wake of the September 11, 2001, terrorist attacks. Almost immediately, America's slimmed-down Intelligence Community (IC) shifted its focus from nation-state threats posed by a rising China or a defeated Soviet Union to a new type of adversary. The events of 9/11 demonstrated that nontraditional enemies could do enormous damage to our way of life while expending few resources—either people or funds—in the process. After 9/11, the IC rallied to shift a shrunken resource base—people, secret collection, and analytic capabilities—and spent the next five years rebuilding itself to address the new threat of Islamic radicals.

Following those attacks, President George W. Bush called for a significant increase in resources for the IC, which had been starved by budget and personnel cuts during the 1990s. There was an immediate redirection of intelligence capabilities to confront a new and growing threat from international terrorism and a war in Afghanistan aimed at denying the terrorists a safe haven. The IC acted expeditiously and effectively to undertake the necessary shifts by becoming much more focused on finding terrorists and denying them the ability to plan and execute their attacks. The intelligence officer also moved to serve side-by-side with the warfighter, first in Afghanistan and then in Iraq after the U.S. invasion in 2003.

Obtaining intelligence to warn of, prevent, and respond to the actions of an adversary remains the core business of the IC. Yet America's intelligence agencies remain ill-postured to address the threats posed by China and a

reemergent Russia. These gaps must be closed while the IC continues to address the disruptive capabilities of non-state terrorist groups such as al-Qaida, ISIS, and Hezbollah.

Complicating the landscape, globalization is producing its own national security challenges. Propaganda campaigns to shape people's hearts and minds are but one example of the global nature of these challenges. The disinformation campaigns mounted by state and non-state players promoting unanticipated objectives leverage commercial mass-media outlets, further complicating the process of warning, preventing, and responding. The IC's shortfall in providing anticipatory warning about complex emerging threats is the result of insufficient resources. Even though the IC simply does not have sufficient capability and capacity to deal equally with every threat that America faces, it must adapt to this changing reality.

The 2017 National Security Strategy and the Intelligence Community

President Trump's 2017 National Security Strategy states that our national security requires that the U.S. be able to determine whether and where geostrategic and regional shifts are taking place that will threaten our interests. To that end, the strategy calls on the IC to collect, analyze, and develop options for the decision-maker to address the panorama of threats. Policymakers expect the IC to engage in aggressive collection of strategic-level intelligence that enables the anticipation of geostrategic shifts such as we see currently with China and Russia. At the same time, American intelligence also needs to obtain secret information essential to generating reliable tactical intelligence so that decision-makers can respond effectively to the actions and provocations of our adversaries.

The President recognizes that modernization of U.S. military forces to overmatch America's adversaries requires intelligence support. To have an improved capability, one has to have some idea of the opponent's capability. Moreover, the strategy underscores that

"[i]ntelligence is needed to understand and anticipate foreign doctrine and the intent of foreign leaders, prevent tactical and operational surprise, and ensure that U.S. capabilities are not compromised before they are fielded."[1]

Adversaries like China and Russia are now mastering technology to build up their own capabilities, which in turn are used to undermine U.S. interests at home and abroad. These same adversaries are making significant investments in artificial intelligence (AI) and machine learning (ML) initiatives for processing and analyzing large quantities of data. Knowing specifically what our adversaries are doing requires that the U.S. IC be able to understand their languages in addition to having the expertise to understand the scientific and technical capabilities that they are pursuing. As they did during the Cold War, U.S. spy agencies need to attract and retain deep country and regional subject matter experts with ample foreign language capabilities and professional spies with technical proficiency in order to gain a significantly increased understanding of the intentions of China, Russia, and their allies.

Spy tradecraft—the art of collecting secrets—needs to be adapted to match today's threats. We know, for example, that China is investing vast sums of money in cutting-edge dual-use technologies that will enable the government to track its own citizens. These same technologies are being used to uncover the plans and intentions of China's adversaries including the U.S. A plan backed by Chinese President Xi Jinping illustrates just how critical technology development is to the Chinese government (and the Chinese Communist Party):

> China will invest an estimated $1.4 trillion over six years to 2025, calling on urban governments and private tech giants like Huawei Technologies Co. to lay fifth generation [5G] wireless networks, install cameras and sensors, and develop AI software that will underpin autonomous driving to automated factories and mass surveillance.[2]

Intelligence: What Is It and What Role Does It Play?

In the Intelligence Community, "intelligence" refers to a dynamic set of actions that relies on collection requirements established by the customers of intelligence, sharing the information within the IC so that various types of analysis can be performed, and then disseminating the results of insights to its customers. Former longtime intelligence professional Mark Lowenthal provides a classic definition of intelligence: "[I]ntelligence is the process by which specific types of information important to national security is requested, collected, analyzed, and provided to policymakers."[3] This essay focuses primarily on information as intelligence: that is, the macro-world of ideas, propaganda, and perception and how our adversaries are working to shape public perspectives on the larger strategic competition with the U.S.

From the standpoint of national security or military operations, intelligence needs to provide decision advantage: "Successful intelligence provides advantages to decision-makers they would not otherwise have, so an analyst must know the frame of mind of the decision-maker and the strategy to help the policymaker to succeed."[4] In other words, one obtains a better understanding of the competitor and is able to hide that advantage so that the competitor is unaware that his efforts have been compromised and his secrets discovered.

In his 2019 worldwide threats briefing to the U.S. Congress, then-Director of National Intelligence Daniel Coats described the nature of the emerging new threats:

> The post–World War II international system is coming under increasing strain amid continuing cyber and WMD proliferation threats, competition in space, and regional conflicts. Among the disturbing trends are hostile states and actors' intensifying online efforts to influence and interfere with elections here and abroad and their use of chemical weapons. Terrorism too will continue to be a top threat

to US and partner interests worldwide, particularly in Sub-Saharan Africa, the Middle East, South Asia, and Southeast Asia. The development and application of new technologies will introduce both risks and opportunities, and the US economy will be challenged by slower global economic growth and growing threats to US economic competitiveness.[5]

The role of intelligence, whether it is providing information or identifying options for the policymaker or the military commander in the field, is to protect American interests at home and abroad. This is not new. What has changed is that intelligence must now be refocused to cover a more diverse and complex set of national security threats. U.S. intelligence faces expanded threats emerging from cyber warfare, adversarial use of AI and ML, space-based capabilities, and very sophisticated counterintelligence from competitor nations that are able to invest in the most advanced technologies.

The National Intelligence Strategy and the Intelligence Community

The IC published its *National Intelligence Strategy* (NIS) in 2019 to provide its workforce with strategic direction for the next four years. While the NIS does not outline specific priorities (these are kept classified), the strategy asserts that "all IC activities must be responsive to national security priorities." It further specifies that:

> All our activities will be conducted consistent with our guiding principles: We advance our national security, economic strength, and technological superiority by delivering distinctive, timely insights with clarity, objectivity, and independence; we achieve unparalleled access to protected information and exquisite understanding of our adversaries' intentions and capabilities; we maintain global awareness for strategic warning; and we leverage what others do well, adding unique value for the Nation.[6]

These four principles for the intelligence enterprise give the IC's rank and file a clear framework to adjust and identify needed resources to hone in collecting and analyzing the intentions and capabilities of near-peer adversaries.

To fully understand the challenges facing the Intelligence Community as it adapts to new circumstances, it is important to know its composition and how it is resourced. The IC is composed of 17 elements, including the Office of the Director of National Intelligence (ODNI).[7] Of these, eight reside within the Department of Defense (DOD),[8] a fact that underscores the importance of intelligence to America's defense posture and to the warfighter in particular. These elements operate in a federated fashion with each one receiving its own appropriated budget within the National Intelligence Program (NIP). Supplementing the NIP funds is the Military Intelligence Program applicable to some of the DOD-based intelligence elements.

The Director of National Intelligence (DNI), a position established by the Intelligence Reform and Terrorism Prevention Act (IRTPA) of 2004,[9] is called upon to "lead a unified, coordinated, and effective intelligence effort. In addition, the Director shall...take into account the views of the heads of departments containing an element of the Intelligence Community and the Director of the Central Intelligence Agency" in guiding America's disbursed intelligence personnel and capabilities.[10]

A Tale of Intelligence Transformation: 2001 to the Present

America's spy agencies have evolved since their establishment over an extended period following World War II and during the Cold War with the USSR and its allies. A certain Sovietology discipline matured over the decades. The IC benefited from deep investments in language skills; deep development of expertise on Soviet political, military, and economic developments; and unique spy tradecraft driven by the need to develop, recruit, and handle Soviet and Soviet-bloc spies

and ferret out spies working against the U.S. and its allies.

After the USSR collapsed, the U.S. no longer had a clearly defined adversary. This so-called peace dividend, combined with disinvestment in human talent and technical capacity, led in the 1990s to a significant reduction in the nation's intelligence capabilities. Then, when al-Qaeda attacked the homeland in 2001, the Bush Administration directed the IC to shift its focus to countering Islamic terrorism. Soon after the terrorist attacks, President George W. Bush assigned the Director of Central Intelligence, George Tenet, the de facto responsibility to become America's combatant commander for countering international terrorism while also serving as America's top intelligence officer. This informal designation for the DCI underscored the role that intelligence would play for years to come in the war on international terrorism.

The events of 9/11 provided an opportunity both to revitalize our nation's intelligence capabilities and to redirect resources to counter a very different type of adversary compared to the USSR during the Cold War. Acquiring new capabilities was given top priority. These capabilities included recruiting Arab, Farsi, Urdu, and other language proficient personnel, adapting technical collection to pursue geolocational discovery, augmenting tactical collection to identify small terrorist cells, and identifying clandestine Internet communications by Islamic extremists.

To address the redirection and rebuilding of intelligence capabilities in the aftermath of the attacks in 2001 and the ensuing wars in Afghanistan and Iraq:

> [T]otal intelligence spending grew by about 110% from 2001 to 2012. National defense excluding intelligence grew by 55% over that time period.... [W]hen measured from 1980, total intelligence spending by 2012 had grown 274%, while national defense spending without intelligence had grown 82% over that time period.[11]

Even with significant growth in the intelligence budgets, however, a side effect of the rise of counterterrorism as the top priority for America's intelligence agencies was to downgrade collection and analysis with respect to more traditional geopolitical issues around the globe. In effect, countering terrorist organizations became vastly more important than countering competitor countries.

The demand for battlefield-level intelligence increased significantly as American and coalition warfighters went into Afghanistan after late 2001 and after the 2003 invasion of Iraq. Geolocational data to detect the enemy's whereabouts was of paramount importance. Our already limited resources shifted further away from clandestine collection on China and Russia to focus on electronically intercepting terrorist messages, honing imagery collection at the battlefield level, and performing clandestine human intelligence at a more tactical level. The warfighter demanded that strategic-level intelligence collection be fused with field-level tactical collection and analysis to find and destroy the enemy on the ground.

American Intelligence in a Rapidly Changing World

As U.S. intelligence collection and analytical priorities shifted to address Islamic terrorism, those same enemies adapted their operational planning and activities. U.S. cyber-focused operations had to adapt to finding an enemy that was modifying its use of web-based presence to communicate, recruit terrorists, and launch propaganda operations. America's spies were essential to disrupting Islamic terrorists' communications and operational planning.

The buildup of counterterrorist (CT) capabilities is now useful in meeting the intelligence demands associated with today's world. For example, data analytics that was used in CT operations to identify and counter "fake news" now has widespread application in confronting the national security challenges we face from nation-state competitors.

Former National Counterterrorism Center Acting Director Russell Travers has noted that we "will never have enough analysts to process the available information so Artificial Intelligence and Machine Learning are not 'nice to have' they are an imperative." Travers quotes from the interim report of the National Security Commission on Artificial Intelligence:

> With respect to data, the government is well positioned to collect useful information from its worldwide network of sensors. But much of that data is unlabeled, hidden in various silos across disparate networks, or inaccessible to the government... Even more data is simply expelled as "exhaust" because it is not deemed to be immediately relevant.[12]

Travers adds that "[w]e have a long way to go to realize the benefits of Artificial intelligence and machine learning."[13] Data analytic processing that results in usable information for IC analysts will help to expand the range of available sources and in turn facilitate the dissemination of better "indications and warning"[14] to the customer.

Our adversaries, both state and non-state, are resilient and adaptable. They continue to invest in their own capabilities, ranging from cyber-focused operations to advanced weaponry, in order to upend our way of life and that of our allies. Our intelligence agencies must therefore continue their own journey of change—and in some instances transformation—to meet today's more complex national security threats and stay ahead of our adversaries. This includes a reexamination of how intelligence should be managed in a post-9/11 world:

> The U.S. Government must fundamentally reexamine the manner in which the Intelligence Community manages intelligence information. In many instances, the intelligence failures that preceded the terrorist attacks of September 11, 2001 were marked by an insistence—whether historically or legally grounded—that intelligence information must be tightly

controlled by the intelligence collector. Often, this position was based on a mistaken predicate, namely that an agency "owned" information that it had collected.[15]

The reforms in America's intelligence enterprise spurred by 9/11 focused on removing barriers to the sharing of two types of information by U.S. agencies: information collected outside the U.S. and information lawfully obtained inside the U.S. Before September 11, 2001, U.S. law (as it still does) prevented the Intelligence Community from conducting surveillance of U.S. citizens. Once granted legal authority pursuant to an investigation, U.S. law enforcement agencies could surveil citizens, but they could not share that information with the Intelligence Community.

The terrorist attacks of 9/11 showed that there was a gap between these two worlds where dangers inside and outside of the U.S. overlapped to create opportunities for enemies—opportunities about which the federal government was ignorant because of the prohibition on sharing information. The Intelligence Reform and Terrorism Prevention Act of 2004[16] led to improvements that made critical CT information more readily available to those charged with disrupting terrorist plots against the homeland, but better information sharing is still needed.

Designing and directing the nation's intelligence capabilities requires a resilient and committed IC leadership operating with a sense of urgency. America's adversaries are constantly and rapidly adapting their capabilities in cyber operations, social media, and other means of technology. American intelligence must remain focused on improving its own intelligence tool kit and staying ahead of the enemy, but that is not enough. America's intelligence agencies also need to pursue improvements in their business processes so that they not only can deliver better products to the decision-maker in a timelier manner, but also will be able to operate more efficiently and effectively if significant resource constraints reappear.[17]

Despite the IC reforms enacted post-9/11, additional action is needed. Collaboration among the spy agencies needs to improve. There is still a propensity among bureaucracies to avoid sharing information. The reasons for not sharing may include concerns by the agency that collected the information that the sensitive intelligence will be mishandled by other agencies and perhaps even leaked to the media or sourced in such a way that sensitive collection methods are exposed. Notwithstanding significant changes in how the spy agencies work today, the evolving threats to the nation require that the IC and its 17 elements continue to adapt.

One area of adaptation is technology itself. In order to be more effective in driving the integration of innovative technology within American intelligence, the IC must shift its culture mindset that expects any needed new technology to be developed within the community. The IC needs to welcome commercial technology solutions, modifying them as necessary to meet the mission requirements of the intelligence professionals.

The IC leadership should consider how best to shift resources and capabilities as they pertain to the adoption of technical capabilities (AI, ML, etc.) that can be applied to the rise of great-power competition. Oracle Cloud's Adaptable Business research project led to the interesting finding that business efficiency increases by 64 percent when the right technology is implemented alongside seven key cultural factors within an organization—all of which are factors that can be linked to characteristics in today's intelligence enterprise:

1. Flexibility and embracing change,

2. Learning culture,

3. Data-driven decision-making,

4. Open communication and collaboration,

5. Shared digital vision and participative leadership,

6. Entrepreneurial culture, and

7. Critical thinking and open questioning.[18]

According to the research, many organizations have invested in the right technologies but lack the culture, skills, or behaviors necessary to fully reap their benefits. The study found that business efficiency increases by only 27 percent when technology is implemented without the identified seven factors.[19]

America's intelligence professionals, in shifting their attention to the rising security threats posed by China, Russia, and their allies, are well postured to do so in only two out of the seven areas: critical thinking/open questioning and a learning culture. The IC as a whole is reluctant either to embrace open communication and collaboration across its 17 elements or to demonstrate flexibility and embrace change. The intelligence elements also fall short of applying data-driven decision-making at every level, having a shared digital vision, or promoting an entrepreneurial culture. If the Intelligence Community is to meet the challenges of the 21st century, its leaders need to address these shortfalls with a sense of urgency. If implemented, their strong and unwavering direction can offer opportunities to enhance the effectiveness of the IC's workforce.

The pivot of 2001 toward combating Islamic extremism as the top intelligence priority and away from a focused attention on the rise of China and the geopolitical aspirations of Russia has shaped the mindset of today's collectors. For example, for two decades, an entire generation of intelligence operators has not been schooled in how to conduct traditional operations against state actors, much less against our near-peer competitors. As a former CIA human intelligence operator observed in 2017:

> Over the past 15 years, this "global war on terror" mindset has become the default at the CIA. After accusations that it was stuck in the Cold War, the agency began to trade concealment devices and human sources for military hardware. Under a directive from President George W. Bush, it expanded its ranks to fight terror. It bulked up its abilities to track and target a dispersed enemy fighting an asymmetrical war. Gone were the days, it seemed, of risky brush passes in a heart-pounding, adrenaline-filled four-second period when an officer was "black"—meaning free, just for a moment, from hostile surveillance and able to pass a message to an asset. The Cold War was over; we had a new enemy to defeat.[20]

To address the security threats posed by China, Russia, and their allies effectively, our experienced operators and analysts must be reprioritized to meet customers' demands for accurate, relevant, and timely intelligence related to capable adversaries. These adversaries are not only capable of mounting complex operations against the U.S., but also able to detect sophisticated operational activities against them. Reflecting on the challenges posed by a rising power, Secretary of State Mike Pompeo has pointedly characterized the nature of the threats presented by a rising China:

> Under [Premier] Xi Jinping, the [Chinese Communist Party] has prioritized something called "military-civil fusion."... It's a technical term but a very simple idea. Under Chinese law, Chinese companies and researchers must—I repeat, must—under penalty of law, share technology with the Chinese military.
>
> The goal is to ensure that the People's Liberation Army has military dominance. And the PLA's core mission is to sustain the Chinese Communist Party's grip on power—that same Chinese Communist Party that has led China in an increasingly authoritarian direction and one that is increasingly repressive as well....[21]

Time to Accelerate
Intelligence Transformation

Technology. The IC agencies are keenly aware that they are operating in a complex world of information technology that is changing rapidly. How America's spies respond to these changes is vital. The advent of fifth generation (5G) technology is on the verge of establishing China as a near-peer competitor in telecommunications. Although there are barriers to entry that limit Huawei's access to the U.S. market, the Chinese 5G footprint is expanding at a rapid clip around the world including among U.S. allies. The intelligence threat posed by Huawei is of a significance that should not be underestimated:

> As an adversarial power, China cannot be allowed to use its government-controlled companies to gain a significant foothold in the United States' burgeoning 5G wireless networks. Such a presence would be a clear national security threat that could decisively compromise American telecommunications and data infrastructure—including the communications integrity of the US military and intelligence community...
>
> The U.S. must not be complacent. Beijing's "civil-military fusion" practices must not be allowed to threaten U.S. national security. Further, the U.S. must penalize Beijing's blatant attempts to threaten America's critical infrastructure and to use its technology industry as an extension of state espionage.[22]

Technology is generally multipurposed and often integrated into multiple strands of hardware and software. For example, AI combined with ML can be incorporated into the daily use of intelligence capabilities to support analysis, counter cyber threats, and also address insider threats. Machine learning holds promise for cyber defense.

The single biggest challenge for network defenders is detection: finding the adversary's presence in one's own network. Detection times vary based on the sophistication of the attacker and defender, but the average lingers at well over a year. While defenders have improved, in many cases, intruders can operate for months within the target network, unnoticed and unconstrained.[23] As cybersecurity expert Ben Buchanan has noted:

> Virtually every major cyber attack—such as Stuxnet, the two blackouts in Ukraine, and NotPetya—has been preceded by months, if not years, of reconnaissance and preparation. This window offers an opportunity. If machine learning can improve detection, interdiction, and attribution, it can dramatically reduce the potential dangers of cyber operations. That said, machine learning has been applied to cyber defense for several years already and challenges persist; it is thus vital to ground the evaluation of machine learning-aided cyber defense not just in theory but in practical—and ideally measurable—results.[24]

Our intelligence professionals must have the very best technology at their disposal. Today, technological innovation rests predominantly in the private sector. To bridge this gap, IC leaders need to promote the development of deeper public–private partnerships to facilitate rapid adoption of this technology. Unfortunately, because of mutual distrust, these partnerships are not easy to forge. Nonetheless, commercial companies can help to find innovative ways both to exploit the vast and increasing body of open-source information available to the intelligence analyst and to counter the sophisticated counterintelligence methods employed by China, Russia, and others to protect their secrets.

As Russell Travers noted in 2019, at least one vehicle for such collaboration already exists:

> Over the past two years, there has been a marked increase in Industries' willingness to work with one another, the

US government and foreign partners to counter terrorism through the Global Internet Forum to Counter Terrorism (GIFCT). Originally created by Facebook, Microsoft, Twitter and YouTube, GIFCT has provided a vehicle for discussions and potential information sharing….

The recent move to establish GIFCT as an independent organization, or NGO, offers a formalized opportunity to better leverage the respective strengths of the private sector and the U.S. government against this dynamic problem. The new construct looks to sustain and deepen industry collaboration and capacity, while incorporating the advice of key civil society and government stakeholders.[25]

The IC leadership needs to adapt commercially available "off the shelf" technology, even if modifications may be required to meet a specific intelligence need. Simultaneously, the IC leadership should cut off funding for technology development within its agencies if it lags far behind what is available in the private sector. This also requires a change in the cultural mindset to make the IC more receptive to adopting commercially based technology. Former Intelligence Community Chief Information Officer John Sherman has underscored that:

Our adversaries are moving out quickly in many areas such as cyber, artificial intelligence and machine learning, information and asymmetric warfare, not to mention other capabilities such as conventional weapons and space. We must respond with equal urgency. We can and must win in an arena increasingly defined by technology, data, and cybersecurity. This requires even greater innovation and partnerships between the government, industry, allies, and academia.[26]

The IC requires commercial support in developing computer infrastructure that allows

collectors and analysts to tackle rough problems such as breaking sophisticated encryption related to leadership communications or advanced weapon systems and identifying denial and deception tactics by adversaries. These capabilities must be secure yet interoperable across intelligence and defense platforms.

Information Integration. Managing information sharing effectively in a classified world remains enormously challenging because of the need to protect our secrets. Nonetheless, the balance between "the need to share" and "the need to protect" is askew under the current paradigm among our intelligence professionals. It is imperative to have in place a data management system in which every person that touches a piece of classified information is monitored to ensure not only that mission needs are met, but also that secrets are protected.

IC analysts are inundated by information, but the most important information needed to "connect the dots" can remain undiscovered or unavailable because the right information is not always identified for the right user. Barriers to information sharing persist among analysts, operators, and military personnel even within the same agency and certainly between the IC's various elements. This shortfall must be addressed to improve the quality of analytic work. As Damien van Puyvelde, Stephen Coulthart, and M. Shahriar Hossain have argued:

Interest in data analytics has been growing due to the demand for more reliable intelligence products following the controversies caused by the 9/11 attacks and the absence of weapons of mass destruction in Iraq. Prior to 9/11 the US intelligence community lacked and missed specific pieces of information pointing to the terrorist plot. In 2002, a national intelligence estimate made a series of erroneous assessments regarding Iraq's WMD programme, which were later used to justify the US decision to go to war in Iraq. These events cast doubt on the intelligence collection and analysis

capabilities of America's spy agencies, especially in the domain of human intelligence (HUMINT). Big data capabilities, it was hoped, would compensate for the limitations, and sometimes the absence, of HUMINT. Consequently, US intelligence agencies began to embrace more systematic and sophisticated data collection and analysis techniques.[27]

Enacting user-based access controls across IC data repositories offers a way to take the human intervention out of the information-sharing conundrum when accompanied with data user rights. What good does it do for an analyst to learn after judgments have been made that information was available but could not be accessed because of artificial barriers? Information needs to be controlled, but in a world where threats are often interconnected, the barriers to accessing mission-relevant information need to be removed so that the IC can provide the most accurate assessments possible to policy customers.

Integrated intelligence assessments are equally important for all customers. This is underscored by the case of the U.S. military, which needs reliable intelligence to maintain situational awareness and be prepared to prevent war but, if necessary, to fight and decisively win the next one. With reference to the Army (although it is equally true for all of America's uniformed services):

> Army HUMINT must be prepared to operate within multiple domains and employ materiel modernization to leverage artificial intelligence/fusion capabilities to reduce cognitive burdens on analysts. The Army G-2X enterprise must adapt to meet the readiness demands of great power competition by ensuring our CI, HUMINT, and security personnel are prepared to deploy, fight, and win across the spectrum of conflict. Through modernization, the Army G-2X enterprise must be able to build an agile CI, HUMINT, and security force that fully embraces

the Information Age, including leveraging technology to reduce cognitive burdens on the force and deliver intelligence at the speed of mission.[28]

The complexities associated with understanding, preparing, and as necessary responding to more sophisticated adversaries calls for the best possible integrated intelligence for our warfighters and planners.

Talent. Removing barriers to hiring and retaining America's top talent is essential to addressing complex national security challenges. The backbone of the IC's performance, effectiveness, and efficiency is the quality and retention of its people. The good news is that the IC has no problem attracting prospective personnel with extraordinary skills and backgrounds. The bad news is that the IC lacks the ability to hire them quickly enough, and significant expertise is lost because the hiring process can takes as much as a year. Also, once in the IC, talented officers leave because they become disaffected by bureaucracy that discourages analytic dissent or by elements that discourage joint-duty career-enhancing assignments among the IC's 17 components.

As it relates to attracting and retaining the best and brightest personnel for the IC, two significant barriers need to be addressed.

First, the granting of a security clearance for an intelligence professional and/or supporting government contractor with the requisite skills remains inefficient despite some gradual improvements. In figures released in late November 2019, the Defense Counterintelligence and Security Agency "noted a dramatic drop in security clearance processing times as of FY 2019 Q4—295 days for Top Secret clearances (down from a high that reached over 500 days), and 181 days for Secret security clearances, down from over 300 days." These "DoD/Industry only numbers...represent the fastest 90% of all clearances."[29] However, the most talented professionals are not likely to wait a year or longer to start their jobs.

Second, when the time it still takes to get a security clearance is combined with the time

needed for a hiring decision—often more than a year—it is not hard to see why the new graduate in one of the highly sought-after technology fields may well not wait to be hired by an intelligence agency. It often takes much longer for first-generation American applicants with highly desirable native foreign language skills to be cleared. It is difficult to quantify the loss of talent and capability this represents, but we can assume that the Intelligence Community does lose badly needed talent.

A case study of graduates from the North Carolina State University Master's Program in Advanced Analytics provides some insights. If a graduate of this 10-month program were interested in a career in national security, it would be next to impossible for that individual to be interviewed, offered a job, and cleared through the process in less than 10 months. Even assuming a somewhat faster hiring process, 40 percent of those hired will leave their employment within two years because of perceived opportunities for job growth elsewhere—obviously a huge loss for any intelligence agency. Many leave for the private sector.[30]

Suitability Barriers to IC Talent Management. Different suitability norms ("suitability" refers to judgments about a person's character traits and conduct) among the IC elements act as a significant constraint on the movement of talent within the IC to meet the highest intelligence priorities. This obstacle also undermines IC team building. The receiving element often raises subjective objections under the guise of finding the prospective person "unsuitable" for the rotational assignment even though the criteria for security clearance are the same for all IC personnel. The resultant delays, often measured in months, undermine the use of the best talent despite IC mission requirements.

This obstacle must be removed if the IC is going to be able to place its talent where it is most needed to meet the requirements of the nation's political or military leadership and prioritize resource allocations to match the greatest threats that appear on the horizon. Removing the suitability barriers to transfers

of IC personnel would also remove an important reason for the IC's talent drain. The ODNI should establish policies that significantly reduce what are often many months of delay in having personnel move from one IC element to another.

The Changing Persona of Clandestine Collection. The advent of biometrics and other threats to secure operation make obtaining core secrets from clandestine human sources extraordinarily challenging. Many of the technologies used by intelligence professionals are readily available to our adversaries, state and non-state alike. Facial recognition and biometrics more generally make the use of alias operational tradecraft nearly impossible. Human intelligence collection must therefore continue to evolve both to address the counterintelligence threats to securely running foreign human spies and to protect its own operational capabilities from the watchful eye of our adversaries.

A major shift in how human intelligence operations are conducted is required. While not easy, and while tradecraft must be applied, online (or cyber-based) human intelligence operations must be increased to spot, assess, develop, recruit, and handle human sources. At the same time, human-to-human interaction in a clandestine manner faces significant hurdles. "U.S. spies are no longer being tailed by foreign governments in about 30 different countries," according to one report, "because advances in facial recognition, biometrics and artificial intelligence have made it almost impossible for the agents to [maintain a false identity]."[31] One former CIA senior officer noted insightfully in 2015 that:

As we continue to advance technologically, in essence making our world smaller, the potential threats posed by these advancements will make both protecting and exploiting real secrets exponentially more difficult. In addition, as these challenges continue to grow, those tasked with addressing them will need to adjust at a much more rapid rate. This applies

both to field operatives as well as to their managers…

The next generation of operatives and their managers will need to be more familiar with, if not adept at, technological augmentation. Augmentation, not replacement. While the tendency to rely increasingly on technology to make HUMINT collection more efficient is commendable, adherence to the core principals [*sic*] will ensure that human operations remain as secure as possible.[32]

Cyber Integration. The DNI has the authority to assign responsibilities within the IC, but the absence of clear policy direction on cyber issues leaves intelligence professionals without the guidance they need with respect to the parameters of their cyber activities. In addition, because of the absence of a policy framework, the IC elements, alongside other elements of the executive branch, have been left to chart their own courses as individual departments or agencies in executing offensive and defensive cyber activities as an element of U.S. national security.[33]

Adversarial threats in the cyber domain change quickly and are increasingly complex. As for the appropriate governance to meet cyber threats, Executive Order 12333, as amended by President George W. Bush in July 2008,[34] did not specifically address cyber as an intelligence discipline. Nonetheless, in just the few years since the IC's principal presidential directive was amended, it has become apparent that specific cyber "lanes in the road" need to be identified within the IC and throughout government.

Cyber intelligence informs a significant number of sub-disciplines such as cyber security, cyber defense, cyber offence, and cyber support to traditional military operations, as well as the establishment of international norms on cyber behavior during peacetime. These missions call for intelligence professionals who are competent to address the multi-strand demands associated with cyber operations, but there is a critical shortage of cyber talent

in the public sector as it competes with private industry because demand for the unique skills and knowledge needed to combat the growing threats in the cyber domain has outpaced the supply of that talent for years. The public sector struggles to attract the required numbers of cyber-trained and experienced personnel because of its slow hiring process and lower compensation compared to the private sector.[35] For example, February 2015, the Pentagon had reached only the midway point in staffing Cyber Command and was backing away from the long-held goal of deploying a full force of 6,000 cyber personnel by 2016.[36] As a top priority, the IC must spend whatever is necessary to train existing IC officers with transferable skills and high potential to be cyber intelligence officers. Training is available in the private sector.[37]

Executive Order 12333 as amended gives the DNI the authority to define roles and responsibilities for elements of the Intelligence Community.[38] What is needed now to achieve enhanced integration among the key cyber collection agencies—the National Security Agency, Central Intelligence Agency, and Federal Bureau of Investigation—are clearly articulated policies for defining their respective missions and how information will be shared among them in a transparent manner. The IC leadership needs to remain focused on achieving "unity of cyber mission," which must be the top priority for anticipating and providing warning to the decision-makers about future threats. Under well-defined rules, the Cyber Threat Intelligence Integration Center (CTIIC) may eventually be in a position to contribute a strong analytic product on cyber threats.

Some progress has been made, but it is not enough. Cyber legislation was stalled for years, but with passage of the cyber bill in 2015, a framework for addressing cyber-related activities has begun to take form.[39] The CTIIC, established at the instigation of the White House ostensibly to conduct analysis of cyber threats, appears to have an ill-defined mission. It also has neither the resources nor the standing among the big departments and agencies to assess cyber threats.[40]

Counterintelligence. Catching spies and protecting our secrets is the traditional framework for counterintelligence. In order to counter highly sophisticated adversaries, however, the scope of counterintelligence needs to be expanded. This broader definition needs to include what our adversaries are doing through disinformation and other forms of information warfare to undermine both the U.S. and its friends and allies. IC talent needs to be placed against this broader definition of counterintelligence.

While the Chinese, Russians, and other adversaries have long wanted to steal our secrets by any means possible, these nations now leverage big data to promote their interests, using all forms of media to foster a false narrative of events in and outside the U.S. Counterintelligence requires identifying and then protecting our national security information on a much broader level. CI must still include its traditional focus on protecting our own secrets from foreign spies, but our security also depends on identifying and countering disinformation and insider threats, as well as responding to adversaries' efforts to disrupt U.S. intelligence. As Christopher Costa and Joshua Gelzter have written:

> If the U.S. government is to fight off disinformation—which can now be created on an industrial scale and spread globally not just by states but also by terrorists and criminals—it must reinvigorate and broaden the practice of counterintelligence.
>
> For too long, the focus of U.S. counterintelligence has been safeguarding government secrets and corporate intellectual property, particularly by thwarting foreign efforts to recruit potential thieves. We must remember that counterintelligence also means warding off efforts to divide and weaken us. We can draw on our Cold War experience and update our responses to reflect modern technologies.[41]

Today, "Moscow and other governments are learning key disinformation tactics from non-state actors" that are using more sophisticated cyber-generated influence operations. All adversaries are now in the cyber domain.

> These developments suggest a future in which both non-state and state actors will contest the United States through online disinformation campaigns, even while more traditional global power competition tied to geography continues to play out. Moreover, it seems inevitable that the Chinese, Iranians, and others will escalate their malign social media efforts much as the Russians have done. FBI Director Christopher Wray recently acknowledged that other countries have been exploring such influence efforts.[42]

The opportunities for the IC to identify and then counter the broad range of counterintelligence threats are coupled with the challenges and opportunities related to technology, information integration, people talent, and clandestine collection. All of these pieces must fit together to maximize the ability of our spy agencies to respond to a much higher national security threat environment for years to come. An effective response to these threats does not require additional funding or personnel resources for the IC, but rather reprioritization of existing capabilities.

Building a More Effective Intelligence Enterprise

As demonstrated after the terrorist attacks of 2001, the U.S. Intelligence Community has demonstrated that it can redirect its resources to meet a different type of threat. It did so immediately in the aftermath of the attacks in 2001 in order to pursue aggressive collection and analysis of Islamic terrorist groups. The goals for intelligence are immutable. Intelligence resources must be postured to give the policymaker and warfighter alike the upper hand against the adversary. That upper hand requires collecting threat warnings that can be

prevented from becoming a reality or be countered by reliable intelligence.

The ability of America's spy agencies to address the wide array of complex threats emerging from the need to deter great-power rivals requires IC leadership committed to applying the resources to address the highest threat vectors. It requires a strong sense of urgency with a top goal of harnessing the power of emerging and disruptive technologies as applied to data analytics, artificial intelligence, machine learning, 5G, and quantum computing while enabling the integration of autonomous systems. Currently, America's intelligence professionals must be prepared to ensure unambiguous advantage in the event of conflict escalation, but the IC needs to be able to act preemptively and provide advance warnings of threats to our national security from both state and non-state actors.

With this in mind, there are several actions that can and should be taken. Specifically:

- **The Director of National Intelligence should require all IC members to provide a plan with specific goals to increase their partnerships with the private sector to acquire cutting-edge technology and infrastructure support.** Each plan should be accompanied by a road map and timetable for adoption of that technology. In an era of significant growth in data and data processing requirements, America's intelligence professionals require the best technology that the private sector has to offer. They should therefore promote agile public–private partnerships to assure their access to the technological innovation that is constantly emerging from America's vibrant commercial sector.

- **The DNI needs to establish a needs-based information-sharing model with appropriate auditing functions to enable enhanced data access by all intelligence professionals with a need to know.** Notwithstanding advances over the past two decades, mission-essential information sharing remains too restricted within the IC due to the propagation of data stovepipes and absence of user-based permissions. Fear continues to drive the risk calculus by the so called owners of data (the agencies that obtain the classified information). The result could be failure to provide adequate warning because mission users are unable to access siloed information.

- **For the Top Secret/Sensitive Compartmented Information clearance, the DNI should mandate and then rigorously enforce time constraints on the security clearance process.** The IC must depend on state-of-the art CI monitoring for its first ring of protection. Therefore, bureaucratic barriers that prevent the timely entry of much-needed talent must be eliminated, and every effort must be made to retain vital personnel and to facilitate ingress to and egress from the IC for that talent. Special allowances are needed for compensation related to highly desirable science, technology, engineering, and mathematics (STEM) talent. Interchangeability of intelligence personnel talent must be promoted aggressively among the 17 elements of the IC to meet the highest intelligence requirements. Suitability barriers to accepting transfers of personnel need to be removed.

- **Clandestine human intelligence collection needs to reevaluate how it can identify, assess, develop, and recruit foreign spies by using different tactics.** Human intelligence operations can no longer rely solely on traditional tradecraft for in-person meetings using alias personas that are subject to discovery because of microchip information and biometrics. A comprehensive revamping of clandestine human intelligence collection is needed. Today's threats to traditional spying will require far more reliance on

online cyber personas and far less reliance on foreign-based collection efforts by American operators.

- **The Acting DNI took an important step in mid-May with the announcement that intelligence-focused cyber efforts would be consolidated under an IC Cyber Executive.** However, this does not go far enough to meet the challenges of cyber-centric requirements. The IC's capabilities against determined adversaries now need to be rigorously assessed with a view to ensuring the IC's ability to defend and respond as necessary to an adversary's capabilities in cyberspace.

- **The DNI needs to lead in expanding the scope and depth of America's counterintelligence focus to address our adversaries' ability to use aggressive cyber online operations to influence the hearts and minds of Americans.** This expanded application of CI can meet the continued need to address more complex challenges pertaining to insider threats in a cyber-centric world and the need to protect national security secrets.

Conclusion

The foundation of U.S. intelligence is sound, but America's intelligence agencies face a range of new national security challenges from emerging great-power competitors. To meet these challenges, the IC needs to attract and retain deep subject matter expertise, including foreign languages, and to focus on China and Russia (and their allies), enhanced operational tradecraft, and a significant increase in the use of technology and STEM-trained personnel to apply artificial intelligence, machine learning, and data analytics in an effective manner. Cyber-centric operational capabilities for U.S. intelligence personnel must become the norm for achieving success against determined and relentless adversaries.

The Intelligence Community, with the benefit of clearly articulated requirements from the policymaker and the warfighter, is capable of delivering invaluable intelligence. This requires bold leadership that is prepared to invest in its people, technology, and security. The leadership needs to incentivize the increase of IC integration and strengthen public–private partnerships to maximize access to innovative technologies.

The challenges facing our intelligence professionals are not for the faint of heart. Dealing with these challenges will require creativity and meaningful steps to break down the bureaucratic walls among the IC's 17 elements. America's national security deserves nothing less than a federated Intelligence Community that operates with unity of effort and interdependence, confronting the capabilities of our adversaries with an eye to providing high-confidence decision advantage for every customer of the world's finest intelligence organizations.

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U.S. Alliances: Crucial Enablers in Great-Power Competition

Andrew A. Michta, PhD

The United States today is at a geostrategic disadvantage that is significantly greater than the "correlation of forces" (as Soviet generals put it) that the U.S. confronted during the Cold War. Unlike in the era of great-power competition with the Soviet Union when the U.S. faced a single geopolitical foe, today America is confronted by two great powers—one revisionist, the other transformational—aligned in the common goal of displacing the United States from its dominant position as the hub of the liberal world order.

Three decades of unequivocal and misguided commitment to globalization and the internationalization of our manufacturing have left America's power significantly depleted. The post–Cold War era has seen persistent budget and trade deficits, deindustrialization and the attendant radical centralization of supply chains in China, and an overall decline in the competitiveness of the American labor force, with U.S. STEM (science, technology, engineering, and mathematics) programs at premier universities increasingly catering to foreign students, fewer of whom are choosing to remain and work in the United States after graduating. At the same time, two decades of low-intensity wars-cum-"state building" projects in Afghanistan and the Middle East have

depleted the capabilities of the U.S. military, and the demands of these theaters have driven a large portion of defense systems acquisition programs and contracting.[1]

The Grand Strategic Challenge

Meanwhile, the Russian Federation has undergone two cycles of military modernization. The scope of this effort may pale in comparison to expenditures by the United States, but two decades of *de facto* disarmament by our European allies have allowed Moscow to change the balance of power along NATO's eastern flank.

More important, China's investment in its military—especially qualitative improvements facilitated by massive technology transfers from the United States and increasingly from Europe, as well as the rapid expansion of its navy—has begun to tilt the balance of power in the Indo-Pacific region against the United States, with the People's Liberation Army Navy (PLAN) staking an exclusive claim to the South China Sea. While the PLAN is already challenging the sovereignty of Taiwan and putting Japan on notice that its security can no longer be taken for granted, it is also increasingly operating in the Mediterranean, entering the Baltic Sea, and—with its tenders to buy 33,000-ton

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nuclear-powered icebreakers—preparing to punch through the Arctic Ocean.

Last but not least, China's Belt and Road Initiative (BRI), with some 50 "special economic zones," and its "17+1" initiative are critical steps toward tying the economies of Europe, Russia, and Africa to China as part of China's larger effort to form a single Eurasian supply-chain network. Once in place, centered on the yuan as the new reserve currency and defended by Chinese military power, the BRI will be poised to effect a "grand inversion" in which the maritime supremacy over the land domain that for half a millennium has favored the West would effectively be reversed. In such a scenario, the European Rimland would cease to be the transatlantic gateway to Eurasia, becoming instead the terminal endpoint of a China-dominated Eurasian empire.

In short, the grand strategic challenge that this round of great-power competition poses for American security and for the democratic West (as well as democracies in Asia) cannot be overstated. Consequently, the role of alliances as a fundamental enabler of American power will be critical in the next decade and beyond.

The Trump Administration's realignment of U.S. national security and defense priorities toward great-power competition is encapsulated in the 2017 *National Security Strategy*[2] and the 2018 *National Defense Strategy*.[3] Both documents (the latter's unclassified 12-page summary having been released by then-Secretary of Defense James Mattis) were long overdue, as changes in the balance of power worldwide have only accelerated following the 2008 "great recession" that exposed deep structural imbalances in the United States economy. Although the United States government managed to stabilize the situation by flooding the markets with liquidity in the aftermath of that crisis, the structural deficiencies of the U.S. economy—especially our excessive reliance on foreign supply networks for ever-greater portions of the economy, including military contracting—were not addressed.

This weakness was exposed during the devastating aftershocks of the Wuhan coronavirus pandemic, with the United States learning the hard way how vulnerable it had become to its principal adversary, China, on account of Beijing's radical centralization of supply chains for products critical to dealing with the crisis. The pandemic has made it imperative that the United States relearn the lesson of the importance of allies who can provide diffuse and redundant supply chains in critical areas while also serving as key enablers for the United States when it comes to its foreign and security policy.

NATO

No alliance proved more essential to the United States' victory in the Cold War than the North Atlantic Treaty Organization, and no other alliance is in greater need of repair today. In the first few decades following the Cold War, NATO devolved into an essentially political structure used to integrate post-Communist states into the transatlantic system and, although membership in the European Union was never expressly conditioned on NATO membership, to help lay the groundwork for the EU's *acquis communautaire*.[4] In the first decade of the 21st century, the alliance became, on the one hand, a growing source of friction between the United States and the largest European allies while, on the other hand, old allies such as the United Kingdom and new ones, including Poland, enabled the United States' global war on terrorism after 9/11.

The process of deconstructing NATO into a collective security organization of sorts continued unabated through the 2014 Russian seizure of Crimea and the invasion of eastern Ukraine. By then, NATO's military capabilities, including the residual forces deployed by the United States to Europe, had become a pale shadow of its once-formidable armies. Furthermore, logistical infrastructure across NATO had become degraded to the point that even moderate-scale joint exercises were problematic. Recent efforts to reverse the trend—the DEFENDER-Europe 20 exercise, for example, was to be the largest such exercise along the eastern flank of NATO since the

end of the Cold War, combining some 20,000 U.S. forces and 18,000 European forces—were effectively stopped by the "shelter-in-place" orders triggered by the COVID-19 pandemic, with only a portion of the troops exercised across the theater.

In addition to the fact that NATO's forces are inadequate to the task at hand, an even greater challenge may be that the alliance's political consensus concerning the overarching strategic threat is fractured. I call the latter problem the "regionalization of security optics," whereby the nature and degree of threat perception morphs as one moves from east to west. Countries along the front line such as Norway, the Baltic States, Poland, and Romania see Russia as a clear and present danger, while countries in the middle of the continent such as Germany have an attenuated view of the risk. France sees the principal pressure points as being in the Mediterranean and North Africa, and the Russian threat registers only remotely in Spain or Portugal.

This fractured threat perception—rather than the oft-discussed resentment against the alleged "transactionalism" of the Trump Administration—is the key reason why the majority of the European NATO allies have consistently failed to meet their agreed-upon 2 percent of GDP defense spending targets, which have been in place since the Warsaw summit of 2016.[5] The much-touted argument that NATO is not just about shared interests but also about shared values (President Trump's critics point to his alleged de-emphasis of the latter) is a false binary because NATO, as the most effective military alliance of like-minded democracies in history, has always been about both.

What has fueled the current turmoil in the alliance is the inability of key governments to see eye-to-eye with the United States on the nature of the threat to the West that is posed by Russia, which wants to revise the post–Cold War political settlement, and by the People's Republic of China (PRC), which wants to replace it. The absence of a policy consensus on Russia in particular is likely to remain the

foundational obstacle to properly resourcing NATO and may in fact cause continued spikes in disagreement within NATO like the one triggered by reports that the Trump Administration planned to remove 9,500 U.S. troops from Germany.[6]

The United States will continue to draw great benefit from its leadership role in the NATO alliance, which serves both as an effective force multiplier and as a source of political influence in Europe and Eurasia more broadly. NATO's contribution to American security in an era of resurgent great-power competition rests on its ability to offset Russian and, increasingly, Chinese pressure on and in Europe, especially the two powers' ongoing efforts to reduce U.S. influence on the continent and *ad extremis* to separate European defense from America's. The critical importance of the NATO alliance as a force multiplier and pathway to lowering the overall price tag for American defense worldwide cannot be overstated.

The question, however, that continues to polarize the U.S. security community is the practical scope of what NATO should be contributing to the common defense and how such contributions address the challenges facing the United Sates not only in the European theater, but also in the Indo-Pacific region. Some analysts have gone so far as to suggest that NATO has an important role to play in Asia and that it should plan accordingly.[7] Such a strategy would be yet another permutation of the "burden sharing" that has been much debated throughout NATO's history, except that this time, the burden would be extended to a theater that historically has not been part of NATO's strategic domain, making such a strategy likely to fail.

What NATO needs is not more "burden sharing" but "burden transferring," a term I use to indicate that the greatest contribution NATO can make to the defense of the transatlantic community is for its European allies to resource their defense properly. This is necessary if the Europeans (with U.S. enablers in place and a modernized core strategic nuclear deterrent) are to be able to deter and, if need be,

defend Europe against a revisionist Russia in the event that the United States is pulled into an emergency in the Indo-Pacific region.

The imperative of "burden transferring" to Europe reflects the twin dilemmas facing the United States when it comes to collective defense: The geostrategic challenge we confront is orders of magnitude greater than in the Cold War, but the size of the United States military is simply too small to meet the requirements in both theaters, deter aggression, and win decisively. The United States should maintain a significant component in Europe. U.S. Army Europe, as currently structured, serves a critical role as both an enabler and a fighting force, with exercises on allied territory along NATO's eastern flank essential to developing the warfighting capability of U.S. troops and ensuring that they are fully interoperable with our allies. The same goes for continued exercises that serve to demonstrate the ability of the United States to reinforce the European theater in a crisis.

However, these will never fully replace the manpower and resources that the Europeans must bring to bear if deterrence in Europe is to hold. This is especially the case should a crisis arise elsewhere, as the United States military is no longer structured as it once was to fight two major theater conflicts plus one smaller engagement in a secondary theater; rather, we are—and are likely to remain—able to engage in only one major theater and one smaller operation if we want to prevail.

The key variable in a workable "burden transferring" approach as NATO's strategy in the unfolding era of great-power competition is an urgently needed political consensus within the alliance. In this context, the ongoing efforts, driven principally by France, to establish "strategic autonomy" for Europe in NATO—exemplified by programs such as Permanent Structured Cooperation (PESCO), Coordinated Annual Review on Defense (CARD), and the European Defense Fund as currently conceived—are counterproductive and likely to fail because the divergent security optics mentioned earlier will block any such

consensus on defense-spending formulas that does not include the United States. The current tenor of the European defense and security debate—punctuated by occasional injudicious outbursts by European leaders that the NATO alliance is "brain dead"—only further undermines the ability of the alliance to come together around a common strategy.

Alliances in the Asia–Pacific Region

Asia is fast becoming the principal area of concern for U.S. defense strategy. The exponential growth of Chinese economic power over the past decade in particular has given rise to military capabilities that increasingly challenge the United States Navy's ability to dominate the theater. China has one-fifth of the world's population, and its military budget is second in size only to that of the United States.[8] Moreover, financial reserves accumulated over decades of predatory trade practices will allow it to continue buying companies, technologies, and expertise unless the United States and its allies impose severe restrictions on China's access. As many as 200 million Chinese citizens travel the world as tourists and work, study, and live abroad, and this number could increase significantly when the current pandemic restrictions are lifted.

The Indo-Pacific theater is also dramatically different from Europe: It rests on a series of bilateral alliances between the United States and its key partners, not on one bureaucratized structure like NATO's. The region is increasingly being transformed by China's abandonment of its former reticence and its growing geostrategic assertiveness, and the leadership of the People's Republic of China under Xi Jinping sees the PRC as having effectively caught up with the United States.

China is a Communist neo-Confucian state marked by repression and rigidity at home, and its foreign and military policy is marked by political and military mobilization and the putting forth of ever-bolder claims, its claim to "exclusivity" in the South China Sea being perhaps the most visible example. The leadership in Beijing seems certain that its path to global

economic dominance will soon be accompanied by expanding military influence that, as the PLAN's power projection capabilities grow, will allow it to dominate militarily.

With this in mind, Beijing has been building its hard power arsenal at a rapid pace, with the expansion of the nuclear, conventional, space, cyber, and information components at an unprecedented pace, posing a truly multi-domain challenge to the United States military. Aided by four decades of unprecedented freedom of access to America's technology, research, and knowledge economy, Beijing is poised to compete for supremacy in the Pacific within the next decade.

When it comes to China, Europe is unlikely to become a close ally of the United States any time soon. Although the devastation wrought by the Wuhan coronavirus on EU economies and Beijing's aggressive information campaigns targeting Europe could change elite attitudes to some extent, Germany, France, and especially Italy (but also a number of other countries, including some in Central Europe) see China principally in economic terms, with opportunities still outweighing risks, especially for smaller, capital-starved European economies outside the European Union and hence not eligible for recovery assistance funds.

The pivotal allies for the United States in Asia are Japan, South Korea, and Australia—the Asian "troika"—whose continued alliance with the United States stands in direct contradiction to Xi Jinping's "China Dream" of a globally dominant PRC to be established through a purposeful strategy of expansion across Eurasia and into the Pacific. The United States also has formal alliances with the Philippines, Thailand, and New Zealand, but their overall strength is derivative when it comes to our core alliances with the troika. The future of the troika depends on the future of each of its members: If China should succeed in isolating one of them, the risk to the security of the others would grow exponentially.

Chinese expansion is already well underway, though Beijing continues to face considerable obstacles to displacing the United States from the center of the global system. The immediate targets of this expansion drive are Hong Kong, where the process of dismantling its autonomy is already near completion, and Taiwan, which will face increased pressure once Beijing has bent Hong Kong to its will. This pattern of expansion targeting the three key U.S. allies in Asia can be seen in the proliferation of Chinese port investments; the development of PRC naval capabilities (including tenders for several nuclear-powered aircraft carrier battle groups); and the exponential investments in anti-access/area denial (A2/AD) capabilities by the People's Liberation Army (PLA) and PLAN.

China's overarching strategy is to break out of a territorially based defense strategy, harden its defenses of transcontinental and overseas transportation routes, and leverage its decades-long access to America's research and development (R&D) base and—even more important—its manufacturing and materials technologies to bring about a qualitative leap in PLA and PLAN capabilities vis-à-vis the United States. This is especially the case when it comes to command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR); strategic support forces; cyber and information; and unmanned systems in space.

Interlocking Alliances

The United States continues to derive great benefit from its leadership position in the NATO alliance and its close bilateral alliances with the troika in the Western Pacific. Our naval, air, and ground troop basing in Europe as well as in Japan, South Korea, and Australia continues to give us flexibility and supportability in power projection across both the Atlantic and the Pacific with the ability to rely on the military resources of our allies as a force multiplier.

In Europe, the effectiveness of NATO demands a strategy of "burden transferring" with continued U.S. nuclear strategic guarantees and continued coordination with our enablers. This must be combined with a small but effective, trained, and integrated Joint

Force component that both provides strategic linkage for the United States and Europe and reinforces the credibility of the larger transatlantic defense strategy.

Arguably, the greatest challenge facing the United States and its European allies, more than the interminable debates about the percentage of GDP to be allocated as a sign of commitment to the alliance, will be the imperative need to rebuild Europe's real usable military capabilities. This strategy of "burden transferring," whereby the Europeans take core responsibility for the continent's defense across multiple domains—not as an exercise in "strategic autonomy" but as a clearly defined and agreed-upon task *within* NATO—will be key to preserving European security and ensuring that the transatlantic bargain holds as we enter arguably the most dangerous period of great-power competition.

In Asia, the Western Pacific is also critical to the security of the Eurasian landmass, with continued close U.S. alliances with the troika presenting a direct challenge to Beijing's military planners. Coupled with U.S. bases on its territory, in Guam, and in Hawaii, the United States has the ability to develop a successful strategy to contain, deter, and if need be defeat China in a future conflict in the Pacific, provided it retains the flexibility to move its forces in the region in a crisis. We must therefore ensure that the troika can withstand direct pressure from China and that its members do not become vassalized over time. Continued close alliance with the United States will allow the three countries to exercise effective counterpressure against the advancing militarization of great-power competition in Asia and respond with effective force if deterrence fails.

There can be little doubt today that the PRC's primary goal is to reestablish itself as a dominant power in eastern Eurasia and the Western Pacific, absorbing Taiwan, isolating and ultimately vassalizing Japan, and pushing the United States back to the margins of the Asia–Pacific region. The second element of Beijing's strategy, which entails its close cooperation with Moscow, is to accomplish the decoupling of the United States from Europe, with long-term economic and population trends favoring China in its *de facto* alliance with the Russian Federation against the United States.

These two trends inextricably connect America's alliances in Europe and in the Asia–Pacific region: They mutually reinforce one another if successfully consolidated and conversely contain within themselves the seeds of each other's destruction. Preserving and strengthening the two as part of a coherent global defense strategy should be a key U.S. policy priority.

Conclusion

Grand, bureaucratized alliances do not simply unravel. They become hollowed out over time as threat assessments change and political will atrophies. This is the risk if NATO continues along its current path of "burden sharing" amid ongoing allegations of American "transactionalism." The preservation of NATO is vital to both Americans and Europeans because the alliance continues to serve both as a deterrent to Russia and as a values-based framework with which the West can confront China. NATO offers the best existing format for common defense and effectively ensures that the North Atlantic remains the internal waterway for Western democracies.

The preservation of America's alliances in Asia is essential to our ability to contain and deter China, for without them we cannot ensure that our rethinking of the U.S.–China relationship will take place on American terms. If NATO were to unravel or the troika to fall out of its close alliance with the United States, or if both were to occur, the entire Pacific Ocean west of Hawaii would become a contested space with the United States directly exposed to the risk of being pushed into its own hemisphere.

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Global Operating Environment

Assessing the Global Operating Environment

Measuring the "strength" of a military force—the extent to which that force can accomplish missions—requires examination of the environments in which the force operates. Aspects of one environment may facilitate military operations; aspects of another may work against them. A favorable operating environment presents the U.S. military with obvious advantages; an unfavorable operating environment may limit the effect of U.S. military power. The capabilities and assets of U.S. allies, the strength of foes, the region's geopolitical environment, and the availability of forward facilities and logistics infrastructure all factor into whether an operating environment is one that can support U.S. military operations.

When assessing an operating environment, one must pay particular attention to any U.S. treaty obligations in the region. A treaty defense obligation ensures that the legal framework is in place for the U.S. to maintain and operate a military presence in a particular country. In addition, a treaty partner usually yields regular training exercises and interoperability as well as political and economic ties.

Additional factors—including the military capabilities of allies that might be useful to U.S. military operations; the degree to which the U.S. and allied militaries in the region are interoperable and can use, for example, common means of command, communication, and other systems; and whether the U.S. maintains key bilateral alliances with nations in the region—also affect the operating environment. Likewise, nations where the U.S.

has stationed assets or permanent bases and countries from which the U.S. has launched military operations in the past may provide needed support to future U.S. military operations. The relationships and knowledge gained through any of these factors would undoubtedly make future U.S. military operations in a region easier and help to ensure a positive operating environment.

In addition to U.S. defense relations within a region, other criteria—including the quality of the local infrastructure, the area's political stability, whether or not a country is embroiled in any conflicts, and the degree to which a nation is economically free—should also be considered.

Then there are low-likelihood, high-consequence events that, although they occur infrequently, can still radically alter conditions in ways that affect U.S. interests. Massive natural disasters like Typhoon Tip (1979)[1] or the explosion of Mount Tambora (1816)[2] can displace populations, upend regional power arrangements, or destroy critical infrastructure. The eruption of Mount Pinatubo did just that in 1991, causing so much damage to Clark Airbase and Subic Bay Naval Station that the cost, combined with diplomatic frictions between the U.S. and the Philippines, led the U.S. to abandon these strategic facilities.[3] A massive solar flare could have a similar impact on a much larger scale because of the world's dependence on electrical power. Scientists, analysts, planners, and officials in public and commercial ventures study such things but

seldom take concrete action to mitigate their potential impact.

Today, the world has been shaken by the COVID-19 pandemic that has caused governments to spend extraordinary sums of money not only to manage the public health crisis, but also to mitigate its economic impact on their countries. Its attendant stresses have put terrific pressures on political establishments; caused governments to divert funding from other matters such as defense capabilities to the more immediate demands of the pandemic; and, given the threat of contagion, the adoption of mitigation measures that have led to the cancellation of military exercises, training events, and deployments. It remains to be seen what the long-term consequences will be, but for the assessed year of 2020, the COVID-19 pandemic has minimized activities that would normally keep military forces in a ready status, pressured related financial accounts, and caused problems for allied countries that would otherwise work to ensure that their military forces are able to collaborate effectively.

The impact of the pandemic on specific countries will be addressed in the assessments of military readiness, political stability, and access to training, exercise, and operational basing opportunities.

Each of these factors contributes to an informed judgment as to whether a particular operating environment is favorable or unfavorable to future U.S. military operations. The operating environment assessment is meant to add critical context to complement the threat environment and U.S. military assessments that are detailed in subsequent sections of the *Index*.

A final note: The *Index of U.S. Military Strength* refers to all disputed territories by the names employed by the United States Department of State. This should not be interpreted as reflecting a position on any of these disputes.

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Europe

Daniel Kochis

During the past year, America continued to reengage on European defense and the North Atlantic Treaty Organization (NATO) continued to operationalize new decisions, exercises, and structures to bolster collective defense, but the spring shock of the COVID-19 pandemic caused some defense exercises to be cancelled or postponed and necessitated the use of military resources for the pandemic response across Europe.[1] External threats to European security include the continued risk of Russian aggression toward the eastern states of NATO, Russian activity in the Arctic, a growing Russian presence in the Mediterranean theater, and Russian efforts to destabilize Western cohesion. In addition, the threat to the transatlantic alliance posed by Chinese investments, technology, and propaganda efforts has begun to move toward center stage.

The 51 countries in the U.S. European Command (USEUCOM) area of responsibility include approximately one-fifth of the world's population, 10.7 million square miles of land, and 13 million square miles of ocean. Some of America's oldest (France) and closest (the United Kingdom) allies are found in Europe. The U.S. and Europe share a strong commitment to the rule of law, human rights, free markets, and democracy. During the 20th century, millions of Americans fought alongside European allies to defend these shared ideals—the foundations on which America was built.

America's economic ties to the region are likewise important. A stable, secure, and economically viable Europe is in America's economic interest. For more than 70 years, the U.S. military presence has contributed to regional security and stability, economically benefiting both Europeans and Americans. The economies of the member states of the European Union (EU), along with the United States, account for approximately half of the global economy. In addition, the U.S. and the EU's member countries are generally each other's principal trading partners.

Europe is also important to the U.S. because of its geographical proximity to some of the world's most dangerous and contested regions. From the eastern Atlantic Ocean to the Middle East, up to the Caucasus through Russia, and into the Arctic, Europe is enveloped by an arc of instability. The European region also has some of the world's most vital shipping lanes, energy resources, and trade choke points.

European basing for U.S. forces provides the ability to respond robustly and quickly to challenges to U.S. economic and security interests in and near the region. Russian naval activity in the North Atlantic and Arctic has necessitated a renewed focus on regional command and control and has led to increased operations by U.S. and allied air and naval assets in the Arctic. At the same time, Russia's strengthened position in Syria has led to a resurgence of Russian activity in the Mediterranean that has contributed to "congested" conditions.[2]

Speaking at an Atlantic Council meeting in March 2019, General Joseph F. Dunford, former Chairman of the U.S. Joint Chiefs of Staff, explained that the U.S. has two key

advantages over adversaries: "our network of allies and partners, and the ability to project power where and when necessary to advance our national interest."[3] Nowhere is the value of allies and U.S. basing more apparent than in the European operating environment.

U.S. Reinvestment in Europe. Russia's continued aggression in the region has caused the U.S. to reinvest in military capabilities on the continent. In April 2014, the U.S. launched Operation Atlantic Resolve (OAR), a series of actions meant to reassure U.S. allies in Europe, particularly those bordering Russia. Under OAR and funded through the European Deterrence Initiative (EDI), the U.S. has increased its forward presence in Europe (around 6,000 soldiers take part in OAR missions at any one time across 17 nations);[4] invested in European basing infrastructure and prepositioned stocks and equipment and supplies; engaged in enhanced multinational training exercises; and negotiated agreements for increased cooperation with NATO allies.

European Deterrence Initiative. The Trump Administration's fiscal year (FY) 2021 request for EDI is $4.5 billion, down from $6 billion in FY 2020 and $6.5 billion in FY 2019.[5] In FY 2020, EDI-funded initiatives included, among others, the continuous U.S. rotational "presence of an Armored Brigade Combat Team (ABCT) with enablers, a Combat Aviation Brigade (CAB), and a Battalion to support NATO's enhanced forward presence (EFP)" along with enhancement of "Theater Anti-Submarine Warfare infrastructure," retention of F-15C fighter aircraft in Europe, "continued placement of prepositioned equipment," and an "increase in the training tempo" to improve the "overall readiness and interoperability of NATO's allies and partners."[6]

Testifying before the Senate Armed Services Committee in February 2020, General Tod Wolters was clear about the importance of EDI funding in returning the United States to a posture of deterrence:

> Through EDI, we have enhanced our presence in the theater to assure Allies

and deter adversaries. Increases of forward-stationed and rotational forces continue to improve our posture and enable us to compete and win in a multi-domain crisis or conflict. EDI funding for exercises, training, and building partner capacity programs enhance the readiness and interoperability of U.S. and Alliance forces. EDI funds have also improved our ability to respond using prepositioned stocks and improved theater infrastructure. Together, these improvements enable the rapid deployment and sustainment of forces.[7]

EDI has supported infrastructure improvements across the region. One major EDI-funded project is a replacement hospital at Landstuhl, Germany. When completed in 2022, the new permanent facility "will provide state-of the-art combat and contingency medical support to service members from EUCOM, AFRICOM and CENTCOM."[8] The importance of Landstuhl should not be underestimated. In early March, the facility was one of the first two U.S. laboratories overseas capable of testing for coronavirus.[9]

In addition to EDI, since 2018, the Department of State has awarded $277 million in grants through its European Recapitalization Incentive Program (ERIP) and repurposed funds to help U.S. allies in Europe replace Russian equipment with U.S.-made equipment. This has led to $2.5 billion in equipment sales including Blackhawk procurement in Albania, Lithuania, and Slovakia; Stryker vehicles in North Macedonia; Bradley Fighting Vehicles in Croatia; Bell Huey II helicopters in Bosnia and Herzegovina; and F16 purchases in Bulgaria.[10]

Forward Presence. In October 2019, the 2nd Armored Brigade Combat Team (ABCT) of the 1st Cavalry Division from Fort Hood, Texas, replaced the outgoing BCT in the "fifth iteration of an armored rotation in support of Atlantic Resolve." The BCT, consisting in part of 3,500 troops, 85 tanks, and 120 infantry fighting vehicles, deployed to sites across Belgium, Bulgaria, the Czech Republic, Denmark, Estonia,

Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Romania, and Slovakia.[11]

General Mark A. Milley, former Army Chief of Staff and now Chairman of the Joint Chiefs of Staff, has emphasized the value of ground forces in deterrence: "The air [and] maritime capabilities are very important, but I would submit that ground forces play an outsize role in conventional deterrence and conventional assurance of allies. Because your physical presence on the ground speaks volumes."[12]

In addition to back-to-back rotations of armor, the U.S. has maintained a rotational aviation brigade in Europe since February 2017.[13] In October 2019, the 3rd Combat Aviation Brigade, 3rd Infantry Division from Hunter Army Airfield, Georgia, arrived in Europe for a nine-month rotation with "approximately 1,700 personnel; 50 UH-60 and HH-60 Black Hawks; 10 CH-47 Chinooks; 20 AH-64 Apaches; and more than 2,000 wheeled vehicles and pieces of equipment." The units of the aviation brigade were distributed to Belgium, Bulgaria, the Czech Republic, Denmark, Estonia, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Romania and Slovakia.[14]

In May 2018, the U.S. began flying MQ-9 Reaper drones on unarmed reconnaissance flights out of Miroslawiec Air Base in Poland. The drones became fully operational in March 2019 when U.S. Air Force (USAF) officials stated that Poland was chosen for the MQ-9s because of its "strategic location."[15] Runway work at Miroslawiec necessitated the temporary relocation of the MQ-9 drones to Campia Turzii Air Base in Romania in July 2019.[16] It is expected that some MQ-9s will eventually be based out of Lask, Poland.[17]

Since 2017, the U.S. has beefed up its presence in Norway as well. In September 2019, 700 Marines from the 2nd Battalion, 6th Marine Regiment deployed to the Norwegian towns of Setermoen and Vaernes, the sixth rotation of the Marine Rotational Force–Europe. However, the Pentagon announced the end of the rotations beginning in October 2020.[18]

The U.S. also continues to rotate a Sustainment Task Force of 900 personnel from 11 Army Reserve and National Guard units that concentrate on logistics and maintenance to improve readiness. The Sustainment Task Force includes "military police, ammunition handlers, movement control teams, truck drivers, maintenance, supply, fuelers and postal services."[19]

In July 2020, the United States announced plans to remove nearly 12,000 troops stationed in Germany, with 6,400 returning to the U.S. and 5,600 to be stationed elsewhere in Europe, principally Belgium and Italy.[20] Among the planned changes, the 2nd Cavalry Regiment based in Vilseck, Germany, would return to the United States; the 5th Battalion, 4th Air Defense Artillery Regiment, activated in November 2018 and currently based in Ansbach, would be moved to Belgium; and the 52nd fighter wing, currently based in Spangdahlem, would be based in Vicenza, Italy.[21] The Department of Defense announced plans to move EUCOM and Special Operations Command Europe (SOCEUR) from Stuttgart, Germany, to Mons, Belgium.[22] The Pentagon also announced plans for further rotational deployments "farther east on the continent in more strategic locations, such as near the Black Sea region," although no specific plans have yet been announced.[23] NATO's Supreme Headquarters Allied Powers Europe is based in Mons, and General Tod Wolters stated that the headquarters moves "'will improve the speed and clarity of our decision-making and promote greater operational alignment."[24]

In August, the U.S. and Poland signed a Defense Cooperation agreement. Under this agreement, an additional 1,000 U.S. soldiers will rotate to the country, "to include the forward elements of the U.S. Army's V Corps headquarters and a Division headquarters, intelligence, surveillance and reconnaissance capabilities, and the infrastructure to support an armored brigade combat team and combat aviation brigade."[25] Poland reportedly will cover $135 million annually to support the augmented presence.[26] The U.S. and Poland have also

agreed to establish a USAF airport of debarkation at Wroclaw–Strachowice Air Base, a U.S. Special Forces facility at Lubliniec, and a joint Combat Training Centre in Drawsko Pomorskie.[27] The U.S. Army reportedly plans to transform "command headquarters in Poznan—known as a mission-command element—into a full-fledged division headquarters that would improve the military's ability to manage forces up and down the eastern flank." In October 2019, the Army "rebranded the headquarters as 1st Infantry Division (Forward), but to date no additional troops have been added since negotiations with Poland remain ongoing."[28]

Operation Atlantic Resolve's naval component has consisted in part of increased deployments of U.S. ships to the Baltic and Black Seas. According to Admiral James Foggo III, Commander of U.S. Naval Forces in Europe and Africa, "The United States and NATO are active with more ships in the Black Sea Region. We provide deterrence through our military presence, our exercises, and the training we conduct with allies and partners there."[29] In 2019, the U.S. spent 109 days in the Black Sea, an increase of four days from 2018.

Russian undersea activity has continued to increase, with EUCOM confirming "a 50 percent increase in the number of resources in the undersea that Russia committed to...out-of-area submarine operations" in the summer and fall of 2019 compared to the same period in 2018.[30] The Navy reestablished the Second Fleet, "responsible for the northern Atlantic Ocean," in May 2018, nearly seven years after it had been disbanded in 2011.[31] Second fleet reached full operational capability at the end of 2019.[32] The fleet was reestablished because of Russian militarization of the Arctic and led the BALTOPS exercise in June 2019.[33]

Prepositioned Stocks. The U.S. continues to preposition equipment in Europe across all services. Equipment and ammunition sufficient to support a division will continue to arrive in Europe through 2021.[34] The U.S. Air Force, Special Forces, and Marine Corps are beefing up prepositioned stocks; the Marine Corps Prepositioning Program in Norway is emphasizing cold-weather equipment.[35] DOD proposed that EDI Army funding will further "continue the build of a division-sized set of prepositioned equipment with corps-level enablers that is planned to contain two ABCTs (one of which is modernized), two Fires Brigades, air defense, engineer, movement control, sustainment and medical units."[36]

In February 2020, General Gustave F. Perna, Commanding General of the U.S. Army Materiel Command, revealed that the U.S. is building an additional Army prepositioned stock that is set for Europe.[37] Also in February, General Tod Wolters testified before the Senate Armed Services Committee that "Army Prepositioned Stocks in Europe hold equipment and logistics for an Armored Brigade Combat Team and key enablers, facilitating increased lethality by rapidly integrating deployed units into operations."[38]

Impact of the Coronavirus. While the impact of Covid-19 was felt across the alliance, it did not alter NATO's ability to carry out the vital work of collective defense. "Our forces remain ready," stated NATO Secretary General Jens Stoltenberg on April 2, "and our crucial work goes on—including in our multinational battlegroups in the east of the alliance, NATO Air Policing and our maritime deployments."[39]

Some members of NATO's military services did fall ill. In early March, Polish general Jarosław Mika was among attendees at a DEFENDER-Europe 20 conference in Wiesbaden, Germany, that caught the coronavirus.[40] In April, 50 French sailors aboard the aircraft carrier *Charles de Gaulle* were found to be positive for coronavirus, and by mid-April, hundreds of American sailors aboard the aircraft carrier USS *Theodore Roosevelt* had tested positive for COVID-19.[41]

Allied militaries across NATO were called upon to assist with civilian pandemic mitigation and response efforts. The French armed forces, for example, helped to set up additional capacity in the form of a field hospital, and the air force "evacuated patients from hospitals in Mulhouse and Colmar to military hospitals in Marseille and Toulon."[42] Similarly, Sweden's

TABLE 2

NATO Excercises Cancelled in 2020 Due to Coronavirus

Excercise	Original Excercise Dates	Location(s)
Asgard Skjold	Spring	Norway
Cold Response	March 2–18	Norway
Dynamic Front	Spring	U.S., Germany, Latvia, and Poland
Joint Warfighting Assessment	April 13–May 23	Several European countries
Juniper Cobra	March 3–13	Israel
Saber Strike	Spring	Estonia, Latvia, Lithuania, and Poland
Swift Response	Spring	Bulgaria, Croatia, and Romania

SOURCE: Heritage Foundation research.

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armed forces built a field hospital at Uppsala.[43] In the United States, USNS *Comfort* and USNS *Mercy*, two naval hospital ships, docked in New York and Los Angeles, respectively, to assist with health care overcrowding.[44]

NATO's Euro-Atlantic Disaster Response Coordination Centre (EADRCC) helped to coordinate assistance based on requests and availability of supplies. The Czech Republic and Turkey, for example, "provided Italy and Spain with medical supplies such as masks, personal protection equipment and disinfectants."[45] In April, NATO foreign ministers directed Supreme Allied Commander Wolters to help coordinate the matching of requests for aid with offers of assistance and to utilize excess airlift capacity to ease the transport of essential supplies across borders.[46] According to Secretary General Stoltenberg, General Wolters "will also implement simplified procedures for rapid air mobility, in coordination with Eurocontrol, using the NATO call sign for military relief flights."[47]

NATO's Strategic Airlift Capability (SAC), "a multinational programme that provides assured access to strategic military airlift capability for its 12 member nations,"[48] which include 10 NATO members and two Partnership for Peace Countries,[49] was leveraged for pandemic response. Examples include cargo flights to bring essential medical supplies from South Korea to the Czech Republic, Hungary, Romania, and Slovakia; use of SAC to transport ICU beds to Dutch Sint Maarten in April; the partnering of an Italian team from NATO's Support and Procurement Agency with a private company to create printed 3-D connectors to convert snorkeling masks to ventilator masks.[50] In April, NATO's Kosovo Force (KFOR) helped to transport gowns, masks, and sanitizers to North and South Mitrovica in Kosovo.[51]

In addition to NATO facilitation, allies have banded together to assist one another during the pandemic. Poland and Albania, for example, have sent doctors to Italy; the German air force has helped to transport patients from France and Italy to German hospitals for treatment; Germany has donated ventilators to the U.K.; the U.S. Administration has "authorized a robust assistance package for Italy," Estonia has donated masks and disinfectant to Spain and Italy, and NATO's Support and Procurement Agency has provided field hospital tents and equipment to Luxembourg to increase capacity.[52]

Another important impact of the pandemic has been the cancellation or postponement

of exercises. In March, Cold Response 20, a major exercise in Norway focused on Arctic security, was cancelled and 1,500 American servicemembers were put into quarantine after coming into contact with an infected Norwegian servicemember.[53] DEFENDER-Europe 20, which was to be "the U.S. Army's largest exercise in Europe in 25 years, ranging across ten countries and involving 37,000 troops from at least 18 countries, of which 20,000 soldiers [were to] be deployed from the United States to Europe," was significantly scaled back, and "linked exercises...Dynamic Front, Joint Warfighting Assessment, Saber Strike and Swift Response" were cancelled.[54]

Despite these changes, the U.S. did exercise large movements of soldiers and equipment before the cancellation of DEFENDER-Europe 20. Beginning in January:

> [T]he Army deployed approximately 6,000 Soldiers from the United States to Europe including a division headquarters and an armored brigade combat team. It has moved approximately 9,000 vehicles and pieces of equipment from Army Prepositioned Stocks and approximately 3,000 pieces of equipment via sea from the United States. And, in coordination with Allies and partners, it also completed movement of Soldiers and equipment from multiple ports to training areas in Germany and Poland.[55]

In early April, it was reported that "Canada and Germany have canceled [their] participation" in and that "Austria is considering not coming" and "Britain will substantially scale down [its] contribution" to the Aurora 20 exercise in Sweden because of COVID-19.[56]

U.S. Nuclear Weapons in Europe. In his 2020 EUCOM posture statement, General Tod Wolters reaffirmed that:

> As long as nuclear weapons exist, NATO will remain a nuclear Alliance. The fundamental purpose of NATO's nuclear capability is to preserve peace, prevent coercion,

and deter aggression. The strategic forces of the Alliance are the supreme guarantee of the security of Allies and underwrite every U.S. military operation in Europe. Since 2015, the Alliance has placed increased emphasis on the role of nuclear capabilities in its overall deterrence and defense posture, and continues to adapt its posture to ensure its nuclear capabilities remain credible, coherent, resilient, and adaptable to the changing environment.[57]

It is believed that until the end of the Cold War, the U.S. maintained approximately 2,500 nuclear warheads in Europe. Unofficial estimates range between 150 and 200 warheads spread across bases in Italy, Turkey, Germany, Belgium, and the Netherlands.[58] In October 2019, reports surfaced that the U.S. was considering moving the roughly 50 tactical nuclear weapons stored at Incirlik Air Base in Turkey in light of ongoing tensions, but no decision has been made.[59] All of these weapons are free-fall gravity bombs designed for use with U.S. and allied dual-capable aircraft.

These bombs are undergoing a life extension program that is expected to add at least 20 years to their life span.[60] The B61-12 bomb, according to U.S. officials, is "intended to be three times more accurate than its predecessors" and had been slated to begin production in March 2020.[61] However, in September 2019, Charles Verdon, Deputy Administrator for Defense Programs at the National Nuclear Security Administration, announced that the life extension program for the new B61-12 gravity bomb could face an 18-month delay, which could shrink in the future, because of the need to replace certain parts.

Important Alliances and Bilateral Relations in Europe

The United States has a number of important multilateral and bilateral relationships in Europe. First and foremost is the North Atlantic Treaty Organization, the world's most important and arguably most successful defense alliance.

CHART 3

Few NATO Members Follow Defense Spending Guidelines

NATO members are expected to spend at least 2 percent of their GDP on defense, and at least 20 percent of their defense spending is supposed to go to equipment. Only the U.S. and seven other nations do both.

DEFENSE SPENDING AS A PERCENTAGE OF GDP, 2020

NATO GUIDELINE: 20%

NATO GUIDELINE: 2%

EQUIPMENT AS A PERCENTAGE OF DEFENSE EXPENDITURES, 2020
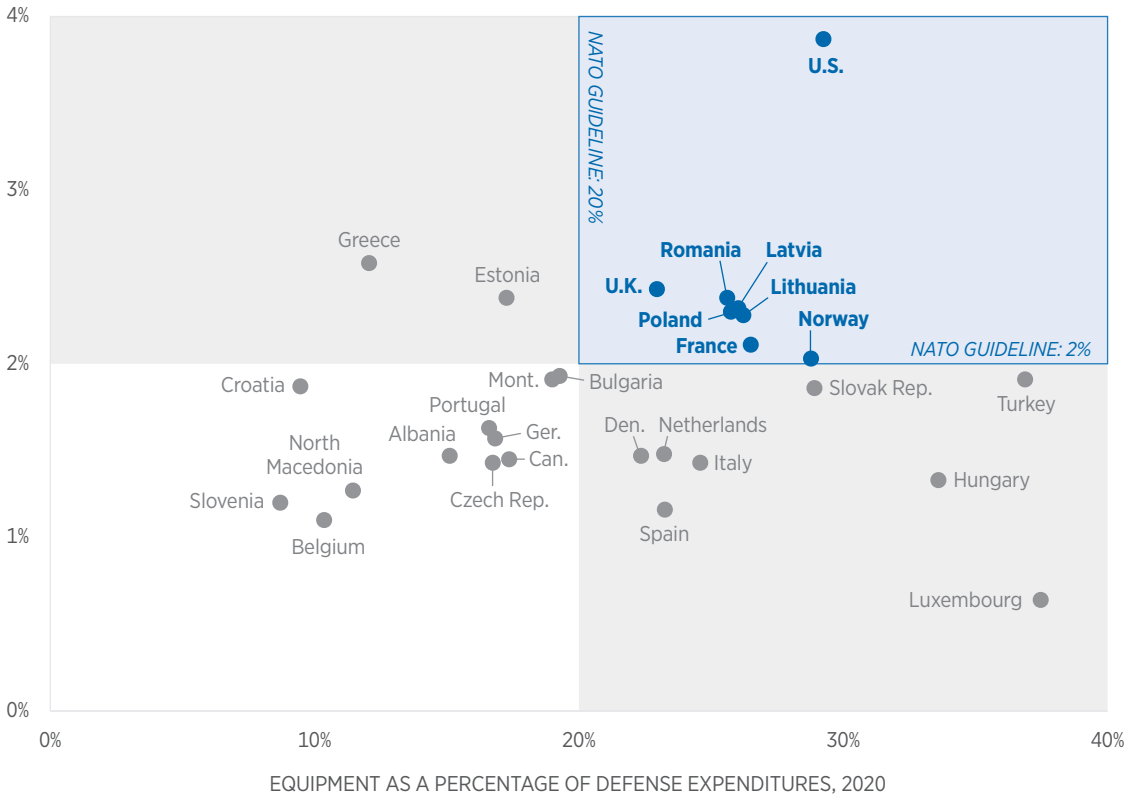
NOTES: Figures are estimates for 2020. Iceland is not listed because it has no military.
SOURCE: Press release, "Defence Expenditure of NATO Countries (2013–2020)," North Atlantic Treaty Organization, October 21, 2020, https://www.nato.int/nato_static_fl2014/assets/pdf/2020/10/pdf/pr-2020-104-en.pdf (accessed October 26, 2020).

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North Atlantic Treaty Organization. NATO is an intergovernmental, multilateral security organization that was designed originally to defend Western Europe from the Soviet Union. It anchored the U.S. firmly in Europe, solidified Western resolve during the Cold War, and rallied European support following the 9/11 terrorist attacks. NATO has been the bedrock of transatlantic security cooperation ever since its creation in

1949 and is likely to remain so for the fore-seeable future.

Current NATO operations include Resolute Support, "a non-combat mission which provides training, advice and assistance to Afghan security forces and institutions"; Kosovo Force; Operation Sea Guardian, tasked with maintaining "maritime situational awareness, counter-terrorism at sea and support to capacity-building" in the Mediterranean; Airborne Surveillance and Interception Capabilities to meet Iceland's Peacetime Preparedness Needs (ASIC IPPN); NATO Air Policing over the Baltics, Albania, Montenegro, and Slovenia; airlift and sealift support to the African Union Mission in Somalia; "capacity-building support" and "expert training support" for the African Standby Force; and NATO Mission Iraq (NMI), "a non-combat training and capacity-building mission that involves several hundred NATO trainers."[62] The 500-strong NMI was temporarily suspended in January 2020 following the death of Iranian General Qassem Soleimani. In February 2020, despite the suspension, NATO reportedly began to consider expanding the NMI to meet U.S. demands for a greater alliance presence in the Middle East.[63]

In recent years, NATO has placed a strong focus on military mobility and logistics in line with its 2014 Readiness Action Plan (RAP). The RAP was designed to reassure nervous member states and put in motion "longer-term changes to NATO's forces and command structure so that the Alliance will be better able to react swiftly and decisively to sudden crises."[64]

In June 2018, NATO defense ministers agreed to the Four 30s plan to improve movement of troops in Europe by 2020. "Four 30s" derives from the plan's objective that NATO should be able to respond to any aggression with 30 battalions, 30 squadrons of aircraft, and 30 warships within 30 days.[65] "In 2019, Allies contributed all of the combat forces required for this initiative," and they "are now working to build and maintain the level of readiness of these forces and organise them into larger formations."[66]

Enhanced Forward Presence. The four multinational battalions stationed in Poland and the Baltic States as part of the alliance's Enhanced Forward Presence (EFP) are the centerpiece of NATO's renewed focus on collective defense. Different countries serve as the lead nation for a designated supported country, providing overall coordination and the centerpiece force that is augmented by other contributing nations.

- The U.S. serves as the lead nation in Orzysz, Poland, near the Suwalki Gap. The U.S.-led battlegroup consists of 857 American troops and an armored cavalry squadron with combat service and support enablers augmented by 80 troops from Croatia, 120 from Romania, and 140 from the United Kingdom.[67]

- In Estonia, the United Kingdom serves as the lead nation, headquartered in Tapa. Its battlegroup consists of 800 troops in an armored infantry battalion with main battle tanks and armored fighting vehicles, supported by "self-propelled artillery and air defence assets, engineers, an intelligence, surveillance and reconnaissance group and logistic support elements," in addition to three staff officers from Denmark, and one Icelandic strategic communications civilian.[68]

- In Adazi, Latvia, Canada is the lead nation with 525 troops and armored fighting vehicles augmented by 21 troops from Albania, 55 from the Czech Republic, 166 from Italy, 10 from Montenegro, approximately 200 from Poland, 152 from Slovakia, 33 from Slovenia, and 350 from Spain.[69]

- In Rukla, Lithuania, Germany serves as the lead nation with 560 troops augmented by another 262 from Belgium, 188 from Croatia, 35 from the Czech Republic, 270 from the Netherlands, 120 from Norway, a contribution from Luxembourg, and one Icelandic public affairs civilian.[70]

EFP troops are under NATO command and control; a Multinational Division Headquarters Northeast located in Elblag, Poland, which reached full operational capability in December 2018, coordinates the four battalions.[71] In February 2017, the Baltic States signed an agreement to facilitate the movement of NATO forces among the countries.[72]

In addition, NATO has established eight Force Integration Units located in Sofia, Bulgaria; Tallinn, Estonia; Riga, Latvia; Vilnius, Lithuania; Bydgoszcz, Poland; Bucharest, Romania; Szekesfehervar, Hungary; and Bratislava, Slovakia. These new units "will help facilitate the rapid deployment of Allied forces to the Eastern part of the Alliance, support collective defence planning and assist in coordinating training and exercises."[73]

At its July 2016 Warsaw summit, NATO also agreed to "develop tailored forward presence in the southeast part of the Alliance territory." According to the summit's official communiqué:

> Appropriate measures, tailored to the Black Sea region and including the Romanian initiative to establish a multinational framework brigade to help improve integrated training of Allied units under Headquarters Multinational Division Southeast, will contribute to the Alliance's strengthened deterrence and defence posture, situational awareness, and peacetime demonstration of NATO's intent to operate without constraint. It will also provide a strong signal of support to regional security. Options for a strengthened NATO air and maritime presence will be assessed.[74]

The land component of NATO's tailored forward presence is a multinational framework brigade based in Craiova, Romania, under the control of Headquarters Multinational Division Southeast (HQ MND–SE) in Bucharest.[75] HQ MND–SE achieved final operational capability in March 2018.[76] The 5,000-strong brigade "still consists mainly of Romanian troops,

but they are supplemented by Bulgarian and Polish troops and headquarters staff from various other NATO states."[77] The U.S. and Romania jointly organize a biannual exercise named Saber Guardian, which is designed to improve the integration of multinational combat forces."[78] In the 2019 iteration, "[a]lmost 8,000 soldiers from six countries (Albania, Bosnia and Herzegovina, Bulgaria, Romania, Hungary and United States of America)" participated in exercises in Bulgaria, Hungary, and Romania.[79]

Addressing a NATO capability gap in aerial refueling, the Czech Republic joined the Multinational Multi-Role Tanker Transport Fleet (MMF) program, which also includes Belgium, Germany, Luxembourg, the Netherlands, and Norway, in October 2019. The first two of eight Airbus A330 Multi-Role Tanker Transport (MRTT) aircraft, which will help to offset some of Europe's reliance on the United States for aerial refueling services, are to be delivered to Eindhoven air base in the Netherlands in May 2020, with another four scheduled for delivery over the next three years; the other three will operate out of Cologne, Germany, with the first to be delivered in October 2020.[80] The U.S. currently carries out 90 percent of NATO air-to-air refuelings.[81]

Additionally, in November 2019, NATO announced a $1 billion package to upgrade its Airborne Warning and Control System (AWACS) planes along with "an announcement that the first of five Global Hawk drones making up the Alliance Ground Surveillance program was en route from the United States to its future home base at Sigonella, Sicily."[82]

In 2018, NATO established two new commands: a joint force command for the Atlantic, based in Norfolk, Virginia, and a logistics and military mobility command.[83] These commands consist of a total of 1,500 personnel, with the logistics command headquartered in Ulm, Germany.[84] Logistics have been a significant focus of the alliance in recent years. An internal alliance assessment in 2017 reportedly concluded that NATO's "ability to logistically support rapid reinforcement in the much-expanded territory covering SACEUR's

(Supreme Allied Commander Europe) area of operation has atrophied since the end of the Cold War."[85] In December 2019, EUCOM Commander General Tod Wolters stated that logistics deficiencies in Europe keep him up at night: "[W]hen I go to sleep at night, it's probably the last thought I have, that we need to continue to improve upon, and we are, from a road, rail, and air perspective, in getting large quantities of hardware and software from west to east on continent."[86]

In recent years, shortfalls in the alliance's ability to move soldiers and equipment swiftly and efficiently have occasionally been glaring. In January 2018, German border guards stopped six U.S. M109 Paladin howitzers en route from Poland to multinational exercises in Bavaria because the trucks being used to transport the artillery were allegedly too wide and heavy for German roadways. In addition, contractors driving the trucks were missing paperwork and trying to transport the howitzers outside of the allowed 9:00 p.m.–5:00 a.m. window. NATO has focused heavily on overcoming these barriers and is working with the European Union, which retains competencies that are critical to improving military mobility, particularly with respect to overcoming legal and regulatory hurdles.

Cyber Capabilities. NATO has stated that "a severe cyber-attack could lead [it] to invoke Article 5."[87] Ultimately, the decision to invoke Article 5 will be a political decision. At the 2016 Warsaw summit, NATO recognized cyberspace as a domain of operations, and on August 31, 2018, it established a Cyberspace Operations Centre (CYOC) in Mons, Belgium, that will include 70 cyber experts when it becomes fully operational in 2023.[88] The CYOC, according to NATO, "will provide situational awareness and coordination of NATO operational activity within cyberspace."[89] In 2017, it was reported that NATO "is preparing to expand its satellite communications capability with contracts worth about $1.85 billion later this year as it prepares to field a new fleet of drones."[90] Its decision was driven in part by the acquisition of five Global Hawk surveillance drones, which

generate significant data; after delays, the first drone was delivered in 2019 to Sigonella Naval Air Station.[91] Satellite communications are critical both for piloting the Global Hawks and for disseminating the surveillance data they collect in real time.

The alliance's Joint Air Power (JAP) Strategy, released in June 2018, highlighted the importance of cyber and space capabilities:

> Increasing reliance on cyber and space-based capabilities by Alliance forces presents vulnerabilities for adversaries to negate critical NATO capabilities through degradation, denial or destruction, whilst providing opportunities for the Alliance to integrate such capabilities with JAP for kinetic and non-kinetic effect. Both the resilience and exploitation of such capabilities is [sic] therefore a critical requirement that future development should address.[92]

Another related initiative, the NATO Industry Cyber Partnership, focuses on industry and the academic community:

> NATO has also invested in strengthening its relationship with industry through the NATO Industry Cyber Partnership. This initiative, established in 2014, facilitates cooperation for the mutual benefit of both NATO and Allies' industry and academia. In 2019, industry continued to support NATO's cyber defence by providing real-time actionable cyber threat information, thereby enabling stakeholders to take rapid action to respond to threats.[93]

U.S. officials have raised concerns about the impact of Chinese 5G technology on the sharing of intelligence in Europe, stating that using Chinese state-controlled companies for next-generation wireless networks would be "nothing short of madness."[94] The landscape in Europe for key decisions regarding Chinese technology in next-generation wireless networks is accelerating. Exactly how the

emerging patchwork approach to Chinese 5G technology in Europe will affect the European operating environment will become clearer in the coming years.

Ballistic Missile Defense. In July 2016, NATO members declared Initial Operational Capability of NATO ballistic missile defense (BMD), which offers a stronger capability to defend alliance populations, territory, and forces across the southern portion of Europe from a potential ballistic missile attack. An Aegis Ashore site in Deveselu, Romania, became operational in May 2016, and in April 2019, the U.S. announced the temporary deployment of a Terminal High Altitude Area Defense (THAAD) system to Romania while the Aegis Ashore system is being updated.[95] An AN/TPY-2 forward-based early-warning BMD radar established at Kürecik, Turkey, has a range of up to 1,800 miles. The U.S. is also reportedly building a second undisclosed site near Malatya, expanding capability at that location.[96]

BMD-capable U.S. Aegis-equipped ships are forward deployed at Rota, Spain.[97] In March 2020, the U.S. Navy announced support for basing an additional two destroyers at Rota, which would bring the total to six.[98] The additional deployments, according to NATO Supreme Allied Commander Wolters, "would allow us the opportunity to continue to improve our ability to get indications and warnings in the potential battlespace and also dramatically improve our ability to better command and control."[99] A second Aegis Ashore site in Redzikowo, Poland, which broke ground in May 2016, was expected to be operational in 2017 but has been beset by construction delays and may not become operational until 2022.[100] Ramstein Air Base in Germany hosts a command center.[101]

The U.K. operates a BMD radar at RAF Fylingdales in England. In November 2015, the government "announced it would invest in a ground-based BMD radar, intended to enhance the coverage and effectiveness of the NATO BMD capability."[102] As of July 2017, it was reported that "[t]he UK's current and only ballistic missile defence (BMD) radar [was still] at RAF Fylingdales" but that the government

expects the new radar "to be in service by the mid-2020s" and "will also investigate further the potential of the Type 45 Destroyers to operate in a BMD role."[103]

In October 2017, ships from the U.S. and allies Canada, France, Germany, Italy, the Netherlands, Spain, and the United Kingdom took part in a three-and-a-half-week Formidable Shield BMD exercise off the Scottish Coast.[104] Formidable Shield exercises were held again in 2019.[105] During Formidable Shield 19, a French FREMM frigate deployed an Aster-15 air defense missile for the first time to "to intercept a projectile travelling at a speed of over Mach 1," and a Canadian frigate engaged a supersonic target with an Evolved Sea Sparrow Missile for the first time.[106]

In January 2017, the Russian embassy in Norway threatened that if Norway contributes ships or radar to NATO BMD, Russia "will have to react to defend our security."[107] Norway operates four *Fridtjof Nansen*–class Aegis-equipped frigates that are not currently BMD capable.[108] A fifth Aegis-equipped frigate, the *Helge Ingstad*, collided with an oil tanker and was intentionally run aground in November 2018; although raised in 2019, it likely will be salvaged for parts rather than returned to service.[109]

Denmark, which agreed in 2014 to equip at least one frigate with radar to contribute to NATO BMD, reaffirmed this commitment in its recent Defence Agreement 2018–2023.[110] Russia's ambassador in Copenhagen has openly threatened Denmark for agreeing to contribute: "I do not believe that Danish people fully understand the consequences of what may happen if Denmark joins the American-led missile defense system. If Denmark joins, Danish warships become targets for Russian nuclear missiles."[111]

In March 2019, the first of four Dutch *Iver Huitfeldt*–class frigates received a "SMART-L Multi-Mission radar upgrade, providing enhanced Air and Missile Defense capability." The SMART-L MM "is capable of detecting a very wide variety of air and space objects including stealth, short up to long range ballistic

MAP 1

Threat Proximity Largely Dictates Military Spending

In Europe, NATO members closer to Russia and the Middle East spend, in general, more on defense than those further away.

DEFENSE SPENDING AS PERCENTAGE OF GDP

- 2%+
- 1.5%–1.99%
- 1%–1.49%
- <1%

NOTES: Figures are estimates for 2019. Iceland is not listed because it has no military.
SOURCE: Press release, "Defence Expenditure of NATO Countries (2013–2019)," North Atlantic Treaty Organization, November 29, 2019, https://www.nato.int/nato_static_fl2014/assets/pdf/pdf_2019_11/20191129_pr-2019-123-en.pdf (accessed August 19, 2020).

heritage.org
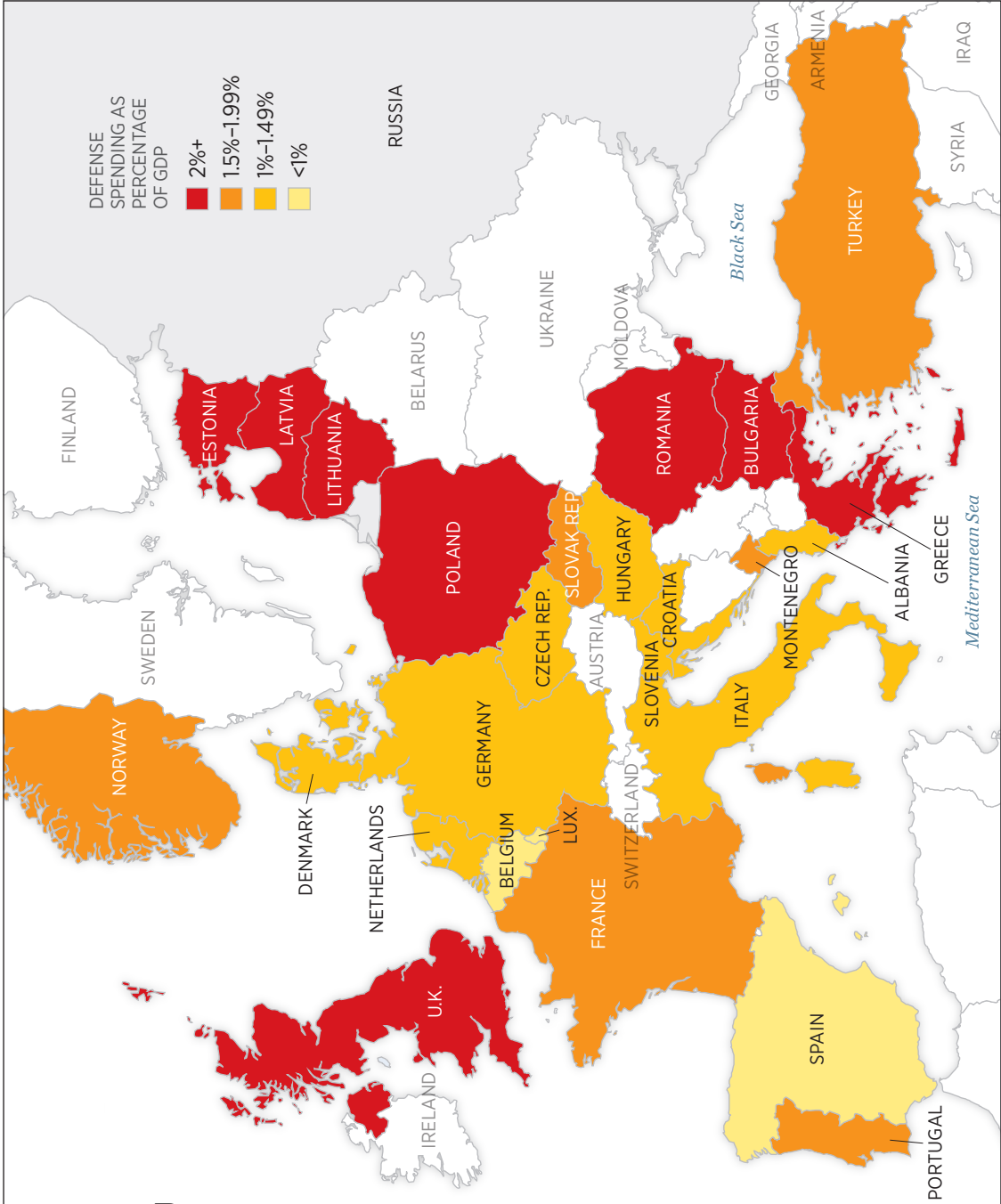
missiles and space objects" and "capable of surveillance and tracking of Ballistic Missiles up to 2000 km while simultaneous[ly] maintaining the Air Defence capability."[112] All four Dutch frigates will receive the radar upgrade, and the Netherlands announced plans to acquire the BMD-capable SM-3 surface-to-air missiles in 2018.[113] In February 2019, the German Navy began a tender to upgrade radar on three F124 *Sachsen*-class frigates in order to contribute sea-based radar to NATO BMD.[114]

In addition, it has been reported that Belgium intends to procure M-class frigates that "will be able to engage exo-atmospheric ballistic missiles."[115] A contract to develop a weapons suite for a joint Belgian and Dutch procurement of two multipurpose frigates apiece was awarded in February 2019, and the vessels are expected to enter service beginning in 2024.[116] Spain currently operates four Aegis-equipped F-100 *Alvaro de Bazan*–class frigates, and "[t]wo more frigates are to come."[117] In April 2019, Spain signed an agreement to procure five F-110 multi-mission frigates; the first of these Aegis-equipped frigates will likely be deployed in 2026 and "will host the first naval solid-state S-band radar for the Spanish Navy."[118] Finally, the Italian Navy is procuring seven multi-role offshore patrol vessels (PPAs) to be delivered from 2021 to 2026; the first of two BMD-capable PPAs in full configuration is scheduled for delivery in 2024.[119]

Quality of Armed Forces in the Region

Article 3 of the 1949 North Atlantic Treaty, NATO's founding document, states that members at a minimum "will maintain and develop their individual and collective capacity to resist armed attack."[120] Regrettably, only a handful of NATO members are living up to their Article 3 commitments.

In 2020, nine countries—Estonia (2.38 percent); Greece (2.58 percent); Latvia (2.32 percent); Lithuania (2.38 percent); Norway (2.03 percent); Poland (2.30 percent); Romania (2.38 percent); the United Kingdom (2.43 percent); and the United States (3.87 percent)—spent the required minimum of 2 percent of

gross domestic product (GDP) on defense,[121] and 16 NATO allies spent 20 percent of their defense budgets on "major new capabilities."[122] NATO defense spending continues to trend upward: "2019 marked the fifth consecutive year of growth in defence spending for European Allies and Canada, with an increase in real terms of 4.6% from 2018 to 2019."[123]

Germany. Germany remains an economic powerhouse that punches well below its weight in terms of defense. In 2020, it will spend only 1.57 percent of GDP on defense and 16.8 percent of its defense budget on equipment;[124] however, this is an increase from 2019, when it spent only 1.38 percent of GDP on defense and 16.6 percent of its defense budget on equipment.[125] In 2019, Germany officially reneged on its pledge to spend 2 percent of GDP in 2024, informing NATO that it would reach only 1.5 percent.[126] In November 2019, Defense Minister Annegret Kramp-Karrenbauer announced that Germany may not attain the 2 percent benchmark until 2031.[127] Because of political constraints under the current coalition government, German defense spending is not likely to shift significantly until after the next election, which will be held before October 2021. Overall, the German military remains underfunded and underequipped. One former German diplomat has stated that without NATO, Germany "would have to double its defence budget to 3–3.5 per cent of GDP or risk being 'completely blind, deaf and defenceless.'"[128]

Germany continues to serve as the lead nation for NATO's EFP battalion in Lithuania, with 560 troops stationed there, and is investing $110 million through 2021 in upgrading facilities in Lithuania, including barracks used by the multinational battalion.[129] The Luftwaffe has taken part in Baltic Air Policing more than any other nation's armed forces: 11 times, including most recently in the second half of 2018.

Germany maintains 70 troops in Kosovo as part of NATO's Kosovo Force and is the second-largest contributor to NATO's Resolute Support Mission in Afghanistan with 1,300 troops.[130] In February 2020, the Bundestag

extended the mandates for Germany's participation in NATO's Sea Guardian maritime security operation and Resolute Support Mission through March 2021.[131] German forces also participate in a number of U.N. peacekeeping missions including in Lebanon, Mali, and South Sudan.[132]

On March 11, 2020, after extending Germany's non-combat training mission in Iraq and its air-to-air refueling and air surveillance radar missions in support of the counter-ISIS coalition, the German government announced that it was ending its Tornado reconnaissance mission on March 31.[133] Germany maintains approximately 90 soldiers in Iraq who are helping to train Kurdish forces.[134] An additional 30 soldiers were redeployed to Kuwait and Jordan in January 2020 after Qassem Soleimani was killed by a U.S. drone strike.[135] In April 2017, the Bundeswehr established a new cyber command, which initially will consist of 260 staff but will number around 13,500 by the time it becomes fully operational in 2021.[136]

While Germany's forces have taken on additional roles in recent years, its overall military continues to suffer serious equipment and readiness issues. According to a January 2020 report, "just 15 percent of Germany's Tiger attack helicopters and only around 12 percent of its NH90 transport helicopters were mission capable as of November 2019."[137] The readiness rate of Germany's fleet of 93 Tornado jets reportedly is less than 40 percent.[138] A February 2019 report stated that, on average, only 39 of 128 Eurofighters and 26 of 93 tornadoes were available for training and combat in 2018.[139] In addition to equipment problems, the Luftwaffe is facing a shortage of pilots, with only two-thirds of combat pilot positions filled.[140]

The situation is not much better for either the army or the navy. Germany, which was the lead nation for NATO's Very High Readiness Joint Task Force (VJTF)[141] in 2019, "promised to have 44 Leopard 2 tanks and 14 Marder armoured infantry vehicles available for the task, yet in the event could only muster nine and three respectively."[142]

For five months in 2018, the German navy had no working submarines; all six of its Type 212–class submarines were in dry dock awaiting repairs or not ready for active service.[143] Equipment availability has since been classified and thus is not available in the Parliamentary Armed Forces Commissioner's 2019 annual report.[144]

In December 2017, Germany's F-125 *Baden-Württemberg*–class frigate failed sea trials because of "software and hardware defects."[145] The frigate reportedly had "problems with its radar, electronics and the flameproof coating on its fuel tanks." It "was also found to list to the starboard" and lacked sufficiently robust armaments as well as the ability to add them.[146] Concerns have been raised about the frigate's lack of a surface-to-air missile system, a deficiency that leaves it fit only for "stabilization operations," and lack of sonar and torpedo tubes, which leaves it vulnerable to submarine attack.[147] The government returned the ship to the shipbuilder following delivery,[148] and the redesigned *Baden-Württemberg* was belatedly commissioned in June 2019, the first of four F-125 frigates to be delivered through 2021.[149] In January 2020, Germany announced a $6.7 billion contract with a Dutch and German shipbuilder to build the next-generation MKS 180 frigate, the first of four (with the possibility of another two) to be delivered in 2027.[150]

Germany has increased the number of personnel on active duty in its army from 176,000 in 2016 to 182,000 in 2019:

> The government recognizes that the force structure needs to expand in light of Germany's ambitious plans but is grappling with recruitment and retention issues. To address this, Berlin launched a new strategy in October 2019, designed to create a more flexible reserve cadre that can rapidly respond to territorial and collective-defence tasks.[151]

In March 2020, Germany announced that it will purchase 90 Eurofighter Typhoons and 45 F/A-18E/F Super Hornets to replace its fleet

of Tornados.[152] It will cost almost €9 billion to keep the Tornados in the air until their retirement, which is scheduled for 2030.[153] Their replacements will need to be able to carry both nuclear and conventional weapons, as the Tornadoes are dual-capable aircraft equipped to carry B61 tactical nukes in addition to conventional payloads.[154] The U.S. and Germany have already tested the Tornado's ability to carry the new B61-12 tactical nuke.[155] While not yet certified, Germany is planning on the Super Hornets as their dual-capable aircraft.[156] Of the 45 Super Hornets, 15 will be an EA-18 Growler electronic warfare variant.[157]

In February 2017, Germany decided to replace its short-range air defense systems. Once complete, this upgrade, which could cost as much as €3.3 billion by 2030, will help to close a gap in Europe's short-range air defense weapons that was identified in 2016.[158]

Germany's procurement of A400M cargo aircraft has been beset by delays. In November 2019, Germany refused to accept delivery of two aircraft, "citing recurring technical problems with the military transporters." As of that same month, 31 of 53 aircraft ordered by Germany had been delivered, but they were found to have a host of technical problems that included incorrect nuts used on propellers and problems with "engine mounts, combustion chambers and engine flaps and for crack detection on various parts."[159] In May 2018, the U.S. approved the sale of six C-130J Hercules aircraft and three KC-130J tankers to France and Germany, which are planning to create a joint capability.[160]

France. France has one of NATO's most capable militaries and retains an independent nuclear deterrent capability. Although France rejoined NATO's Integrated Command Structure in 2009, it remains outside the alliance's nuclear planning group. In 2020, France will spend 2.11 percent of GDP on defense and 26.5 percent of its defense budget on equipment, meeting both NATO benchmarks.[161]

In February 2020, the *Suffren*, the first of six new fifth-generation *Barracuda*-class nuclear-powered attack submarines, was floated for the

first time. The vessel is expected to be commissioned late in 2020.[162] Construction began on the first of five defense and intervention frigates in October 2019, and "[t]he navy expects the ship to be pronounced operational in early 2025."[163]

France is upgrading its aerial refueling and airlift fleet. In September 2019, it received the first of two KC-130J Super Hercules.[164] It has also been introducing a dozen new A330 MRTT Multi-Role Tanker Transport aircraft, which were procured in 2018 and will be delivered through 2023.[165] By the end of 2020, all 15 French A400M Atlas military transport aircraft will have been upgraded to "tactical standard," and it is expected that an additional 10 aircraft will be procured by 2025.[166]

In January 2019, France signed a $2.3 billion agreement with Dassault Aviation for development of the F4 standard upgrade to the Rafale fighter aircraft. The F4 Standard upgrade includes "a number of new features, the most important of which is an improvement in the aircraft's connectivity in both national and allied contexts, through software-defined radio, new links, and satellite communications."[167] The 28 Rafales, to be delivered in 2023, "will include some F4 functionalities." Also in January, Armed Forces Minister Florence Parly announced a potential order of 30 additional Rafales at full F4 standard in 2023 for delivery between 2027 and 2030.[168] France is also spending $5 billion in 2020 on modernization of its sea-based and air-based nuclear deterrent.[169]

France established a 220-person Space Command under its air force in September 2019 and has committed to investing $4.78 billion in its space capabilities by 2025.[170] France plans to have an "active defence" of its assets in space, including lasers and patrols of "nano-satellites," by 2023. "If our satellites are threatened," Armed Forces Minister Parly has explained, "we intend to blind those of our adversaries. We reserve the right and the means to be able to respond: that could imply the use of powerful lasers deployed from our satellites or from patrolling nano-satellites."[171]

In December 2016, France opened a cyber-operational command.[172] The French Military Programming Law for 2019–2025, enacted in the summer of 2018, added "an additional 1.6 billion euros for cyber operations along with 1,500 additional personnel for a total of 4,000 cyber combatants by 2025," and in January 2019, France issued its "first doctrine for offensive cyber operations."[173]

France, which has the third-largest number of active-duty personnel in NATO, withdrew the last of its troops from Afghanistan at the end of 2014 (all of its combat troops had left in 2012) but remains engaged in the fight against the Islamic State with 1,000 troops deployed in Operation Chammal.[174] The January–April 2020 deployment of a carrier strike group led by the aircraft carrier *Charles de Gaulle* to the eastern Mediterranean in support of Operation Chammal was the fifth such deployment since 2014.[175] France has contributed to NATO deterrence missions in Eastern Europe, although 300 soldiers deployed to Estonia as part of NATO's Enhanced Forward Presence withdrew in August 2019.[176]

The French military is also very active in Africa, with more than 5,100 troops involved in anti-terrorism operations in Burkina Faso, Chad, Mali, Mauritania, and Niger as part of Operation Barkhane and more than 1,450 troops stationed in Djibouti, 900 in Côte d'Ivoire, 350 in Gabon, and 350 in Senegal. In addition, France has a close relationship with the United Arab Emirates. It has 650 troops stationed in the UAE,[177] and a 15-year defense agreement between the countries has been in effect since 2012.

France is part of the EU-led Operation Sophia in the Mediterranean against human smuggling and migration and is involved in a few other maritime missions across the globe as well.[178] In Asia, for example, French naval forces occasionally conduct freedom-of-navigation operations in the South China Sea.[179] In April 2019, France sent a frigate, the *Vendemiaire*, through the Taiwan Strait on a freedom-of-navigation operation.[180] The French-led Maritime Situation Awareness in the Strait of Hormuz (EMASOH) initiative to help patrol the waters near Iran is based out of Abu Dhabi and became operational on February 25, 2020.[181] France is expanding its presence in the eastern Mediterranean and conducted naval drills with Cyprus in October 2019.[182] Cyprus is planning to expand Evangelos Florakis naval base in Mari to host the French navy.[183]

Operation Sentinelle, launched in January 2015 to protect France from terrorist attacks, is the largest operational commitment of French forces, accounting for some 13,000 troops and reportedly costing "upwards of €400,000 per day."[184] Frequent deployments, especially in Operation Sentinelle, have placed significant strains on French forces and equipment. "In early September 2017," according to the International Institute for Strategic Studies (IISS), "the chief of defense staff declared that the French armed forces have been used to '130% of their capacities and now need time to regenerate.'"[185] France's 2017 *Defense and National Security Strategic Review* similarly noted that "simultaneous sustained operations and deployments are causing early wear and tear of human resources and equipment."[186]

Sentinelle deployments have had a negative effect on morale for a myriad of reasons. In March 2019, for example, at the height of the *gilets jaunes* (yellow vests) protests, soldiers temporarily took over guard duties at certain Paris buildings to free police.[187] To counteract the strain on soldiers, the government extended deployment pay to soldiers who took part and created a "medal for Protection of the Territory" for troops deployed for 60 days in Operation Sentinelle.[188]

The United Kingdom. America's most important bilateral relationship in Europe is the Special Relationship with the United Kingdom. In his famous 1946 "Sinews of Peace" speech—now better known as his "Iron Curtain" speech—Winston Churchill described the Anglo–American relationship as one that is based first and foremost on defense and military cooperation. From the sharing of intelligence to the transfer of nuclear technology, a high degree of military cooperation has helped

to make the Special Relationship between the U.S. and the U.K. unique.

In 2020, the U.K. will spend 2.43 percent of GDP on defense and 23.0 percent of its defense budget on equipment.[189] In September 2019, the Treasury announced a defense budget increase of $2.7 billion between 2019 and 2021, raising overall spending from £39 billion in 2019 to "over £41 billion" ($53 billion) in 2021.[190] The increase, however, is less than the £3.3 billion requested by the Ministry of Defence (MOD).[191] In addition, more than 30 percent of the increased funding ($910 million) "was earmarked to deal with an increase in pensions contributions," with most of the remaining £1.2 billion used for military modernization, "including investments in the *Dreadnought*-class nuclear-powered ballistic-missile submarine that will replace the *Vanguard* class; wider ship-building plans, such as the Type-26 and Type-31 frigates; and funding for cyber capabilities."[192] The *Financial Times* reported in December 2019 that the chief of the Defence Staff had called an emergency meeting with the service chiefs to discuss a £1 billion FY 2021 budget shortfall that would cause "a squeeze on day-to-day deployments and training activities, which will jeopardise overall capability and operational readiness."[193]

In December 2018, the U.K. released its Modernising Defence Programme, which reaffirmed Britain's commitment to defense in post-Brexit Europe. The program noted plans to rebuild weapons stockpiles and "improve the readiness and availability of a range of key defence platforms, including: major warships, our attack submarines and helicopters." The report on the program also announced the creation of a £160 million transformation fund to develop "cutting-edge technologies."[194] A 2020 report from the National Audit Office, however, warned that the U.K.'s "10-year defense equipment plan shows there is a potential funding shortfall of up to £13 billion (U.S. $15 billion)."[195]

On February 26, 2020, Prime Minister Boris Johnson announced a foreign policy, defense, security, and international development review intended in part to "[d]efine the Government's ambition for the UK's role in the world and the long-term strategic aims for our national security and foreign policy" and "[s]et out the way in which the UK will be a problem-solving and burden-sharing nation, examining how we work more effectively with our allies."[196] The July 2020 deadline for this review, which will run parallel with a comprehensive spending review, was criticized as overly ambitious even before the outbreak of the COVID-19 pandemic.[197]

Though its military is small in comparison to the militaries of France and Germany, the U.K. maintains one of European NATO's most effective armed forces. Former Defence Secretary Michael Fallon stated in February 2017 that the U.K. will have an expeditionary force of 50,000 troops by 2025.[198] This goal was reiterated in the MOD's 2018 report on the Modernising Defence Programme.[199] However, U.K. defense forces remain plagued by vacancies. According to the IISS:

> The personnel strength of the British armed forces continues to decrease, with an overall deficit of 7.6% in 2019, compared with 6.2% the previous year. Although recruitment initiatives continue, shortages remain in key specialist areas, including 18% of required Royal Air Force (RAF) pilots. The MoD routinely claims that it has enough personnel to meet operational requirements, and in the event of a large-scale operation, such as a NATO Article 5 contingency, the army could probably draw on its reserves to bring its units to full strength. But the Royal Navy and RAF, with smaller reserves, might find it more problematic to generate the necessary personnel for a large-scale operation.[200]

The National Audit Office found that one-third of the U.K.'s 32 most important procurement projects were behind, with new equipment "on average more than two years late before it can be at full operating capability."[201] In April 2019, the U.K. reportedly was planning

to upgrade only 148 of its 227 remaining Challenger 2 main battle tanks, cutting its fleet by one-third.[202] The 79 other tanks would be used "as a source of spare parts."[203] The British Army had previously cut its tank forces by 40 percent in 2010.[204]

In November 2018, former Defence Secretary Gavin Williamson announced a contract to order an additional 17 F-35B aircraft. The U.K. has taken delivery of 16 F-35Bs, and it is expected that 17 more will be delivered between 2020 and 2022.[205] The MOD remains committed to purchasing 138 F-35s but has yet to decide which variants will complete the bloc.[206] RAF F-35s based at Akrotiri, Cyprus, flew operational sorties for the first time in June 2019.[207]

In September 2019, the U.K. took delivery of the last of 160 Typhoon aircraft, which are expected to stay in service until 2040.[208] Project Centurion, a $515.83 million Typhoon upgrade to integrate additional Storm Shadow long-range cruise missiles and Brimstone precision attack missiles, was completed in 2018, allowing the U.K. to retire its fleet of Tornado aircraft.[209] The U.K. also plans to invest $2.6 billion in development of the Tempest, a sixth-generation fighter to be delivered in 2035.[210]

The RAF operates the largest fleet of air-to-air refuelers in Europe, which is noteworthy because of the severe shortage of this capability on the continent.[211] Along with the U.K., the U.S. has produced and jointly operated an intelligence-gathering platform, the RC-135 Rivet Joint aircraft, which has seen service in Mali, Nigeria, and Iraq and is now part of the RAF fleet.[212]

The U.K. operates seven C-17 cargo planes and has started to bring the European A400M cargo aircraft into service after years of delays. Britain will procure a total of 22 A400Ms by the early 2020s.[213] In July 2019, the U.K. extended the out-of-service date for its fleet of 14 C-130Js (one C-130J C5 and 13 C-130J-30 C4s) to 2035; the fleet, which is critical to the U.K.'s special operations forces, is undergoing "a key structural upgrade programme."[214]

The Sentinel R1, an airborne battlefield and ground surveillance aircraft, was due to be removed from the force structure in 2015, but its service is being extended at least to 2025, and the U.K. will soon start operating the P-8 Poseidon maritime patrol aircraft (MPA). The U.K. has procured nine P-8A maritime patrol aircraft, the first of which landed in Scotland in February 2020.[215] A £132 million facility to house the P-8s is under construction at RAF Lossiemouth in Scotland, and P-8s will operate out of the facility by the end of 2020.[216] The U.K. has relied on allied MPAs to fill a capability gap that began in 2010. In 2018, retired Air Vice-Marshal Andrew Roberts testified before a parliamentary committee that, "capable though the P-8 may be, the number of aircraft planned is undoubtedly inadequate to fulfil even the highest priority tasks likely to be assigned to the force in tension and hostilities."[217]

The Royal Navy has lost 40 percent of its fleet since the end of the Cold War.[218] Of the 55 ships that the Royal Navy has lost since the early 1980s, half are frigates, and the U.K. was operating only 13 as of 2018.[219] The Royal Navy's surface fleet is based on the new Type-45 destroyer and the older Type-23 frigate. The latter will be replaced by eight Type-26 Global Combat Ships sometime in the 2020s.[220] The Type-26 Global Combat Ships are meant to handle a flexible range of tasks, but whether all of their weapons capabilities will be funded remains unclear.[221] The U.K. announced procurement of five T31e frigates to enter service in 2023, the year the first of the Type-23 frigates is slated to be phased out of service.[222]

HMS *Queen Elizabeth* is expected to become operational in 2021.[223] The U.K.'s *Queen Elizabeth*–class carriers will be the largest operated in Europe, and two of her class will be built. HMS *Price of Wales,* which will be the larger of the two carriers, was commissioned in December 2019 and will undergo fixed-wing sea trials with F-35s off the U.S. east coast in January 2021.[224] In July 2019, a leak in the *Queen Elizabeth* forced the carrier to return to port early from sea trials.[225] In January 2020, the carrier took part in sea trials with F-35s in

U.K. waters for the first time.[226] While each carrier is capable of supporting 36 F-35s, the U.K. plans to procure only 48 F-35s for the foreseeable future.[227]

The Royal Navy is also introducing seven *Astute*-class attack submarines as it phases out its older *Trafalgar*-class subs. Crucially, the U.K. also maintains a fleet of 13 Mine Counter Measure Vessels (MCMVs) that deliver world-leading capability. As a supplement, the U.K. began minehunting and survey operations using unmanned surface vessels (USVs) in March 2020.[228]

Perhaps the Royal Navy's most important contribution is its continuous-at-sea, submarine-based nuclear deterrent based on the *Vanguard*-class ballistic missile submarine and the Trident missile. In July 2016, the House of Commons voted to renew Trident and approved the manufacture of four replacement submarines to carry the missile. The replacement submarines are not expected to enter service until 2028 at the earliest.[229] The U.K. plans to procure four new *Dreadnought*-class ballistic missile submarines at a cost of £31 billion with a completion date of 2028 for the first, HMS *Valiant*.[230]

The U.K. remains a leader inside NATO, serving as the lead nation for NATO's EFP in Estonia and as a contributing nation for the U.S.-led EFP in Poland. The Royal Air Force has taken part in Baltic Air Policing five times since 2004, including most recently from May–September 2019.[231] Four RAF Typhoons were deployed to Romania for four months in May 2017 to support NATO's Southern Air Policing mission, and another four were deployed from May–September 2018.[232] From November–December 2019, four U.K. typhoons and 120 personnel took part in Icelandic Air Policing.[233]

The U.K. also increased its already sizeable force in Afghanistan to 1,100 troops in 2018 and continues to support this deployment as part of NATO's Resolute Support Mission in addition to contributing to NATO's Kosovo Force.[234] U.K. forces are an active part of the anti-ISIS coalition, contributing 1,400 servicemembers to Operation Shader, which includes 400 servicemembers involved in training Iraqi security forces, and with RAF drones and aircraft carrying out 8,400 missions.[235]

Italy. Italy hosts some of the most important U.S. bases in Europe, including the headquarters of the Sixth Fleet. It also has NATO's fifth-largest military[236] and one of its more capable despite continued lackluster defense investment. Italy cut its procurement budget by 15 percent in 2019 but increased its overall defense budget, which included an additional 19 percent for maintenance and operations.[237] Italy raised its defense spending in 2020 but still spent only 1.43 percent of GDP on defense; however, it spent 24.6 percent of its defense budget on equipment, meeting the second NATO spending benchmark.[238] Overall, "the procurement approval and delay in programme launch and the long-term 2019–2033 investment planning (with most of the budget concentrated from 2027–2028) is affecting defence programmes and international commitments."[239]

In June 2019, the government announced plans to invest $8.1 billion in defense modernization through 2032. Some of the modernization projects receiving additional funds include procurements for 64 Centauro II 8x8 tank destroyers, 156 VBM Freccia 8x8 infantry combat vehicles, the M-345 jet trainer and HH-101 Combat Search and Rescue helicopter programs, and the NH90 Tactical Transport helicopter.[240] Italy plans to purchase 60 F-35As for the air force and 30 F-35Bs, with the F-35Bs to be divided equally between the air force and navy.[241] The government will spend $942 million on F-35 deliveries in 2020.[242] A government-owned final assembly plant for the F-35 is located in Cameri, Italy.

Key naval procurements include plans for four U212A submarines, a special operations and diving operations/Submarine Rescue Ship platform, and a new anti-ship missile system.[243] Italy launched its tenth and final new FREMM frigate in January 2020.[244] Among other defense priorities are "protection of the defence infrastructure against cyber-attacks," the launch of new surveillance and

communications satellites, "the development and qualification programme for the ground-based air-defence MBDA Italia CAMM ER missile system," and "procurement of munition[s] for training and NATO reserve replenishment—for a long time neglected."[245]

Italy's focus is the Mediterranean region where it participates in a number of stabilization missions including NATO's Sea Guardian and the EU's Operation Sophia (EUNAVFOR MED), as well as the Italian Navy's own Operation Mare Sicuro (Safe Sea) off the Libyan Coast. Additionally, 400 Italian troops take part in the Bilateral Mission of Assistance and Support in Misrata and Tripoli.[246]

Despite a southern focus, Italy contributes to Standing NATO Maritime Group Two.[247] It also has 166 troops deployed in the EFP battalion in Latvia, 895 in Afghanistan as part of NATO's Resolute Support mission, and a contingent of approximately 1,100 troops in Kuwait and Iraq taking part in Operation Prima Parthica, Italy's "[n]ational contribution to the Global Coalition Against DAESH."[248] In 2020, Italian Eurofighter jets operating out of Kuwait replaced Germany in a reconnaissance mission in support of the coalition to defeat the Islamic State.[249]

Italy is a major contributor to KFOR with 542 troops, second only to the United States.[250] The Italian Air Force has taken part in Baltic Air Policing three times, most recently in the first half of 2018. From May–August 2019, Italy's air force took part in NATO's enhanced Air Policing in Romania, having previously participated in "a four-month enhanced Air Policing deployment to Bulgaria in 2017."[251] The Italian Air Force also has deployed to Iceland to perform air patrols five times since 2013, most recently in October 2019 when four F-35As were deployed.[252]

Poland. Situated in the center of Europe, Poland shares a border with four NATO allies, a long border with Belarus and Ukraine, and a 144-mile border with Russia's Kaliningrad Oblast, a Russian enclave between Poland and Lithuania on the Baltic Sea. Poland also has a 65-mile border with Lithuania, making it the only NATO member state that borders any of the Baltic States, and NATO's contingency plans for liberation of the Baltic States in the event of a Russian invasion reportedly rely heavily on Polish troops and ports.[253]

Poland has an active military force of 123,700, including a 61,200-strong army with 606 main battle tanks.[254] In November 2016, the parliament approved a new 53,000-strong territorial defense force (TDF) intended, in the words of Defense Minister Antoni Macierewicz, "to increase the strength of the armed forces and the defense capabilities of the country" and as "the best response to the dangers of a hybrid war like the one following Russia's aggression in Ukraine."[255] The TDF is mostly volunteer; "its personnel combine their civilian careers with limited military service of a minimum of two days twice a month and an annual two-week camp."[256] The TDF's planned 17 brigades will be distributed across the country.[257] The force, which currently numbers approximately 21,000, constitutes the fifth branch of the Polish military, subordinate to the Minister of Defense.[258]

Poland is also investing in cyber capabilities. "Plans for a 2,000-strong cyberdefence force were also unveiled in 2019," reports the IISS. "Centralised within the defence ministry, this force is due to be operational before 2025. A cyber component was also set up in the TDF in 2019."[259]

In 2020, Poland will spend 2.30 percent of GDP on defense and 25.7 percent of its defense budget on equipment, reaching both NATO benchmarks.[260] Increases in defense spending adopted in October 2017 should enable Poland to spending 2.5 percent of GDP on defense in 2030.[261] Poland is making major investments in military modernization and is planning to spend $133 billion on new capabilities by 2035 pursuant to the government's new Technical Modernization Plan for 2021–2035, which was signed in October 2019.[262]

In January 2020, Poland signed a $4.6 billion deal to purchase 32 F-35As, with deliveries to begin in 2024.[263] In March 2018, in the largest procurement contract in its history,

Poland signed a $4.75 billion deal for two Patriot missile batteries.[264] In February 2019, Poland signed a $414 million deal to purchase 20 high-mobility artillery rocket systems from the U.S. for delivery by 2023, and in April 2019, it signed a $430 million deal to buy four AW101 helicopters, which will provide anti-submarine warfare and search-and-rescue capabilities and are to be delivered by the end of 2022.[265] In February 2018, Poland joined an eight-nation "coalition of NATO countries seeking to jointly buy a fleet of maritime surveillance aircraft."[266] In March 2020, the State Department approved "the potential $100 million sale to Poland of 180 Javelin anti-tank guided missiles and associated equipment."[267]

Although Poland's focus is territorial defense, it has 350 troops deployed in Afghanistan as part of NATO's Resolute Support Mission and took part in Operation Inherent Resolve to defeat ISIS.[268] Poland's air force has taken part in Baltic Air Policing nine times since 2006, most recently operating four F-16s at Ämari Air Base in Estonia from January–April 2020.[269] In 2020, Poland took the lead for NATO's VJTF, taking over from Germany. Of the force's 6,000 troops, half are Polish units.[270] Poland also is part of NATO's EFP in Latvia and has 249 troops in NATO's KFOR mission.[271] In January, the government announced that "there were no plans to withdraw" the 268 soldiers in Iraq assisting in NATO Mission Iraq and the U.S.-led coalition against ISIS and that "NATO commanders in Iraq have stressed the need for Poland to prepare for...reactivation" of both operations.[272]

Turkey. Turkey remains an important U.S. ally and NATO member, but the increasingly autocratic presidency of Recep Tayyip Erdogan and a thaw in relations between Turkey and Russia have introduced troubling challenges. Turkey has been an important U.S. ally since the closing days of World War II. During the Korean War, it deployed 15,000 troops to Korea and suffered 721 killed in action and more than 2,000 wounded. Turkey joined NATO in 1952, one of only two NATO members (the other was Norway) that had a land border with the Soviet Union. Today, it continues to play an active role in the alliance, but not without difficulties.

Following an attempted coup in July 2016, thousands of academics, teachers, journalists, judges, prosecutors, bureaucrats, and soldiers were fired or arrested. As of February 2020, 80,000 people had been jailed, with an estimated 3,000 in solitary confinement, and nearly 150,000 civil servants and military members had been fired or suspended; the mass detentions led the government to announce in May 2019 that it was planning to build 100 new prisons.[273] As a response to the COVID-19 pandemic, Turkey has utilized early and temporary releases to lower the prison population by a third, but many political prisoners arrested after the failed coup were excluded from the releases.[274]

The post-coup crackdown has had an especially negative effect on the military; 17,500 officers have been dismissed since 2016, and "[t]he effect on officer morale of these continuing purges was exacerbated by the widespread suspicion that promotions and appointments were increasingly politicised, with outspoken supporters of Erdogan fast-tracked for promotion"[275]

Turkey's military is now suffering from a loss of experienced generals and admirals as well as an acute shortage of pilots. The dismissal of more than 300 F-16 pilots, for instance, which greatly exacerbated existing pilot shortages, led in 2017 to "a decree that threaten[ed] 330 former pilots with the revocation of their civil pilot license, unless they return[ed] to Air Force duty for four years."[276] Almost a third of the dismissed pilots "were commanders and veterans who were in charge of bases, fleets and squadrons."[277] A request to the U.S. that it send trainers was denied, as was a Turkish plan to utilize Pakistani trainers to fly the F-16.[278] In addition:

> The shortage of pilots was not the only problem. Many of the veteran staff members, especially at the operations and logistics centers that help pilots fly successful missions, were also removed, hampering the close coordination

between the air and land elements of the air force. Hundreds of engineers on the ground were also removed.[279]

Erdogan's rapprochement with Russian President Vladimir Putin has brought U.S.–Turkish relations to an all-time low. In December 2017, Turkey signed a $2.5 billion agreement with Russia to purchase S-400 air defense systems, and delivery began in July 2019.[280] According to the IISS, "[t]he decision to purchase two S-400 air-defence systems from Russia was made by the president without detailed consultation with the armed forces about the possible technical and strategic repercussions."[281] The U.S. suspended Turkey from the F-35 program in July 2019, stating that "[t]he F-35 cannot coexist with a Russian intelligence collection platform that will be used to learn about its advanced capabilities."[282] Turkish plans to activate the S-400s in April 2020 were delayed by "several months" because of what one senior Turkish official reportedly characterized as "technical issues."[283]

Eight Turkish defense firms make more than 800 components for the F-35, and suspension from the program could cost Turkey's defense industry as much as $10 billion.[284] The U.S. stopped delivery of key parts and program materials to Turkish firms in early April 2019 and reportedly has offered to allow Turkey to purchase a Patriot missile battery if it cancels the S-400 sale, but "Turkey has said it will only agree to an offer if it includes technology transfer and joint production terms."[285]

Partly as a result of its manned aircraft issues, Turkey is investing heavily in armed drones. It currently has approximately 130 of these drones, and they have played a significant role in Turkish operations in Syria.[286]

In October 2019, Turkey launched a major offensive in Syria against the Kurdish-led Syrian Democratic Forces (SDF), in part to create a buffer zone near the Turkish border. The largest Kurdish armed faction within the SDF, the People's Protection Units (YPG), is an offshoot of the Kurdistan Workers' Party (PKK), a U.S.-designated terrorist group that has waged war against Turkey off and on since 1984. The offensive led to the creation of a buffer zone jointly patrolled by Turkish and Russian forces following an agreement between Turkish President Erdogan and Russian President Putin in Sochi.

In February 2020, Russian-backed Syrian regime forces launched an attack on Idlib, the last remaining stronghold of forces opposed to Syrian President Bashar al-Assad. Turkish forces opposed the offensive and lost 36 soldiers before Turkey and Russia agreed to a cease-fire.[287] Turkey requested additional NATO support including "greater air support on the Turkish–Syrian border, more reconnaissance aircraft, surveillance drones, and more ships in the eastern Mediterranean."[288] Following the Idlib offensive, Erdogan announced that Turkey would "no longer [be] able to hold refugees" and instead facilitated their movement to Turkey's borders with EU states, reneging on "a 2016 agreement with the EU to halt the flow of migrants in to Europe."[289] Turkey's decision placed new strain on Turkish–Greek relations, with Greek officials voicing concern "that refugees infected with the coronavirus may be among the new wave of asylum seekers."[290]

Turkey and Greece remain at odds over Cyprus. Turkey is reportedly scouting a location for a naval base in the Turkish Republic of Northern Cyprus and began flying unmanned aerial vehicles (UAVs), some of them armed, out of Geçitkale Airport in December 2019.[291] Turkey remains locked in a dispute with Greece over drilling rights off the Cypriot coast. The EU rejects Turkish claims, and France has sent warships to the region in support of Cyprus.[292]

U.S. security interests in the region lend considerable importance to America's relationship with Turkey. Turkey is home to Incirlik Air Base, a major U.S. and NATO air base, but it was reported early in 2018 that U.S. combat operations at Incirlik had been significantly reduced and that the U.S. was considering permanent reductions. In January 2018, the U.S. relocated an A-10 squadron from Incirlik

to Afghanistan to avoid operational disruptions. Restrictions on the use of Incirlik for operations in Syria have proven problematic: "[The] American operation to kill Islamic State leader Abu Bakr al-Baghdadi in Syria saw U.S. forces use a base in Iraq instead of the much closer Incirlik, requiring a round trip of many hours."[293] In July 2019, Turkish Foreign Minister Mevlut Cavusoglu threatened that if the U.S. sanctioned Turkey over its purchase of S-400s, "U.S. use of two strategically vital bases [Incirlik and Kürecik] could be at risk."[294] Germany's decision to leave the base in 2017 also has affected American views of Incirlik's value.[295]

U.S. officials, however, have largely downplayed tensions with Turkey. An official at EUCOM, for example, has stated that "Incirlik still serves as [a] forward location that enables operational capabilities and provides the U.S. and NATO the strategic and operational breadth needed to conduct operations and assure our allies and partners."[296] Incirlik's strategic value was on display again in May 2018 when an F-18 pilot taking part in air strikes against ISIS made an emergency landing there after suffering from hypoxia.[297]

One cause for optimism has been NATO's decision to deploy air defense batteries to Turkey and increased AWACS flights in the region after the Turkish government requested them in late 2015.[298] In December 2019, Spain announced a six-month extension of its air defense batteries deployed to Turkey (Italy, on the other hand, had previously announced that its air defense deployment to Turkey would be ended by December 31).[299] Additionally, NATO AWACS aircraft involved in counter-ISIS operations have flown from Turkey's Konya Air Base.[300] Turkey also hosts a crucial radar at Kürecik, which is part of NATO's BMD system, and the U.S. is reportedly building a second undisclosed site (site K) near Malatya, which is home to an AN/TPY-2 radar with a range of up to 1,800 miles.[301]

Turkey continues to maintain more than 600 troops in Afghanistan as part of NATO's Resolute Support Mission, making it the seventh-largest troop contributor out of 39 nations.[302] The Turks also have contributed to a number of peacekeeping missions in the Balkans, still maintain 371 troops in Kosovo, and have participated in counterpiracy and counterterrorism missions off the Horn of Africa in addition to deploying planes, frigates, and submarines during the NATO-led operation in Libya. Turkey has a 355,200-strong active-duty military,[303] which is NATO's second largest after that of the United States. However, in June 2019:

President Recep Tayyip Erdogan ratified a new law that reduced the length of compulsory military service from 12 to six months. On payment of a fee, compulsory service can be reduced further to one month of basic training. The changes were expected to reduce the overall size of the armed forces by around 35%, as part of Turkey's long-term plan to create compact and fully professional armed forces.[304]

Turkish defense procurement has become more convoluted and more directly tied to President Erdogan. A December 2017 decree placed the Undersecretariat for Defense Industries (SSB), which is responsible for procurement, under Erdogan's direct control.[305] Since then, Turkey's defense procurement has suffered from a "brain drain." In January 2019, it was reported that 272 defense officials and engineers had left for jobs overseas since the change. Of the 81 who responded to an SSB survey, "41 percent are in the 26–30 age group. 'This highlights a trend among the relatively young professionals to seek new opportunities abroad,' one SSB official noted."[306]

Other challenges include continued reliance on foreign components despite a focus on indigenous procurement. For example, Turkey's procurement of 250 new Altay main battle tanks, the first of which had been scheduled for delivery in May 2020, has been delayed indefinitely. The tank relies on a German-made engine and transmission, but because the technology transfer has not been approved, Turkey

is looking to produce domestic alternatives.[307] Similarly, Turkey's procurement of 50 T-129 attack helicopters will likely be delayed for more than four years because of the need to produce a domestic engine to replace one produced by American and British firms.[308] Additionally, the French government has blocked development of anti-ballistic missiles with Turkey because of Turkey's actions in Syria.[309]

Other major procurements include 350 T-155 Fırtına 155mm self-propelled howitzers and six Type-214 submarines. The first of the submarines was launched in December 2019, and the program, which was delayed for six years by "technical and financial issues," is expected to deliver one submarine a year, "with all six submarines from the project set to be completed by 2027."[310]

In February 2019, Turkey announced upgrades of four *Preveze*-class submarines, to take place from 2023–2027.[311] The same month, Turkey launched an intelligence-gathering ship, the TCG *Ufuk*, described by President Erdogan as the "eyes and ears of Turkey in the seas."[312] In December 2019, the SSB released its "Strategic Plan 2019–2023," which specifies that by 2023, 75 percent of Turkish military needs will be supplied domestically and defense exports will be increased to $10.2 billion (up from $2 billion in 2018), although there are doubts about the feasibility of the latter goal.[313]

The Baltic States. The U.S. has a long history of championing the sovereignty and territorial integrity of the Baltic States that dates back to the interwar period of the 1920s. Since regaining their independence from Russia in the early 1990s, Estonia, Latvia, and Lithuania have been staunch supporters of the transatlantic relationship. Although small in absolute terms, the three countries contribute significantly to NATO in relative terms.

Estonia. Estonia has been a leader in the Baltics in terms of defense, spending 2.38 percent of GDP on defense and 17.3 percent of its defense budget on equipment in 2020.[314] Estonia's development plan for 2021–2024, released in February 2020, details planned investments of $216 million over four years

in early warning and intelligence and a plan for Estonian defense forces to have modern anti-tank weapons, along with command and communications systems, by 2024.[315]

Although Estonia's armed forces total only 6,700 active-duty service personnel (including the army, navy, and air force),[316] they are held in high regard by their NATO partners and punch well above their weight inside the alliance. Between 2003 and 2011, 455 served in Iraq. Perhaps Estonia's most impressive deployment has been to Afghanistan: More than 2,000 troops were deployed between 2003 and 2014 and sustained the second-highest number of deaths per capita among all 28 NATO members.

In 2015, Estonia reintroduced conscription for men ages 18–27, who must serve eight or 11 months before being added to the reserve rolls.[317] The number of conscripts will increase from 3,200 to 4,000 by 2026.[318]

Estonia has demonstrated that it takes defense and security policy seriously, focusing on improving defensive capabilities at home while maintaining the ability to be a strategic actor abroad. In October 2019, it was reported that Estonia was acquiring six South Korean–built howitzers at a cost of €20 million "after purchasing an initial 12 last year" at a cost of €46 million and that the U.S. "has recently helped Estonia acquire large-caliber ammunition, marine surveillance equipment, intelligence equipment, and communications equipment which the Estonian government has planned to buy themselves."[319] In February 2020, the U.S. delivered 128 Javelin anti-tank weapons to Estonia.[320]

Additionally, in 2014, Estonia contracted with the Netherlands to purchase 44 used infantry fighting vehicles, the last of which was delivered in 2019.[321] In June 2018, it signed a $59 million deal to purchase short-range air defenses, with Mistral surface-to-air missiles to be delivered starting in 2020.[322] In 2019, it received two C-145A tactical transport aircraft donated by the U.S.[323] In May 2019, the first of three *Sandown*-class minehunters underwent sea trials following upgrades.[324] In July 2019, Estonia signed a $24 million deal to purchase

16,000 rifles from an American arms company, allowing it to phase out older Soviet and Israeli weapons.[325] And in April 2020, it signed a technical agreement with Finland and Latvia for joint armored vehicle development.[326]

According to Estonia's National Defence Development Plan for 2017–2026, "the size of the rapid reaction structure will increase from the current 21,000 to over 24,400."[327] Estonia's cyber command became operational in August 2018 and is expected to include 300 people when it reaches full operational capability in 2023.[328]

In 2017, Estonia and the U.S. strengthened their bilateral relationship by signing a defense cooperation agreement that builds on the NATO–Estonia Status of Forces Agreement, further clarifying the legal framework for U.S. troops in Estonia.[329] Cooperation continues to grow. In 2019, Estonian and American troops engaged in over 150 military-to-military engagements.[330]

Estonian forces contribute to a number of operations including 42 soldiers taking part in Resolute Support, "up to 210 service members being sent to NATO's Response Force (NRF), with an armored infantry company (within the Baltic Battalion), special operations forces, staff officers and a mine counter-measures vessel crew, and up to 24 service members towards the UK-led Joint Expeditionary Force."[331] In November 2019, Estonia announced that the number of troops taking part in the French-led Operation Barkhane in Mali would be increased to 95 and that "Estonian special operations forces are set to join the new France-led Task Force Takuba in the Sahel in the second half of 2020."[332] Estonian troops also take part in the U.S.-led Operation Inherent Resolve in Iraq along with NATO Mission Iraq,[333] although Estonian operations in NMI were temporarily suspended in early 2020 because of COVID-19.

Latvia. Latvia's recent military experience also has been centered on operations in Iraq and Afghanistan alongside NATO and U.S. forces. Latvia has deployed more than 3,000 troops to Afghanistan and between 2003 and 2008 deployed 1,165 troops to Iraq. In addition, despite a military that consists of only 6,900 full-time servicemembers,[334] Latvia contributes to NATO's Resolute Support Mission in Afghanistan (40 troops); Operation Inherent Resolve in Iraq (six soldiers, temporarily transferred to Kuwait in January 2020); and NATO's VJTF,[335] as well as a number of EU flagged missions.

Latvia's 2016 National Defence Concept clearly defines Russia as a threat to national security and states that "[d]eterrence is enhanced by the presence of the allied forces in Latvia."[336] To that end, Latvia is making a significant investment in military infrastructure: $56 million annually through 2022, with two-thirds of this amount being used to upgrade Ādaži military base, headquarters of the Canadian-led EFP battlegroup.[337]

In 2020, Latvia will spend 2.32 percent of GDP on defense and 26.0 percent of its defense budget on equipment.[338] In November 2018, it signed a deal for four UH-60M Black Hawk helicopters.[339] In 2018, Latvia also received the last of 47 M109 series 155mm self-propelled artillery systems purchased from Austria and signed a $133 million agreement to purchase Spike precision-guided tactical missiles, the first of which were delivered in February 2020.[340] Latvia has also expressed interest in procuring a medium-range ground-based air-defense system (GBADS).

Lithuania. Lithuania is the largest of the three Baltic States, and its armed forces total 20,650 active-duty troops.[341] It reintroduced conscription in 2015.[342] Lithuania has also shown steadfast commitment to international peacekeeping and military operations. Between 2003 and 2011, it sent 930 troops to Iraq. Since 2002, around 3,000 Lithuanian troops have served in Afghanistan—a notable contribution that is divided between a special operations mission alongside U.S. and Latvian Special Forces and command of a Provisional Reconstruction Team (PRT) in Ghor Province, making Lithuania one of a handful of NATO members to have commanded a PRT. Lithuania also continued to contribute to NATO's KFOR and Resolute Support Missions in 2019 and NATO's VJTF in 2020.[343]

In 2020, Lithuania spent 2.28 percent of GDP on defense and 26.2 percent of its defense budget on equipment.[344] In April 2019, the U.S. and Lithuania signed a five-year "road map" defense agreement.[345] According to the Pentagon, the agreement will help "to strengthen training, exercises, and exchanges" and help Lithuania "to defend against malicious cyber intrusions and attacks." The two nations also pledged "to support regional integration and procurement of warfighting systems," including "integrated air and missile defense systems and capabilities to enhance maritime domain awareness."[346]

In October 2019, Lithuania announced plans to spend €300 million on six Black Hawk helicopters from the U.S., the first of which "would be delivered to Lithuania by the end of 2024."[347] Procurement of Norwegian-made ground-based mid-range air defense systems armed with U.S.-made missiles, along with "training and integration of all components," should be completed by 2021.[348] Additional procurements include 88 Boxer Infantry Fighting Vehicles, €145 million for 200 U.S.-made Oshkosh Joint Light Tactical Vehicles, additional missiles for the Javelin anti-tank system, and 21 PzH 2000 self-propelled howitzers.[349]

Current U.S. Military Presence in Europe

In 1953, because of the Soviet threat to Western Europe at the height of the Cold War, the U.S. had approximately 450,000 troops in Europe operating across 1,200 sites. During the early 1990s, both in response to a perceived reduction in the threat from Russia and as part of the so-called peace dividend following the end of the Cold War, U.S. troop numbers in Europe were slashed. Today, around 72,000 troops are stationed in Europe.[350]

EUCOM's stated mission is to conduct military operations, international military partnering, and interagency partnering to enhance transatlantic security and defend the United States as part of a forward defensive posture. EUCOM is supported by four service component commands (U.S. Naval Forces Europe [NAVEUR]; U.S. Army Europe [USAREUR];

U.S. Air Forces in Europe–Air Forces Africa [USAFE–AFAFRICA]; and U.S. Marine Forces Europe [MARFOREUR]) and one subordinate unified command (U.S. Special Operations Command Europe [SOCEUR]).

U.S. Naval Forces Europe. NAVEUR is responsible for providing overall command, operational control, and coordination for maritime assets in the EUCOM and Africa Command (AFRICOM) areas of responsibility. This includes more than 20 million square nautical miles of ocean and more than 67 percent of the Earth's coastline.

This command is currently provided by the U.S. Sixth Fleet, based in Naples, and brings critical U.S. maritime combat capability to an important region of the world. Some of the more notable U.S. naval bases in Europe include the Naval Air Station in Sigonella, Italy; the Naval Support Activity Base in Souda Bay, Greece; and the Naval Station at Rota, Spain.

In 2018, the Norfolk, Virginia-based Harry S. Truman Carrier Strike Group (CSG) executed no-notice deployments to the Mediterranean over the summer and the Norwegian Sea above the Arctic Circle in October; the Arctic deployment was the first for a CSG in 30 years.[351] In February 2020, General Wolters stated the importance of CSG deployments: "We see predictable Carrier Strike Group and Amphibious presence as key elements of an agile theater posture. The reactivation of U.S. Second Fleet provides necessary maritime command and control capability in the Atlantic, while reinforcing NATO's western flank."[352]

U.S. Army Europe. USAREUR was established in 1952. Then, as today, the U.S. Army formed the bulk of U.S. forces in Europe. USAREUR, overseeing 38,000 soldiers, is headquartered in Wiesbaden, Germany.[353] Permanently deployed forces include the 2nd Cavalry Regiment, based in Vilseck, Germany,[354] and the 173rd Airborne Brigade in Italy, with both units supported by the 12th Combat Aviation Brigade out of Ansbach, Germany. In November 2018, the 41st Field Artillery Brigade returned to Europe with headquarters in Grafenwoehr, Germany.[355] In addition:

Operational and theater enablers such as the 21st Theater Sustainment Command, 7th Army Training Command, 10th Army Air and Missile Defense Command, 2nd Theater Signal Brigade, 66th Military Intelligence Brigade, the U.S. Army NATO Brigade, Installation Management Command–Europe and Regional Health Command–Europe provide essential skills and services that enable our entire force.[356]

The 1st Battalion, 6th Field Artillery, 41st Field Artillery Brigade was reactivated in September 2019 and is currently the only U.S. rocket artillery brigade in Europe and represents the first time in 13 years in which USAREUR has had the Multiple Launch Rocket System in its command; a second field artillery battalion will be reactivated in the fall of 2020.[357] The 5th Battalion, 4th Air Defense Artillery Regiment, was activated in November 2018 and is now based in Ansbach.[358]

USAREUR also engages in major exercises with allies. In 2019, it participated in over 50 multinational exercises with 68,000 multinational participants in 45 countries.[359]

U.S. Air Forces in Europe–Air Forces Africa. USAFE–AFAFRICA provides a forward-based air capability that can support a wide range of contingency operations. It originated as the 8th Air Force in 1942 and flew strategic bombing missions over the European continent during World War II. Today, "USAFE directs air operations in a theater spanning three continents, covering more than 19 million square miles, containing 104 independent states, and possessing more than a quarter of the world's population and more than a quarter of the world's Gross Domestic Product."[360]

Headquartered at Ramstein Air Base, "USAFE–AFAFRICA consists of one Numbered Air Force, seven main operating bases and 114 geographically separated locations."[361] The main operating bases include the RAF bases at Lakenheath and Mildenhall in the U.K., Ramstein and Spangdahlem Air Bases in Germany, Lajes Field in the Azores, Incirlik Air Base in Turkey, and Aviano Air Base in Italy.[362] Terrorist attacks against these installations remain a threat. In March and April 2020, five Tajik Nationals who came to Germany seeking refugee status were arrested for plotting terrorist attacks against U.S. Air Force bases and personnel on behalf of ISIS.[363]

In March 2020, B-2 bombers and KC-10 refueling aircraft were deployed to Laje Field in Portugal's Azores "to conduct theater integration and flying training."[364] EUCOM stated that "[s]trategic bomber deployments to Europe provide theater familiarization for aircrew members and demonstrate U.S. commitment to allies and partners."[365]

U.S. Marine Forces Europe. MARFOREUR was established in 1980. It was originally a "designate" component command, meaning that it was only a shell during peacetime but could bolster its forces during wartime. Its initial staff was 40 personnel based in London. By 1989, it had more than 180 Marines in 45 separate locations in 19 countries throughout the European theater. Today, the command is based in Boeblingen, Germany, and approximately 140 of the 1,500 Marines based in Europe are assigned to MARFOREUR.[366] It was also dual-hatted as Marine Corps Forces, Africa (MARFORAF), under U.S. Africa Command in 2008.

MARFOREUR supports the Norway Air Landed Marine Air Ground Task Force, the Marine Corps' only land-based prepositioned stock. The Corps has enough prepositioned stock in Norway "to equip a fighting force of 4,600 Marines, led by a colonel, with everything but aircraft and desktop computers," and the Norwegian government covers half of the costs of the prepositioned storage. The stores have been utilized for Operation Iraqi Freedom and current counter-ISIS operations, as well as for humanitarian and disaster response.[367] The prepositioned stock's proximity to the Arctic region makes it of particular geostrategic importance. In October 2018, Marines utilized the prepositioned equipment as part of Trident Juncture 18, the largest NATO exercise in 16 years, which included 50,000 troops from

31 nations.[368] The prepositioned stocks were also to factor heavily into the cancelled Cold Response 2020 exercise.[369]

Crucially, MARFOREUR provides the U.S. with rapid reaction capability to protect U.S. embassies in North Africa. The Special-Purpose Marine Air-Ground Task Force–Crisis Response–Africa (SPMAGTF–CR–AF) is currently located in Spain and Italy and provides a response force of 850 Marines, six MV-22 Ospreys, and three KC-130s.[370] The SPMAGTF helped with embassy evacuations in Libya and South Sudan and conducts regular drills with embassies in the region and exercises with several African nations' militaries.[371]

U.S. Special Operations Command Europe. SOCEUR is the only subordinate unified command under EUCOM. Its origins are in the Support Operations Command Europe, and it was based initially in Paris. This headquarters provided peacetime planning and operational control of special operations forces during unconventional warfare in EUCOM's area of responsibility.

SOCEUR has been headquartered in Panzer Kaserne near Stuttgart, Germany,[372] since 1967. It also operates out of RAF Mildenhall. In June 2018, U.S. Special Operations Command General Tony Thomas stated that the U.S. plans "to move tactical United States special operations forces from the increasingly crowded and encroached Stuttgart installation of Panzer Kaserne to the more open training grounds of Baumholder," a move that is expected to take a few years.[373]

Due to the sensitive nature of special operations, publicly available information is scarce. However, it has been documented that SOCEUR elements participated in various capacity-building missions and civilian evacuation operations in Africa; took an active role in the Balkans in the mid-1990s and in combat operations in the Iraq and Afghanistan wars; and most recently supported AFRICOM's Operation Odyssey Dawn in Libya. SOCEUR also plays an important role in joint training with European allies; since June 2014, it has maintained an almost continuous presence in the Baltic States and Poland in order to train special operations forces (SOF) in those countries.

According to General Tod Wolters, SOF are essential to counter Russia's "*below-the-threshold* strategy." U.S. SOF in Europe "are another vital element of this approach working with European Allies and partners to enhance defense institutions, border security, and resilience to Russian malign attacks."[374] The FY 2021 DOD EDI budget request included over $40 million in declared special operations funding for various programs including intelligence enhancements, staging and prepositioning, and exercises with allies.[375]

Key Infrastructure and Warfighting Capabilities

One of the major advantages of having U.S. forces stationed in Europe is access to logistical infrastructure. For example, EUCOM supports the U.S. Transportation Command (TRANSCOM) with its array of air bases and access to ports throughout Europe. One of these bases, Mihail Kogalniceanu Air Base in Romania, is a major logistics and supply hub for U.S. equipment and personnel traveling to the Middle East region.[376]

Europe is a mature and advanced operating environment. America's decades-long presence in Europe means that the U.S. has tried and tested systems that involve moving large numbers of matériel and personnel into, inside, and out of the continent. This offers an operating environment that is second to none in terms of logistical capability. There are more than 166,000 miles of rail line in Europe (not including Russia), an estimated 90 percent of the roads are paved, and the U.S. enjoys access to a wide array of airfields and ports across the continent.

Conclusion

Overall, the European region remains a stable, mature, and friendly operating environment. Russia remains the preeminent military threat to the region, both conventionally and unconventionally. However, the threat posed by Chinese propaganda, influence operations,

and investments in key sectors is also significant and needs to be addressed. Both NATO and many European countries apart from those in the alliance have reason to be increasingly concerned about the behavior and ambitions of both countries, although agreement on a collective response to these challenges remains elusive.

America's closest and oldest allies are located in Europe, and the region is incredibly important to the U.S. for economic, military, and political reasons. Perhaps most important, the U.S. has treaty obligations through NATO to defend the European members of that alliance. If the U.S. needs to act in the European region or nearby, there is a history of interoperability with allies and access to key logistical infrastructure that makes the operating environment in Europe more favorable than the environment in other regions in which U.S. forces might have to operate.

The past year saw continued U.S. reengagement with the continent, both militarily and politically, along with modest increases in European allies' defense budgets and capability investment. Despite allies' initial concerns, the U.S. has increased its investment in Europe, and its military position on the continent is stronger than it has been for some time.

COVID-19 caught the U.S. and Europe off guard, led to disrupted or cancelled exercises, and caused the armed forces of Europe to take on new and unexpected roles in assisting with the response to the pandemic. The economic, political, and societal impacts of the pandemic are only beginning to be felt and will undoubtedly have to be reckoned with for years to come, in particular with respect to Europe's relationship with China. NATO utilized a host of resources in responding to the pandemic while continuing to ensure that the pandemic did not undermine the alliance's collective defense.

NATO's renewed focus on collective defense has resulted in a focus on logistics, newly established commands that reflect a changed geopolitical reality, and a robust set of exercises. NATO's biggest challenges derive from capability and readiness gaps for many European nations, continuing improvements and exercises in the realm of logistics, a tempestuous Turkey, disparate threat perceptions within the alliance, and the need to establish the ability to mount a robust response to both linear and nonlinear forms of aggression.

Scoring the European Operating Environment

As noted at the beginning of this section, various considerations must be taken into account in assessing the regions within which the U.S. may have to conduct military operations to defend its vital national interests. Our assessment of the operating environment utilized a five-point scale that ranges from "very poor" to "excellent" conditions and covers four regional characteristics of greatest relevance to the conduct of military operations:

1. **Very Poor.** Significant hurdles exist for military operations. Physical infrastructure is insufficient or nonexistent, and the region is politically unstable. The U.S. military is poorly placed or absent, and alliances are nonexistent or diffuse.

2. **Unfavorable.** A challenging operating environment for military operations is marked by inadequate infrastructure, weak alliances, and recurring political instability. The U.S. military is inadequately placed in the region.

3. **Moderate.** A neutral to moderately favorable operating environment is characterized by adequate infrastructure, a moderate alliance structure, and acceptable levels of regional political stability. The U.S. military is adequately placed.

4. **Favorable.** A favorable operating environment includes good infrastructure, strong alliances, and a stable political

environment. The U.S. military is well placed for future operations.

5. **Excellent.** An extremely favorable operating environment includes well-established and well-maintained infrastructure; strong, capable allies; and a stable political environment. The U.S. military is exceptionally well placed to defend U.S. interests.

The key regional characteristics consist of:

a. **Alliances.** Alliances are important for interoperability and collective defense, as allies are more likely to lend support to U.S. military operations. Various indicators that provide insight into the strength or health of an alliance include whether the U.S. trains regularly with countries in the region, has good interoperability with the forces of an ally, and shares intelligence with nations in the region.

b. **Political Stability.** Political stability brings predictability for military planners when considering such things as transit, basing, and overflight rights for U.S. military operations. The overall degree of political stability indicates whether U.S. military actions would be hindered or enabled and considers, for example, whether transfers of power are generally peaceful and whether there have been any recent instances of political instability in the region.

c. **U.S. Military Positioning.** Having military forces based or equipment and supplies staged in a region greatly facilitates the United States' ability to respond to crises and, presumably, achieve successes in critical "first battles" more quickly. Being routinely present in a region also assists in maintaining familiarity with its characteristics and the various actors that might try to assist or thwart U.S. actions. With this in mind, we assessed whether or not the U.S. military was well positioned in the region. Again, indicators included bases, troop presence, prepositioned equipment, and recent examples of military operations (including training and humanitarian) launched from the region.

d. **Infrastructure.** Modern, reliable, and suitable infrastructure is essential to military operations. Airfields, ports, rail lines, canals, and paved roads enable the U.S. to stage, launch operations from, and logistically sustain combat operations. We combined expert knowledge of regions with publicly available information on critical infrastructure to arrive at our overall assessment of this metric.

For Europe, scores this year remained steady with no substantial changes in any individual categories or average scores:

- Alliances: **4—Favorable**

- Political Stability: **4—Favorable**

- U.S. Military Positioning: **4—Favorable**

- Infrastructure: **4—Favorable**

Leading to a regional score of: **Favorable**

Operating Environment: Europe

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Alliances				✔	
Political Stability				✔	
U.S. Military Posture				✔	
Infrastructure				✔	
OVERALL				✔	

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Middle East

Luke Coffey and Nicole Robinson

Strategically situated at the intersection of Europe, Asia, and Africa, the Middle East has long been an important focus of United States foreign policy. U.S. security relationships in the region are built on pragmatism, shared security concerns, and economic interests, including large sales of U.S. arms to countries in the region to help them defend themselves. The U.S. also has a long-term interest in the Middle East that derives from the region's economic importance as the world's primary source of oil and gas.

The region is home to a wide array of cultures, religions, and ethnic groups, including Arabs, Jews, Kurds, Persians, and Turks, among others. It also is home to the three Abrahamic religions of Judaism, Christianity, and Islam as well as many smaller religions like the Bahá'í, Druze, Yazidi, and Zoroastrian faiths. The region contains many predominantly Muslim countries as well as the world's only Jewish state.

The Middle East is deeply sectarian, and these long-standing divisions, exacerbated by the constant vying for power by religious extremists, are central to many of the challenges that the region faces today. In some cases, these sectarian divides go back centuries. Contemporary conflicts, however, have less to do with these histories than they do with modern extremist ideologies and the fact that today's borders often do not reflect cultural, ethnic, or religious realities. Instead, they are often the results of decisions taken by the British, French, and other powers during and soon after World War I as they dismantled the Ottoman Empire.[1]

In a way not understood by many in the West, religion remains a prominent fact of daily life in the modern Middle East. At the heart of many of the region's conflicts is the friction within Islam between Sunnis and Shias. This friction dates back to the death of the Prophet Muhammad in 632 AD.[2] Sunni Muslims, who form the majority of the world's Muslim population, hold power in most of the Arab countries in the Middle East.

Viewing the Middle East's current instability through the lens of a Sunni–Shia conflict, however, does not show the full picture. The cultural and historical division between Arabs and Persians has reinforced the Sunni–Shia split. The mutual distrust between many Sunni Arab powers and Iran, the Persian Shia power, compounded by clashing national and ideological interests, has fueled instability in such countries as Iraq, Lebanon, Syria, and Yemen. The COVID-19 coronavirus exposed Sunni–Shia tensions when Sunni countries in the region blamed "Shia backwardness," likely referencing the licking of religious shrines, as the reason for the rapid spread of the virus in Iran.[3] Sunni extremist organizations such as al-Qaeda and the Islamic State (IS) have exploited sectarian and ethnic tensions to gain support by posing as champions of Sunni Arabs against Syria's Alawite-dominated regime and other non-Sunni governments and movements.

Regional demographic trends also are destabilizing factors. The Middle East contains one

of the world's youngest and fastest-growing populations. In most of the West, this would be viewed as an advantage, but not in the Middle East. Known as "youth bulges," these demographic tsunamis have overwhelmed many countries' inadequate political, economic, and educational infrastructures, and the lack of access to education, jobs, and meaningful political participation fuels discontent. Because almost two-thirds of the region's inhabitants are less than 30 years old, this demographic bulge will continue to have a substantial effect on political stability across the region.[4]

The Middle East contains more than half of the world's oil reserves and is the world's chief oil-exporting region.[5] As the world's largest producer and consumer of oil,[6] the U.S., even though it actually imports relatively little of its oil from the Middle East, has a vested interest in maintaining the free flow of oil and gas from the region. Oil is a fungible commodity, and the U.S. economy remains vulnerable to sudden spikes in world oil prices. During the COVID-19 crisis, oil prices plunged to below zero in April 2020 after stay-at-home orders caused a severe imbalance between supply and demand. This unprecedented drop in demand sparked an oil price war between Saudi Arabia and Russia. U.S. oil producers were forced to cut back production, and "[i]f prices don't regain stability, analysts' biggest fear is that the U.S. energy sector won't be able to bounce back."[7] In the Middle East, the plummet in oil prices will cause significant shocks. Exporters that are heavily dependent on oil revenues will experience a decline in gross domestic product (GDP), and importers will suffer from reduced foreign investment, remittances, tourism, and grants from exporters.[8]

Because many U.S. allies depend on Middle East oil and gas, there is also a second-order effect for the U.S. if supply from the Middle East is reduced or compromised. For example, Japan is both the world's third-largest economy and second-largest importer of liquefied natural gas (LNG).[9] The U.S. itself might not be dependent on Middle East oil or LNG, but the economic consequences arising from a major disruption of supplies would ripple across the globe.

Financial and logistics hubs are also growing along some of the world's busiest transcontinental trade routes. One of the region's economic bright spots in terms of trade and commerce is in the Persian Gulf. The emirates of Dubai and Abu Dhabi in the United Arab Emirates (UAE), along with Qatar, are competing to become the region's top financial center.

The economic situation in the Middle East is part of what drives the political environment. The lack of economic freedom was an important factor leading to the Arab Spring uprisings, which began in early 2011 and disrupted economic activity, depressed foreign and domestic investment, and slowed economic growth.

The COVID-19 pandemic will have massive repercussions for the entire region, affecting economies and possibly shaking political systems in the aftermath of the crisis.[10] For example, the pandemic is likely to exacerbate Lebanon's political instability, fuel conflict between rival political factions competing to secure scarce medical resources for their supporters, and aggravate tensions between Lebanese citizens and desperate refugees who have flooded in from neighboring Syria. Iraq faces similar challenges. Newly appointed Prime Minister Mustafa al-Kadhimi will have to address the crippling economic crisis and social unrest while also managing the brewing conflict between Iran and the United States.[11]

The political environment has a direct bearing on how easily the U.S. military can operate in a region. In many Middle Eastern countries, the political situation remains fraught with uncertainty. The Arab Spring uprisings (2010–2012) formed a sandstorm that eroded the foundations of many authoritarian regimes, erased borders, and destabilized many countries in the region.[12] Yet the popular uprisings in Tunisia, Libya, Egypt, Bahrain, Syria, and Yemen did not usher in a new era of democracy and liberal rule, as many in the West were hoping. At best, they made slow progress toward democratic reform; at worst, they added to political instability, exacerbated economic

problems, and contributed to the rise of Islamist extremists.

Today, the economic and political outlooks remain bleak. In some cases, self-interested elites have prioritized regime survival over real investment in human capital, exacerbating the material deprivation of youth in the region as unresolved issues of endemic corruption, high unemployment, and the rising cost of living have worsened. Frustrated with the lack of progress, large-scale protests re-emerged in 2019 in Lebanon, Iraq, Egypt, Sudan, Algeria, and other countries.[13] The protests in Lebanon and Iraq could even affect the operational environment for U.S. forces in the region.[14]

There is no shortage of security challenges for the U.S. and its allies in this region. Using the breathing space and funding afforded by the July 14, 2015, Joint Comprehensive Plan of Action (JCPOA),[15] for example, Iran has exacerbated Shia–Sunni tensions to increase its influence on embattled regimes and has undermined adversaries in Sunni-led states. In May 2018, the Trump Administration left the JCPOA after European allies failed to address many of its serious flaws including its sunset clauses.[16] A year later, in May 2019, Iran announced that it was withdrawing from certain aspects of the JCPOA.[17] Since then, U.S. economic sanctions have been crippling Iran's economy as part of the U.S. Administration's "Maximum Pressure Campaign" meant to force changes in Iran's behavior, particularly with regard to its support of terrorist organizations and refusal to renounce a nascent nuclear weapons program.[18]

While many of America's European allies publicly denounced the Administration's decision to withdraw from the JCPOA, most officials agree privately that the agreement is flawed and needs to be fixed. America's allies in the Middle East, including Israel and most Gulf Arab states, supported the U.S. decision and welcomed a harder line against the Iranian regime.[19]

Tehran attempts to run an unconventional empire by exerting great influence on sub-state entities like Hamas (the Palestinian territories); Hezbollah (Lebanon); the Mahdi movement (Iraq); and the Houthi insurgents (Yemen). The Iranian Quds Force, the special-operations wing of Iran's Islamic Revolutionary Guard Corps, has orchestrated the formation, arming, training, and operations of these sub-state entities as well as other surrogate militias. These Iran-backed militias have carried out terrorist campaigns against U.S. forces and allies in the region for many years. On January 2, 2020, President Trump ordered an air strike that killed General Qassem Suleimani, the leader of the Iranian Quds Force, and Abu Mahdi al-Muhandis, the leader of the Iraqi Shia paramilitary group, who were responsible for carrying out attacks against U.S. personnel in Iraq.

In Afghanistan, Tehran's influence on some Shiite groups is such that thousands have volunteered to fight for Bashar al-Assad in Syria.[20] Iran also provided arms to the Taliban after it was ousted from power by a U.S.-led coalition[21] and has long considered the Afghan city of Herat, near the Afghan–Iranian border, to be within its sphere of influence.

Iran already looms large over its weak and divided Arab rivals. Iraq and Syria have been destabilized by insurgencies and civil war and may never fully recover; Egypt is distracted by its own internal problems, economic imbalances, and the Islamist extremist insurgency in the Sinai Peninsula; and Jordan has been inundated by a flood of Syrian refugees and is threatened by the spillover of Islamist extremist groups from Syria.[22] Meanwhile, Tehran has continued to build up its missile arsenal, now the largest in the Middle East; has intervened to prop up the Assad regime in Syria; and supports Shiite Islamist revolutionaries in Yemen and Bahrain.[23]

In Syria, the Assad regime's brutal repression of peaceful demonstrations early in 2011 ignited a fierce civil war that has led to the deaths of more than half a million people in addition to displacing more than 5.6 million refugees in Turkey, Lebanon, Jordan, Iraq, and Egypt and millions more people internally within Syria.[24] The large refugee populations created by this civil war could become a reservoir of potential recruits for extremist

groups. The Islamist Hay'at Tahrir al-Sham (formally known as the al-Qaeda–affiliated Jabhat Fateh al-Sham and before that as the al-Nusra Front) and the self-styled Islamic State (formerly known as ISIS or ISIL and before that as al-Qaeda in Iraq), for example, used the power vacuum created by the war to carve out extensive sanctuaries where they built proto-states and trained militants from a wide variety of other Arab countries, Central Asia, Russia, Europe, Australia, and the United States.[25]

At the height of its power, with a sophisticated Internet and social media presence and by capitalizing on the civil war in Syria and sectarian divisions in Iraq, the IS was able to recruit over 25,000 fighters from outside the region to join its ranks in Iraq and Syria. These foreign fighters included thousands from Western countries, including the United States. In 2014, the U.S. announced the formation of a broad international coalition to defeat the Islamic State. Early in 2019, the territorial "caliphate" had been destroyed by a U.S.-led coalition of international partners.

Arab–Israeli tensions are another source of instability in the region. The repeated breakdown of Israeli–Palestinian peace negotiations has created an even more antagonistic situation. Hamas, the Palestinian branch of the Muslim Brotherhood that has controlled Gaza since 2007, seeks to transform the conflict from a national struggle over sovereignty and territory into a religious conflict in which compromise is denounced as blasphemy. Hamas invokes jihad in its struggle against Israel and seeks to destroy the Jewish state and replace it with an Islamic state.

Important Alliances and Bilateral Relations in the Middle East

The U.S. has strong military, security, intelligence, and diplomatic ties with several Middle Eastern nations, including Israel, Egypt, Jordan, and the six members of the Gulf Cooperation Council (GCC).[26] Because the historical and political circumstances that led to the creation of NATO have largely been absent in the Middle East, the region lacks a similarly strong collective security organization.

When it came into office, the Trump Administration proposed the idea of a multilateral Middle East Strategic Alliance with its Arab partners.[27] The initial U.S. concept, which included security, economic cooperation, and conflict resolution and deconfliction, generated considerable enthusiasm, but the project was sidelined by a diplomatic dispute involving Saudi Arabia, the UAE, and Qatar.[28] Middle Eastern countries traditionally have preferred to maintain bilateral relationships with the U.S. and generally have shunned multilateral arrangements because of the lack of trust among Arab states.

This lack of trust manifested itself in June 2017 when the Kingdom of Saudi Arabia, the United Arab Emirates, Bahrain, Egypt, and several other Muslim-majority countries cut or downgraded diplomatic ties with Qatar after Doha was accused of supporting terrorism in the region.[29] All commercial land, air, and sea travel between Qatar and these nations has been severed, and Qatari diplomats and citizens have been evicted. Discussions between Qatar and GCC members to resolve the dispute began in October 2019 but broke down in February 2020. Political tensions among the Gulf States remain high.[30]

This is only the most recent example of how regional tensions can transcend the Arab–Iranian or Israeli–Palestinian debate. In 2014, several Arab states recalled their ambassadors to Qatar to protest Doha's support for Egypt's Muslim Brotherhood movement.[31] It took eight months for the parties involved to resolve this dispute so that relations could be fully restored. In addition, Qatar has long supported Muslim Brotherhood groups, as well as questionable Islamist factions in Syria and Libya, and has often been viewed as too close to Iran, a major adversary of Sunni Arab states in the Gulf.

Bilateral and multilateral relations in the region, especially with the U.S. and other Western countries, are often made more difficult by their secretive nature. It is not unusual for

governments in this region to see value (and sometimes necessity) in pursuing a relationship with the U.S. while having to account for domestic opposition to working with America: hence the perceived need for secrecy. The opaqueness of these relationships sometimes creates problems for the U.S. when it tries to coordinate defense and security cooperation with European allies (mainly the United Kingdom and France) that are active in the region.

Military training is an important part of these relationships. The principal motivations behind these exercises are to ensure close and effective coordination with key regional partners, demonstrate an enduring U.S. security commitment to regional allies, and train Arab armed forces so that they can assume a larger share of responsibility for regional security.

Israel. America's most important bilateral relationship in the Middle East is with Israel. Both countries are democracies, value free-market economies, and believe in human rights at a time when many Middle Eastern countries reject those values. With support from the United States, Israel has developed one of the world's most sophisticated air and missile defense networks.[32] No significant progress on peace negotiations with the Palestinians or on stabilizing Israel's volatile neighborhood is possible without a strong and effective Israeli–American partnership.

After years of strained relations during the Obama Administration, ties between the U.S. and Israel improved significantly during the first two years of the Trump Administration. In May 2018, the U.S. moved its embassy from Tel Aviv to a location in western Jerusalem.[33] On January 28, 2020, President Trump unveiled his Israeli–Palestinian peace proposal.[34] The plan accords a high priority to Israeli security needs, recognizes Israel's vital interest in retaining control of the border with Jordan, and clears the way for U.S. recognition of Israeli sovereignty over many settlements and Jewish holy sites in the disputed territory of the West Bank.[35]

Saudi Arabia. After Israel, the U.S. military relationship is deepest with the Gulf States, including Saudi Arabia, which serves as de facto leader of the GCC. America's relationship with Saudi Arabia is based on pragmatism and is important for both security and economic reasons, but it has come under intense strain since the murder of Saudi dissident and *Washington Post* journalist Jamal Ahmad Khashoggi, allegedly by Saudi security services, in Turkey in 2018.

The Saudis enjoy huge influence across the Muslim world, and roughly 2 million Muslims participate in the annual Hajj pilgrimage to the holy city of Mecca. Riyadh has been a key partner in efforts to counterbalance Iran. The U.S. is also the largest provider of arms to Saudi Arabia and regularly, if not controversially, sells munitions needed to resupply stockpiles expended in the Saudi-led campaign against the Houthis in Yemen.

Gulf Cooperation Council. The countries of the GCC (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the UAE) are located close to the Arab–Persian fault line and are therefore strategically important to the U.S.[36] The root of Arab–Iranian tensions in the Gulf is Tehran's ideological drive to export its Islamist revolution and overthrow the traditional rulers of the Arab kingdoms. This ideological clash has further amplified long-standing sectarian tensions between Shia Islam and Sunni Islam. Tehran has sought to radicalize Shia Arab minority groups to undermine Sunni Arab regimes in Saudi Arabia, Kuwait, and Bahrain. It also sought to incite revolts by the Shia majorities in Iraq against Saddam Hussein's regime and in Bahrain against the Sunni al-Khalifa dynasty. Culturally, many Iranians look down on the Gulf States, many of which they see as artificial entities carved out of the former Persian Empire and propped up by Western powers.

The GCC's member countries often have difficulty agreeing on a common policy with respect to matters of security. This reflects both the organization's intergovernmental nature and its members' desire to place national interests above those of the GCC. The recent dispute regarding Qatar illustrates this difficulty.

Another source of disagreement involves the question of how best to deal with Iran. On one end of the spectrum, Saudi Arabia, Bahrain, and the UAE take a hawkish view of the threat from Iran. Oman and Qatar, the former of which prides itself on its regional neutrality and the latter of which shares natural gas fields with Iran, view Iran's activities in the region as less of a threat and maintain cordial relations with Tehran. Kuwait tends to fall somewhere in the middle. Intra-GCC relations also can be problematic.

Egypt. Egypt is another important U.S. military ally. As one of only two Arab countries that maintain diplomatic relations with Israel (the other is Jordan), Egypt is closely enmeshed in the Israeli–Palestinian conflict and remains a leading political, diplomatic, and military power in the region.

Relations between the U.S. and Egypt have been problematic since the 2011 downfall of President Hosni Mubarak after 30 years of rule. The Muslim Brotherhood's Mohamed Morsi was elected president in 2012 and used the Islamist-dominated parliament to pass a constitution that advanced an Islamist agenda. Morsi's authoritarian rule, combined with rising popular dissatisfaction with falling living standards, rampant crime, and high unemployment, led to a massive wave of protests in June 2013 that prompted a military coup in July. The leader of the coup, Field Marshal Abdel Fattah el-Sisi, pledged to restore democracy and was elected president in 2014 and again in 2018 in elections that many considered to be neither free nor fair.

Sisi's government faces major political, economic, and security challenges. Rare anti-government protests broke out for two weeks in September 2018 despite a ban on demonstrations, and waves of arrests and detainments followed in a massive crackdown that shut down protests.[37] The demonstrations exposed Egypt's tenuous stability, and support for President Sisi appears to be waning.

Quality of Armed Forces in the Region

The quality and capabilities of the region's armed forces are mixed. Some countries spend billions of dollars each year on advanced Western military hardware; others spend very little. According to the Stockholm International Peace Research Institute (SIPRI), "Saudi Arabia is by far the largest military spender in the region, with an estimated total of $61.9 billion in 2019."[38] If defense spending is measured as a percentage of GDP, the leader in the region is Oman, which spent 8.8 per cent of its GDP on the military in 2019, followed closely by Saudi Arabia at 8.0 percent.[39]

Historically, figures on defense spending for the Middle East have been very unreliable, and the lack of data has worsened. For 2019, there were no available data for Qatar, Syria, the United Arab Emirates, and Yemen according to the SIPRI.[40]

Different security factors drive the degree to which Middle Eastern countries fund, train, and arm their militaries. For Israel, which fought and defeated Arab coalitions in 1948, 1956, 1967, 1973, and 1982, the chief potential threats to its existence are now posed by an Iranian regime that has called for Israel to be "wiped off the map."[41] States and non-state actors in the region have responded to Israel's military dominance by investing in asymmetric and unconventional capabilities to offset its military superiority.[42] For the Gulf States, the main driver of defense policy is the Iranian military threat combined with internal security challenges; for Iraq, it is the internal threat posed by insurgents and terrorists.

The Israel Defense Forces (IDF) are considered to be one of the most capable military forces in the Middle East. Recently, Iran and other Arab countries have spent billions of dollars in an effort to catch up with Israel, and the result has been an arms race that could threaten Israel's qualitative military edge (QME). Iran is steadily improving its missile capabilities and could soon have access to the global arms trade if the U.N. conventional arms embargo is allowed to expire as scheduled in October 2020.[43] In response, other Arab countries are "procuring and upgrading cutting-edge U.S., Russian and European systems in bulk, including amphibious assault ships, missile

boats, submarines, multirole fighter aircraft, precision munitions, air and missile defenses as well as radar and cyber technologies."[44]

Israel funds its military sector heavily and has a strong national industrial capacity supported by significant funding from the U.S. Combined, these factors give Israel a regional advantage despite limitations of manpower and size. In particular, the IDF has focused on maintaining its superiority in missile defense, intelligence collection, precision weapons, and cyber technologies.[45] The Israelis regard their cyber capabilities as especially important and use cyber technologies for a number of purposes, including defending Israeli cyberspace, gathering intelligence, and carrying out attacks.[46]

Israel maintains its qualitative superiority in medium-range and long-range missile capabilities and fields effective missile defense systems, including Iron Dome and Arrow, both of which the U.S. helped to finance. Israel also has a nuclear weapons capability (which it does not publicly acknowledge) that increases its strength relative to other powers in the region and has helped to deter adversaries as the gap in conventional capabilities has been reduced.

After Israel, the most technologically advanced and best-equipped armed forces are found in the Gulf Cooperation Council. Previously, the export of oil and gas meant that there was no shortage of resources to devote to defense spending, but the collapse of crude oil prices has forced oil-exporting countries to adjust their defense spending patterns. At present, however, GCC nations still have the region's best-funded (even if not necessarily the most effective) Arab armed forces. All GCC members boast advanced defense hardware that reflects a preference for U.S., U.K., and French equipment.

Saudi Arabia maintains the GCC's most capable military force. It has an army of 75,000 soldiers and a National Guard of 100,000 personnel reporting directly to the king. The army operates 900 main battle tanks including 370 U.S.-made M1A2s. Its air force is built around American-built and British-built

aircraft and consists of more than 429 combat-capable aircraft including F-15s, Tornados, and Typhoons.[47]

In fact, air power is the strong suit of most GCC members. Oman operates F-16s and Typhoons. In 2018, the U.S. government awarded Lockheed Martin a $1.12 billion contract to produce 16 new F-16 Block 70 aircraft (Lockheed Martin's newest and most advanced F-16 production configuration) for the Royal Bahraini Air Force.[48] Qatar operates French-made Mirage fighters and is buying 24 Typhoons from the U.K.[49]

Middle Eastern countries have shown a willingness to use their military capability under certain and limited circumstances. The navies of the GCC members rarely deploy beyond their Exclusive Economic Zones, but Kuwait, Bahrain, the UAE, Saudi Arabia, and Qatar have participated in and in some cases have commanded Combined Task Force 152, formed in 2004 to maintain maritime security in the Persian Gulf.[50] Since 2001, Jordan, Egypt, Bahrain, and the UAE have supplied troops to the U.S.-led mission in Afghanistan. The UAE and Qatar deployed fighters to participate in NATO-led operations over Libya in 2011, although they did not participate in strike operations. All six GCC members also joined the U.S.-led anti-ISIS coalition, albeit to varying degrees, with the UAE contributing the most in terms of air power.[51] Air strikes in Syria by members of the GCC ended in 2017.

With 438,500 active personnel and 479,000 reserve personnel, Egypt has the largest Arab military force in the Middle East.[52] It possesses a fully operational military with an army, air force, air defense, navy, and special operations forces. Until 1979, when the U.S. began to supply Egypt with military equipment, Cairo relied primarily on less capable Soviet military technology.[53] Since then, its army and air force have been significantly upgraded with U.S. military weapons, equipment, and warplanes.

Egypt has struggled with increased terrorist activity in the Sinai Peninsula, including attacks on Egyptian soldiers, attacks on foreign tourists, and the October 2015 bombing

of a Russian airliner departing from the Sinai. The Islamic State's "Sinai Province" terrorist group has claimed responsibility for all of these actions.[54]

Jordan is a close U.S. ally and has small but effective military forces. The principal threats to its security include terrorism, turbulence spilling over from Syria and Iraq, and the resulting flow of refugees. While Jordan faces few conventional threats from its neighbors, its internal security is threatened by Islamist extremists returning from fighting in the region who have been emboldened by the growing influence of al-Qaeda and other Islamist militants. As a result, Jordan's highly professional armed forces have focused in recent years on border and internal security.

Considering Jordan's size, its conventional capability is significant. Jordan's ground forces total 86,000 soldiers and include 100 British-made Challenger 1 tanks. Forty-seven F-16 Fighting Falcons form the backbone if its air force,[55] and its special operations forces are highly capable, having benefitted from extensive U.S. and U.K. training. Jordanian forces have served in Afghanistan and in numerous U.N.-led peacekeeping operations.

Iraq has fielded one of the region's most dysfunctional military forces. After the 2011 withdrawal of U.S. troops, Iraq's government selected and promoted military leaders according to political criteria.[56] Shiite army officers were favored over their Sunni, Christian, and Kurdish counterparts, and former Prime Minister Nouri al-Maliki chose top officers according to their political loyalties. Politicization of the armed forces also exacerbated corruption within many units, with some commanders siphoning off funds allocated for "ghost soldiers" who never existed or had been separated from the army for various reasons.[57] It is unclear whether new Prime Minister Mustafa al-Kadhimi will follow the same model, but both the Iranian foreign minister and the United States have welcomed the appointment.[58]

The promotion of incompetent military leaders, poor logistical support due to corruption and other problems, limited operational mobility, and weaknesses in intelligence, reconnaissance, medical support, and air force capabilities have combined to weaken the effectiveness of the Iraqi armed forces. In June 2014, for example, the collapse of up to four divisions that were routed by vastly smaller numbers of Islamic State fighters led to the fall of Mosul.[59] The U.S. and its allies responded with a massive training program for the Iraqi military that led to the liberation of Mosul on July 9, 2017.[60]

Current U.S. Military Presence in the Middle East

Before 1980, the limited U.S. military presence in the Middle East consisted chiefly of a small naval force that had been based at Bahrain since 1958. The U.S. "twin pillar" strategy relied on prerevolutionary Iran and Saudi Arabia to take the lead in defending the Persian Gulf from the Soviet Union and its client regimes in Iraq, Syria, and South Yemen,[61] but the 1979 Iranian revolution demolished one pillar, and the December 1979 Soviet invasion of Afghanistan increased the Soviet threat to the Gulf.

In January 1980, President Jimmy Carter proclaimed in a commitment known as the Carter Doctrine that the United States would take military action to defend oil-rich Persian Gulf States from external aggression. In 1980, he ordered the creation of the Rapid Deployment Joint Task Force (RDJTF), the precursor to U.S. Central Command (USCENTCOM), which was established in January 1983.[62]

Up until the late 1980s, America's "regional strategy still largely focused on the potential threat of a massive Soviet invasion of Iran."[63] After the collapse of the Soviet Union, Saddam Hussein's Iraqi regime became the chief threat to regional stability. Iraq invaded Kuwait in August 1990, and the United States responded in January 1991 by leading an international coalition of more than 30 nations to expel Saddam's forces from Kuwait. CENTCOM commanded the U.S. contribution of more than 532,000 military personnel to the coalition's armed forces, which totaled at least 737,000.[64]

This marked the peak U.S. force deployment in the Middle East.

Confrontations with Iraq continued throughout the 1990s as Iraq continued to violate the 1991 Gulf War cease-fire. Baghdad's failure to cooperate with U.N. arms inspectors to verify the destruction of its weapons of mass destruction and its links to terrorism led to the U.S. invasion of Iraq in 2003. During the initial invasion, U.S. forces reached nearly 192,000,[65] joined by military personnel from coalition forces. Apart from the "surge" in 2007, when President George W. Bush deployed an additional 30,000 personnel, the number of American combat forces in Iraq fluctuated between 100,000 and 150,000.[66]

In December 2011, the U.S. officially completed its withdrawal of troops, leaving only 150 personnel attached to the U.S. embassy in Iraq.[67] In the aftermath of IS territorial gains in Iraq, however, the U.S. redeployed thousands of troops to the country to assist Iraqi forces against IS and help build Iraqi capabilities. Despite calls from the Iraqi parliament to expel U.S. troops after the January 2020 air strike that killed General Qassem Suleimani, U.S. forces remain in Iraq and have "consolidated their basing" and "deployed new missile defenses."[68] Today, approximately 5,200 U.S. troops are based in Iraq. Escalating attacks by Iran-backed militias against U.S. forces in 2020 could influence future troop deployment.[69]

In addition, the U.S. continues to maintain a limited number of forces in other locations in the Middle East, primarily in GCC countries. Rising naval tensions in the Persian Gulf prompted additional deployments of troops, Patriot missile batteries, and combat aircraft to the Gulf in late 2019 to deter Iran, although reductions in U.S. forces were subsequently announced in May 2020.[70] The move might indicate a shifting strategy to counter Iran or an assessment by U.S. officials of a reduced risk as Iran continues to mitigate the economic and political effects of COVID-19.

Currently, tens of thousands of U.S. troops are serving in the region. "Due to the fluctuating nature of U.S. military operations in the region," according to one study, "it is not possible to put together a complete picture of the entirety of U.S. forces' deployment."[71] Nevertheless, information gleaned from open sources reveals the following:

- **Kuwait.** Over 16,000 U.S. personnel are based in Kuwait and are spread among Camp Arifjan, Ahmad al-Jabir Air Base, and Ali al-Salem Air Base. A large depot of prepositioned equipment and a squadron of fighters and Patriot missile systems are also deployed to Kuwait.[72]

- **UAE.** About 4,000 U.S. personnel are deployed at Jebel Ali port, Al Dhafra Air Base, and naval facilities at Fujairah. Jebel Ali port is the U.S. Navy's busiest port of call for aircraft carriers. U.S. Air Force personnel who are stationed in the UAE use Al Dhafra Air Base to operate fighters, unmanned aerial vehicles (UAVs), refueler aircraft, and surveillance aircraft. The United States also has regularly deployed F-22 Raptor combat aircraft to Al Dhafra and recently deployed the F-35 combat aircraft because of escalating tensions with Iran. Patriot missile systems are deployed for air and missile defense.[73]

- **Oman.** In 1980, Oman became the first Gulf State to welcome a U.S. military base. Today, it provides important access in the form of over 5,000 aircraft overflights, 600 aircraft landings, and 80 port calls annually. The number of U.S. military personnel in Oman has fallen to about 200, mostly from the U.S. Air Force. According to the Congressional Research Service, "the United States reportedly can use—with advance notice and for specified purposes—Oman's military airfields in Muscat (the capital), Thumrait, Masirah Island, and Musnanah," as well as (pursuant to a March 2019 Strategic framework Agreement) the ports of Al Duqm and Salalah.[74]

- **Bahrain.** Approximately 5,000 U.S. military personnel are based in Bahrain. Bahrain is home to Naval Support Activity Bahrain and the U.S. Fifth Fleet, so most U.S. military personnel there belong to the U.S. Navy. A significant number of U.S. Air Force personnel operate out of Shaykh Isa Air Base, where F-16s, F/A-18s, and P-8 surveillance aircraft are stationed. U.S. Patriot missile systems also are deployed to Bahrain. The deep-water port of Khalifa bin Salman is one of the few facilities in the Gulf that can accommodate U.S. aircraft carriers.[75]

- **Saudi Arabia.** The U.S. withdrew the bulk of its forces from Saudi Arabia in 2003. After the October 2019 attacks on Saudi Arabia's oil and natural gas facilities, the U.S. Defense Department deployed 3,000 additional troops and sent radar and missile systems to improve air defenses, an air expeditionary wing to support fighter aircraft, and two fighter squadrons in an effort to deter future attacks.[76] This large-scale military buildup to counter Iran was reduced in May 2020 after the U.S. removed two Patriot missile batteries and dozens of troops that were deployed during the troop buildup.[77] The six-decade-old United States Military Training Mission to the Kingdom of Saudi Arabia, the four-decade-old Office of the Program Manager of the Saudi Arabian National Guard Modernization Program, and the Office of the Program Manager–Facilities Security Force are based in Eskan Village Air Base approximately 13 miles south of the capital city of Riyadh.[78]

- **Qatar.** Approximately 10,000 U.S. personnel, mainly from the U.S. Air Force, are deployed in Qatar.[79] The U.S. operates its Combined Air Operations Center at Al Udeid Air Base, which is one of the world's most important U.S. air bases. It is also the base from which the anti-ISIS campaign was headquartered. Heavy bombers, tankers, transports, and ISR (intelligence, surveillance, and reconnaissance) aircraft operate from Al Udeid Air Base, which also serves as the forward headquarters of CENTCOM. The base houses prepositioned U.S. military equipment and is defended by U.S. Patriot missile systems. So far, the recent diplomatic moves by Saudi Arabia and other Arab states against Doha have not affected the United States' relationship with Qatar.

- **Jordan.** According to CENTCOM, Jordan "is one of [America's] strongest and most reliable partners in the Levant sub-region."[80] Although there are no U.S. military bases in Jordan, the U.S. has a long history of conducting training exercises in the country. Due to recent events in neighboring Syria, in addition to other military assets like fighter jets and air defense systems, "approximately 2,910 U.S. military personnel are deployed to Jordan."[81]

CENTCOM "directs and enables military operations and activities with allies and partners to increase regional security and stability in support of enduring U.S. interests."[82] Execution of this mission is supported by four service component commands (U.S. Naval Forces Middle East [USNAVCENT]; U.S. Army Forces Middle East [USARCENT]; U.S. Air Forces Middle East [USAFCENT]; and U.S. Marine Forces Middle East [MARCENT]) and one subordinate unified command (U.S. Special Operations Command Middle East [SOCCENT]).

- **U.S. Naval Forces Central Command.** USNAVCENT is the maritime component of USCENTCOM. With its forward headquarters in Bahrain, it is responsible for commanding the afloat units that rotationally deploy or surge from the United States in addition to other ships that are based in the Gulf for longer periods. USNAVCENT conducts persistent maritime operations to advance U.S. interests, deter and counter disruptive countries,

defeat violent extremism, and strengthen partner nations' maritime capabilities in order to promote a secure maritime environment in an area encompassing about 2.5 million square miles of water.

- **U.S. Army Forces Central Command.** USARCENT is the land component of USCENTCOM. Based in Kuwait, USARCENT is responsible for land operations in an area that totals 4.6 million square miles (1.5 times larger than the continental United States).

- **U.S. Air Forces Central Command.** USAFCENT is the air component of USCENTCOM. Based in Qatar, USAFCENT is responsible for air operations and for working with the air forces of partner countries in the region. It also manages an extensive supply and equipment prepositioning program at several regional sites.

- **U.S. Marine Forces Central Command.** MARCENT is the designated Marine Corps service component for USCENTCOM. Based in Bahrain, MARCENT is responsible for all Marine Corps forces in the region.

- **U.S. Special Operations Command Central.** SOCCENT is a subordinate unified command under USCENTCOM. Based in Qatar, SOCCENT is responsible for planning special operations throughout the USCENTCOM region, planning and conducting peacetime joint/combined special operations training exercises, and orchestrating command and control of peacetime and wartime special operations.

In addition to the American military presence in the region, two U.S. allies—the United Kingdom and France—play an important role that should not be overlooked.

The U.K.'s presence in the Middle East is a legacy of British imperial rule. The U.K. has maintained close ties with many countries that it once ruled and has conducted military operations in the region for decades. Approximately 1,350 British service personnel are based throughout the region. This number fluctuates with the arrival of visiting warships.[83]

The British presence in the region is dominated by the Royal Navy. Permanently based naval assets include four mine hunters and one Royal Fleet Auxiliary supply ship. Generally, there also are frigates or destroyers in the Gulf or Arabian Sea performing maritime security duties.[84] In addition (although such matters are not the subject of public discussion), U.K. attack submarines operate in the area. In April 2018, as a sign of its long-term maritime presence in the region, the U.K. opened a base in Bahrain—its first overseas military base in the Middle East in more than four decades.[85] The U.K. has made a multimillion-dollar investment in modernization of the Duqm Port complex in Oman to accommodate its new *Queen Elizabeth*–class aircraft carriers.[86]

The U.K. has a sizeable Royal Air Force (RAF) presence in the region as well, mainly in the UAE and Oman. A short drive from Dubai, Al-Minhad Air Base is home to a small contingent of U.K. personnel, and small RAF detachments in Oman support U.K. and coalition operations in the region. Although considered to be in Europe, the U.K.'s Sovereign Base Areas of Akrotiri and Dhekelia in Cyprus have supported U.S. military and intelligence operations in the past and will continue to do so.

The British presence in the region extends beyond soldiers, ships, and planes. A British-run staff college operates in Qatar, and Kuwait chose the U.K. to help run its own equivalent of the Royal Military Academy at Sandhurst.[87] The U.K. also plays a very active role in training the Saudi Arabian and Jordanian militaries.

The French presence in the Gulf is smaller than the U.K.'s but still significant. France opened its first military base in the Gulf in 2009. Located in the emirate of Abu Dhabi, it was the first foreign military installation built by the French in 50 years.[88] The French have

650 personnel based in the UAE, along with six Rafale fighter jets, as well as military operations in Kuwait and Qatar.[89] French ships have access to the Zayed Port in Abu Dhabi, which is big enough to handle every ship in the French Navy except the aircraft carrier *Charles De Gaulle.*

Military support from the U.K. and France has been particularly important in Operation Inherent Resolve, a U.S.-led joint task force formed to combat the Islamic State in Iraq and Syria. In March 2020, France and the U.K. announced that they would be reducing their footprint in Iraq. France is suspending its anti-terrorism training operations and bringing home troops to support the government's effort to combat COVID-19. The U.K. temporarily redeployed troops back to the U.K. as a result of COVID-19 but will resume its training of Iraqi forces once the situation permits.[90] There have been concerns that the IS might exploit COVID-19 to gain strength if Iraqi security forces do not remain vigilant, particularly along the Iraqi–Syria border.[91] The situation will be a test to measure Iraq's effectiveness in managing its own security challenges without the support of coalition forces.

Another important actor in Middle East security is the small East African country of Djibouti. Djibouti sits on the Bab el-Mandeb Strait, through which an estimated 6.2 million barrels of oil a day transited in 2018 (the most recent year for which U.S. Energy Administration data are available) and which is a choke point on the route to the Suez Canal.[92] An increasing number of countries recognize Djibouti's value as a base from which to project maritime power and launch counterterrorism operations. The country is home to Camp Lemonnier, which can hold up to 4,000 personnel and is the only permanent U.S. military base in Africa.[93]

China is also involved in Djibouti and has its first permanent overseas base there, which can house 10,000 troops and which Chinese marines have used to stage live-fire exercises featuring armored combat vehicles and artillery. France, Italy, and Japan also have presences of varying strength in Djibouti.[94]

Key Infrastructure and Warfighting Capabilities

The Middle East is critically situated geographically. Two-thirds of the world's population lives within an eight-hour flight from the Gulf region, making it accessible from most other regions of the globe. The Middle East also contains some of the world's most critical maritime choke points, such as the Suez Canal and the Strait of Hormuz.

Although infrastructure is not as developed in the Middle East as it is in North America or Europe, during a decades-long presence, the U.S. has developed systems that enable it to move large numbers of matériel and personnel into and out of the region. According to the Department of Defense, at the height of U.S. combat operations in Iraq during the Second Gulf War, the U.S. presence included 165,000 servicemembers and 505 bases. Moving personnel and equipment out of the country was "the largest logistical drawdown since World War II" and included redeployment of "the 60,000 troops who remained in Iraq at the time and more than 1 million pieces of equipment ahead of their deadline."[95]

The condition of the region's roads varies from country to country. For example, 100 percent of the roads in Israel, Jordan, and the UAE are paved. Other nations such as Oman (49.3 percent); Saudi Arabia (21.5 percent); and Yemen (8.7 percent) have poor paved road coverage according to the most recent information available.[96] Rail coverage is also poor.

The U.S. has access to several airfields in the region. The primary air hub for U.S. forces is Al Udeid Air Base in Qatar. Other airfields include Ali Al Salem Air Base, Kuwait; Al Dhafra, UAE; Al Minhad, UAE; Isa, Bahrain; Eskan Village Air Base, Saudi Arabia; Muscat, Oman; Thumrait, Oman; and Masirah Island, Oman, in addition to the commercial airport at Seeb, Oman. In the past, the U.S. has used major airfields in Iraq, including Baghdad International Airport and Balad Air Base, as well as Prince Sultan Air Base in Saudi Arabia.

The fact that the U.S. has access to a particular air base today, however, does not mean

that it will be made available for a particular operation in the future. For example, because of their more cordial relations with Iran, it is highly unlikely that Qatar and Oman would allow the U.S. to use air bases in their territory for strikes against Iran unless they were first attacked themselves.

The U.S. has access to ports in the region, perhaps most importantly in Bahrain, as well as a deep-water port, Khalifa bin Salman, in Bahrain and naval facilities at Fujairah, UAE.[97] The UAE's commercial port of Jebel Ali is open for visits from U.S. warships and prepositioning of equipment for operations in theater.[98] In March 2019, "Oman and the United States signed a 'Strategic Framework Agreement' that expands the U.S.–Oman facilities access agreements by allowing U.S. forces to use the ports of Al Duqm...and Salalah."[99] The location of these ports outside the Strait of Hormuz makes them particularly useful. Approximately 90 percent of the world's trade travels by sea, and some of the busiest and most important shipping lanes are located in the Middle East. Tens of thousands of cargo ships travel through the Strait of Hormuz and the Bab el-Mandeb Strait each year.

Given the high volume of maritime traffic in the region, no U.S. military operation can be undertaken without consideration of how these shipping lanes offer opportunity and risk to America and her allies. The major shipping routes include:

- **The Suez Canal.** In 2019, more than 1.2 billion tons of cargo transited the canal, averaging 51 ships each day.[100] Considering that the canal itself is 120 miles long but only 670 feet wide, this is an impressive amount of traffic. The Suez Canal is important to Europe because it provides a means of access to oil from the Middle East. It also serves as an important strategic asset, as it is used routinely by the U.S. Navy to move surface combatants between the Mediterranean Sea and the Red Sea. Thanks to a bilateral arrangement between Egypt and the United States, the

U.S. Navy enjoys priority access to the canal.[101] However, the journey through the narrow waterway is no easy task for large surface combatants. The canal was not constructed with the aim of accommodating 100,000-ton aircraft carriers and therefore exposes a larger ship to attack. For this reason, different types of security protocols are followed, including the provision of air support by the Egyptian military.[102]

- **Strait of Hormuz.** The Strait of Hormuz is a critical oil-supply bottleneck and the world's busiest passageway for oil tankers. The strait links the Persian Gulf with the Arabian Sea and the Gulf of Oman. "The **Strait of Hormuz** is the world's most important chokepoint, with an oil flow of 18 million b/d [barrels per day] in 2016," according to the U.S. Energy Information Administration.[103] Most of these crude oil exports go to Asian markets, particularly Japan, India, South Korea, and China.[104] Given the extreme narrowness of the passage and its proximity to Iran, shipping routes through the Strait of Hormuz are particularly vulnerable to disruption. Tehran repeatedly attacked oil tankers in May and June 2019 and continues to harass U.S. naval ships.[105]

- **Bab el-Mandeb Strait.** The Bab el-Mandeb Strait is a strategic waterway located between the Horn of Africa and Yemen that links the Red Sea to the Indian Ocean. Exports from the Persian Gulf and Asia destined for Western markets must pass through the strait en route to the Suez Canal. Because the Bab el-Mandeb Strait is 18 miles wide at its narrowest point, passage is limited to two channels for inbound and outbound shipments.[106]

Maritime Prepositioning of Equipment and Supplies. The U.S. military has deployed noncombatant maritime prepositioning ships (MPS) containing large amounts of military

equipment and supplies in strategic locations from which they can reach areas of conflict relatively quickly as associated U.S. Army or Marine Corps units located elsewhere arrive in the area. The British Indian Ocean Territory of Diego Garcia, an island atoll, hosts the U.S. Naval Support Facility Diego Garcia, which supports prepositioning ships that can supply Army or Marine Corps units deployed for contingency operations in the Middle East.

Conclusion

For the foreseeable future, the Middle East region will remain a key focus for U.S. military planners. Once considered relatively stable, mainly because of the ironfisted rule of authoritarian regimes, the area is now highly unstable and a breeding ground for terrorism.

Overall, regional security has deteriorated in recent years. Even though the Islamic State (or at least its physical presence) appears to have been defeated, the nature of its successor is unclear. Iraq has restored its territorial integrity after the defeat of ISIS, but the political situation and future relations between Baghdad and the U.S. will remain difficult as long as a government that is sympathetic to Iran is in power.[107] The regional dispute with Qatar has made U.S. relations in the region even more complex and difficult to manage, although it has not stopped the U.S. military from operating.

Many of the borders created after World War I are under significant stress. In countries like Iraq, Libya, Syria, and Yemen, the supremacy of the nation-state is being challenged by non-state actors that wield influence, power,

and resources comparable to those of small states. The region's principal security and political challenges are linked to the unrealized aspirations of the Arab Spring, surging transnational terrorism, and meddling by Iran, which seeks to extend its influence in the Islamic world. These challenges are made more difficult by the Arab–Israeli conflict, Sunni–Shia sectarian divides, the rise of Iran's Islamist revolutionary nationalism, and the proliferation of Sunni Islamist revolutionary groups. COVID-19 will likely exacerbate these economic, political, and regional crises, which may destabilize the post-pandemic operational environment for U.S. forces.

Thanks to its decades of military operations in the Middle East, the U.S. has tried-and-tested procedures for operating in the region. Bases and infrastructure are well established, and the logistical processes for maintaining a large force forward deployed thousands of miles away from the homeland are well in place. Moreover, unlike in Europe, all of these processes have been tested recently in combat. The personal links between allied armed forces are also present. Joint training exercises improve interoperability, and U.S. military educational courses regularly attended by officers (and often royals) from the Middle East allow the U.S. to influence some of the region's future leaders.

America's relationships in the region are based pragmatically on shared security and economic concerns. As long as these issues remain relevant to both sides, the U.S. is likely to have an open door to operate in the Middle East when its national interests require that it do so.

Scoring the Middle East Operating Environment

As noted at the beginning of this section, various aspects of the region facilitate or inhibit the ability of the U.S. to conduct military operations to defend its vital national interests against threats. Our assessment of the operating environment uses a five-point scale that ranges from "very poor" to "excellent"

conditions and covers four regional characteristics of greatest relevance to the conduct of military operations:

1. **Very Poor.** Significant hurdles exist for military operations. Physical infrastructure is insufficient or nonexistent, and the

region is politically unstable. In addition, the U.S. military is poorly placed or absent, and alliances are nonexistent or diffuse.

2. **Unfavorable.** A challenging operating environment for military operations is marked by inadequate infrastructure, weak alliances, and recurring political instability. The U.S. military is inadequately placed in the region.

3. **Moderate.** A neutral to moderately favorable operating environment is characterized by adequate infrastructure, a moderate alliance structure, and acceptable levels of regional political stability. The U.S. military is adequately placed.

4. **Favorable.** A favorable operating environment includes good infrastructure, strong alliances, and a stable political environment. The U.S. military is well placed for future operations.

5. **Excellent.** An extremely favorable operating environment includes well-established and well-maintained infrastructure, strong and capable allies, and a stable political environment. The U.S. military is exceptionally well placed to defend U.S. interests.

The key regional characteristics consist of:

a. **Alliances.** Alliances are important for interoperability and collective defense, as allies are more likely to lend support to U.S. military operations. Indicators that provide insight into the strength or health of an alliance include whether the U.S. trains regularly with countries in the region, has good interoperability with the forces of an ally, and shares intelligence with nations in the region.

b. **Political Stability.** Political stability brings predictability for military planners when considering such things as transit, basing, and overflight rights for U.S. military operations. The overall degree of political stability indicates whether U.S. military actions would be hindered or enabled and reflects, for example, whether transfers of power are generally peaceful and whether there have been any recent instances of political instability in the region.

c. **U.S. Military Positioning.** Having military forces based or equipment and supplies staged in a region greatly facilitates the ability of the United States to respond to crises and, presumably, achieve success in critical "first battles" more quickly. Being routinely present in a region also assists in maintaining familiarity with its characteristics and the various actors that might assist or thwart U.S. actions. With this in mind, we assessed whether or not the U.S. military was well positioned in the region. Again, indicators included bases, troop presence, prepositioned equipment, and recent examples of military operations (including training and humanitarian) launched from the region.

d. **Infrastructure.** Modern, reliable, and suitable infrastructure is essential to military operations. Airfields, ports, rail lines, canals, and paved roads enable the U.S. to stage, launch, and logistically sustain combat operations. We combined expert knowledge of regions with publicly available information on critical infrastructure to arrive at our overall assessment of this metric.[108]

The U.S. has developed an extensive network of bases in the Middle East region and has acquired substantial operational experience in combatting regional threats. At the same time, however, many of its allies are hobbled by political instability, economic problems, internal security threats, and mushrooming transnational threats. Although the region's overall score remains "moderate," as it was last year,

it is in danger of falling to "poor" because of political instability and growing bilateral tensions with allies over the security implications of the nuclear agreement with Iran and how best to fight the Islamic State.

With this in mind, we arrived at these average scores for the Middle East (rounded to the nearest whole number):

- Alliances: **3—Moderate**

- Political Stability: **2—Unfavorable**

- U.S. Military Positioning: **3—Moderate**

- Infrastructure: **3—Moderate**

  Leading to a regional score of: **Moderate**

Operating Environment: Middle East

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Alliances			✔		
Political Stability		✔			
U.S. Military Posture			✔		
Infrastructure			✔		
OVERALL			✔		

Endnotes

1. For example, during a 1916 meeting in Downing Street, Sir Mark Sykes, Britain's lead negotiator with the French on carving up the Ottoman Empire in the Middle East, pointed to the map and told the Prime Minister that for Britain's sphere of influence in the Middle East, "I should like to draw a line from the *e* in Acre [modern-day Israel] to the last *k* in Kirkuk [modern-day Iraq]." See James Barr, *A Line in the Sand: Britain, France, and the Struggle That Shaped the Middle East* (London: Simon & Schuster U.K., 2011), pp. 7–20. See also Margaret McMillan, *Paris 1919: Six Months That Changed the World* (New York: Random House, 2003).

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Asia

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Ever since the founding of the American Republic, Asia has been a key U.S. area of interest for both economic and security reasons. One of the first ships to sail under an American flag was the aptly named *Empress of China*, which inaugurated America's participation in the lucrative China trade in 1784. In the more than 230 years since then, the United States has worked under the strategic assumption that allowing any single nation to dominate Asia would be inimical to American interests. Asia constitutes too important a market and is too great a source of key resources for the United States to be denied access. Thus, beginning with U.S. Secretary of State John Hay's "Open Door" policy toward China in the 19th century, the United States has worked to prevent the rise of a regional hegemon in Asia, whether it was imperial Japan or the Soviet Union.

In the 21st century, Asia's importance to the United States will continue to grow. Asia is a key source of vital natural resources and a crucial part of the global value chain in areas like electronic components. As of March 2020, six of America's top 15 trading partners were found in Asia: China (third), Japan (fourth), South Korea (sixth), Taiwan (10th), India (13th), and Vietnam (15th).[1] Disruption in Asia can affect the production of goods like cars, aircraft, and computers around the world, as well as the global financial system.

The COVID-19 pandemic that originated in China and swept through the world in early 2020 has wreaked havoc on the global economy, disrupting supply chains and defense budgets across the region. It has led to the cancellation of several series of military exercises and created new challenges for America's ongoing efforts to secure a peace deal between the Taliban and the government in Afghanistan.

Asia is of more than just economic concern, however. Several of the world's largest militaries are in Asia, including those of China, India, North and South Korea, Pakistan, Russia, and Vietnam. The United States also maintains a network of treaty alliances and security partnerships, as well as a significant military presence, in Asia, and five Asian states (China, North Korea, India, Pakistan, and Russia) possess nuclear weapons.

The region is a focus of American security concerns both because of the presence of substantial military forces and because of its legacy of conflict. Both of the two major "hot" wars fought by the United States during the Cold War (Korea and Vietnam) were fought in Asia. Moreover, the Asian security environment is unstable. For one thing, the Cold War has not ended in Asia. Of the four states divided between Communism and democracy by the Cold War, three (China, Korea, and Vietnam) are in Asia. Neither the Korean situation nor the China–Taiwan situation was resolved despite the fall of the Berlin Wall and the collapse of the Soviet Union.

The Cold War itself was an ideological conflict layered atop long-standing—and still lingering—historical animosities. Asia is home to several major territorial disputes, among them:

- Northern Territories/Southern Kuriles (Japan and Russia);

- Senkakus/Diaoyutai/Diaoyu Dao (Japan, China, and Taiwan);

- Dok-do/Takeshima (Korea and Japan);

- Paracels/Xisha Islands (Vietnam, China, and Taiwan);

- Spratlys/Nansha Islands (China, Taiwan, Vietnam, Brunei, Malaysia, and the Philippines);

- Kashmir (India and Pakistan); and

- Aksai Chin and parts of the Indian state of Arunachal Pradesh (India and China).

Even the various names applied to the disputed territories reflect the fundamental differences in point of view, as each state uses different names when referring to the disputed areas. Similarly, different names are applied to the various major bodies of water: for example, "East Sea" or "Sea of Japan" and "Yellow Sea" or "West Sea." China and India do not even agree on the length of their disputed border, with Chinese estimates as low as 2,000 kilometers and Indian estimates generally in the mid-3,000s.

These disputes over names also reflect the broader tensions rooted in historical animosities that still scar the region. Most notably, Japan's actions leading up to and during World War II remain a major source of controversy, particularly in China and South Korea where debates over issues such as what should be incorporated in textbooks and governmental statements prevent old wounds from healing. Similarly, a Chinese claim that much of the Korean Peninsula was once Chinese territory aroused reactions in both Koreas. The end of the Cold War did little to resolve any of these underlying disagreements.

It is in this light and in light of the reluctance of many states in the region to align

with great powers that one should consider the lack of a political–security architecture. There is no equivalent of NATO in Asia despite an ultimately failed mid-20th century effort to forge a parallel multilateral security architecture through the Southeast Asia Treaty Organization (SEATO). Regional security entities like the Five Power Defense Arrangement (involving the United Kingdom, Australia, New Zealand, Malaysia, and Singapore in an "arrangement" rather than an alliance) or discussion forums like the ASEAN Regional Forum (ARF) and the ASEAN Defence Ministers Meeting-Plus (ADMM-Plus) have been far weaker. There also is no Asian equivalent of the Warsaw Pact.

Instead, Asian security has been marked by a combination of bilateral alliances, mostly centered on the United States, and individual nations' efforts to maintain their own security. In recent years, these core aspects of the regional security architecture have been supplemented by "minilateral" consultations like the U.S.–Japan–Australia and India–Japan–Australia trilaterals and the quadrilateral security dialogue involving all four countries.

Nor is there much of an economic architecture undergirding East Asia. Despite substantial trade and expanding value chains among the various Asian states, as well as with the rest of the world, formal economic integration is limited. There is no counterpart to the European Union or even to the European Economic Community, just as there is no parallel with the European Coal and Steel Community, the precursor to European economic integration.

The Association of Southeast Asian Nations (ASEAN) is a far looser agglomeration of disparate states, although they have succeeded in expanding economic linkages among themselves over the past 50 years through a range of economic agreements like the ASEAN Free Trade Area (AFTA). Less important to regional stability has been the South Asia Association of Regional Cooperation (SAARC), which includes Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan, and Sri Lanka. The SAARC is largely ineffective, both because of

the lack of regional economic integration and because of the historical rivalry between India and Pakistan.

With regard to Asia-wide free trade agreements, the 11 countries remaining in the Trans-Pacific Partnership (TPP) after U.S. withdrawal subsequently modified and signed it. The Regional Comprehensive Economic Partnership—the ASEAN-centric agreement that includes China, Japan, South Korea, India, Australia, and New Zealand—has gone through 25 rounds of negotiations. When fully implemented, these agreements will help to remedy the lack of regional economic integration.

Important Alliances and Bilateral Relations in Asia

The keys to America's position in the Western Pacific are its alliances with Japan, the Republic of Korea (ROK), the Philippines, Thailand, and Australia, supplemented by very close security relationships with New Zealand and Singapore, an emerging strategic partnership with India, and evolving relationships with regional partners in Southeast Asia like Vietnam, Malaysia, and Indonesia. The U.S. also has a robust unofficial relationship with Taiwan. In South Asia, American relationships with Afghanistan and Pakistan are critical to regional peace and security.

The United States also benefits from the interoperability gained from sharing common weapons and systems with many of its allies. Many nations, for example, have equipped their ground forces with M-16/M-4–based infantry weapons and share the 5.56mm caliber ammunition; they also field F-15 and F-16 combat aircraft and employ LINK-16 data links. Australia, Japan, and South Korea are partners in production of the F-35 Joint Strike Fighter; Australia and Japan have already taken delivery of aircraft, and South Korea is due to take delivery soon. And partners like India and Australia operate American-made P8 surveillance aircraft and C-17 transport aircraft.

Consequently, in the event of conflict, the region's various air, naval, and even land forces will be able to share information in such key areas as air defense and maritime domain awareness. This advantage is further expanded by the constant ongoing range of both bilateral and multilateral exercises, which acclimate various forces to operating together and familiarize both American and local commanders with each other's standard operating procedures (SOPs), as well as training, tactics, and (in some cases) war plans. America has also signed "enabling" military agreements with several regional partners that allow for access to each other's military facilities, the sharing of intelligence and encrypted communications and equipment, and refueling each other's warships at sea.

While it does not constitute a formal alliance, in November 2017, Australia, Japan, India, and the U.S. reconstituted their quadrilateral security dialogue, popularly known as "the Quad." Officials from the four countries agreed to meet in the quadrilateral format twice a year to discuss ways to strengthen strategic cooperation and combat common threats. In 2019, the group held its first meeting at the ministerial level and added a counterterrorism tabletop exercise to its agenda. In 2020, officials from the four countries participated in a series of conference calls to discuss responses to the COVID-19 pandemic that also included government representatives from New Zealand, South Korea, and Vietnam.

Japan. The U.S.–Japan defense relationship is the linchpin of America's network of relations in the Western Pacific. The U.S.–Japan Treaty of Mutual Cooperation and Security, signed in 1960, provided for a deep alliance between two of the world's largest economies and most sophisticated military establishments, and changes in Japanese defense policies are now enabling an even greater level of cooperation on security issues, both between the two allies and with other countries in the region.

Since the end of World War II, Japan's defense policy has been distinguished by Article 9 of the Japanese constitution, which states in part that "the Japanese people forever renounce war as a sovereign right of the nation and the threat or use of force as means

of settling international disputes."[2] In effect, this article prohibits the use of force by Japan's governments as an instrument of national policy. It also has led to several other associated policies.

One such policy is a prohibition against "collective self-defense." Japan recognized that nations have a right to employ their armed forces to help other states defend themselves (i.e., to engage in collective defensive operations) but rejected that policy for itself: Japan would employ its forces only in defense of Japan. This changed in 2015. The U.S. and Japan revised their defense cooperation guidelines, and the Japanese passed legislation to enable their military to exercise limited collective self-defense in certain cases involving threats to both the U.S. and Japan, as well as in multilateral peacekeeping operations. In recent years, Japan has increased security cooperation with other Indo-Pacific democracies. This has included enhancing security agreements, participating in more multilateral military exercises, and providing ships to Southeast Asian coast guard forces.

Tokyo relies heavily on the United States for its security. In particular, it depends on the United States to deter both conventional and nuclear attacks on the home islands. The combination of the pacifist constitution and Japan's past (the atomic bombings of Hiroshima and Nagasaki, which ended World War II in the Pacific) has forestalled much public interest in obtaining an independent nuclear deterrent. Similarly, throughout the Cold War, Japan relied on the American conventional and nuclear commitment to deter Soviet and Chinese aggression.

As part of its relationship with Japan, the United States maintains some 54,000 military personnel and another 8,000 Department of Defense civilian employees in Japan under the rubric of U.S. Forces Japan (USFJ).[3] These forces include, among other things, a forward-deployed carrier battle group centered on the USS *Ronald Reagan*; an amphibious ready group at Sasebo centered on the LHA-6 *America*, an aviation-optimized amphibious assault ship; and the bulk of the Third Marine Expeditionary Force (III MEF) on Okinawa. U.S. forces exercise regularly with their Japanese counterparts, and this collaboration has expanded in recent years from air and naval exercises to include joint amphibious exercises.

The American presence is supported by a substantial American defense infrastructure throughout Japan, including Okinawa. These major bases provide key logistical and communications support for U.S. operations throughout the Western Pacific, cutting travel time substantially compared with deployments from Hawaii or the West Coast of the United States. They also provide key listening posts to monitor Russian, Chinese, and North Korean military operations. This capability is supplemented by Japan's growing array of space systems, including new reconnaissance satellites.

The Japanese government "pays roughly $2 billion per year to defray the cost of stationing U.S. military personnel in Japan."[4] These funds cover approximately 75 percent of the cost of deployed U.S. forces,[5] including utility and labor costs at U.S. bases, improvements to U.S. facilities in Japan, and the cost of relocating training exercises away from populated areas in Japan. Japan paid nearly all of the cost of new U.S. military facilities at Futenma and Iwakuni, as well as a third of the cost of new facilities in Guam. Japan purchases 90 percent of its weapons and defense systems from the United States.[6]

At least since the 1990 Gulf War, the United States has sought to expand Japanese participation in international security affairs. Japan's political system, grounded in the country's constitution, legal decisions, and popular attitudes, has generally resisted this effort. Similarly, attempts to expand Japan's range of defense activities, especially away from the home islands, have often been vehemently opposed by Japan's neighbors, especially China and South Korea, because of unresolved differences on issues ranging from territorial claims and boundaries to historical grievances, including visits by Japanese leaders to the Yasukuni Shrine, a controversial memorial to Japan's

war dead that includes some who are deemed war criminals for their conduct in World War II. Even with the incremental changes allowing for broader Japanese defense contributions, these issues will doubtless continue to constrain Japan's contributions to the alliance.

These historical issues have been serious enough to torpedo efforts to improve defense cooperation between Seoul and Tokyo. South Korean–Japanese relations took a major downturn in 2018 when the South Korean Supreme Court ruled that Japanese companies could be forced to pay occupation reparations. In December 2018, an incident between a South Korean naval ship and Japanese air force plane further exacerbated tensions. Japan responded in July 2019 by imposing restrictions on exports to South Korea of three chemicals that are critical to the production of semiconductors and smartphones.[7] In turn, Seoul threatened to withdraw from the bilateral General Security of Military Information Agreement (GSOMIA), which enables the sharing of classified intelligence and military information on the North Korean nuclear and missile threat. The Moon Jae-in administration relented and maintained the agreement, but there was public criticism of U.S. pressure.

Republic of Korea. The United States and the Republic of Korea signed their Mutual Defense Treaty in 1953. That treaty codified the relationship that had grown from the Korean War, when the United States dispatched troops to help South Korea defend itself against invasion by Communist North Korea. Since then, the two states have forged an enduring alliance supplemented by a substantial trade and economic relationship that includes a free trade agreement.

The U.S. is committed to maintaining 28,500 troops on the Korean Peninsula. This presence is centered mainly on the U.S. 2nd Infantry Division, rotating brigade combat teams, and a significant number of combat aircraft.

The U.S.–ROK defense relationship involves one of the more integrated and complex command-and-control structures. A United Nations Command (UNC) established in 1950 was the basis for the American intervention and remained in place after the armistice was signed in 1953. UNC has access to a number of bases in Japan in order to support U.N. forces in Korea. In concrete terms, however, it only oversaw South Korean and American forces as other nations' contributions were gradually withdrawn or reduced to token elements.

In 1978, operational control of frontline South Korean and American military forces passed from UNC to Combined Forces Command (CFC). Headed by the American Commander of U.S. Forces Korea, who is also Commander, U.N. Command, CFC reflects an unparalleled degree of U.S.–South Korean military integration. Similarly, the system of Korean Augmentees to the United States Army (KATUSA), which places South Korean soldiers into American units assigned to Korea, allows for an atypical degree of tactical-level integration and cooperation.

Under current command arrangements for the U.S. and ROK militaries, CFC would exercise operational control (OPCON) of all forces on the peninsula in time of war; peacetime control rests with respective national authorities, although the U.S. exercises peacetime OPCON over non-U.S., non-ROK forces located on the peninsula. In 2003, South Korean President Roh Moo-hyun, as agreed with the U.S., began to transfer wartime operational control from CFC to South Korean commanders, thereby establishing the ROK military as fully independent of the United States. This decision engendered significant opposition within South Korea and raised serious military questions about the transfer's impact on unity of command. Faced with various North Korean provocations, including a spate of missile tests as well as attacks on South Korean military forces and territory in 2010, Washington and Seoul agreed in late 2014 to postpone wartime OPCON transfer and adopt a conditions-based rather than timeline-based policy. President Moon Jae-in has advocated for an expedited OPCON transition before the end of his administration in 2021, but critical prerequisite conditions, including improvement in South

Korean forces and a decrease in North Korea's nuclear program, have yet to be met.[8]

The domestic political constraints under which South Korea's military operates are less stringent than those that govern the operations of the Japanese military. South Korea has fought alongside the United States in every conflict since the Korean War. Seoul sent 300,000 troops to the Vietnam War, and 5,000 of its soldiers were killed. At one point, it fielded the third-largest troop contingent in Iraq after the United States and Britain. It also has conducted anti-piracy operations off the coast of Somalia and has participated in peacekeeping operations in Afghanistan, East Timor, and elsewhere.

South Korean defense planning remains focused on North Korea, especially as Pyongyang has deployed its forces in ways that optimize a southward advance and has carried out several penetrations of ROK territory over the years by ship, submarine, commandos, and drones. The sinking of the South Korean frigate *Cheonan* and shelling of Yongpyeong-do in 2010, which together killed 48 military personnel, wounded 16, and killed two civilians, have only heightened concerns about North Korea.

Over the past several decades, the American presence on the peninsula has slowly declined. In the early 1970s, President Richard Nixon withdrew the 7th Infantry Division, leaving only the 2nd Infantry Division on the peninsula. Those forces have been positioned farther back so that there are now few Americans deployed on the Demilitarized Zone (DMZ).

Traditionally, U.S. military forces have engaged regularly in major exercises with their ROK counterparts, including the Key Resolve and Foal Eagle series, both of which involved the deployment of substantial numbers of forces and were intended partly to deter Pyongyang, as well as to give U.S. and ROK forces a chance to practice operating together. However, after the 2018 U.S.–North Korean Summit, President Donald Trump unilaterally announced that he was cancelling major bilateral military exercises because he thought they were provocative and expensive.[9] This decision was made without consulting the Department of Defense, U.S. Forces Korea, or allies South Korea and Japan. As of early 2020, the U.S. and South Korea have cancelled 14 exercises and have imposed constraints on additional exercises. The outbreak of COVID-19 in South Korea in 2020 led to additional curtailment of training activity, risking further degradation of allied deterrence and defense capabilities, but Seoul's rapid and effective epidemic response measures should eventually make it possible to ease some training restrictions.

The ROK government provides substantial resources to defray the costs of U.S. Forces Korea. The bilateral, cost-sharing Special Measures Agreement has offset the non-personnel costs of stationing U.S. forces in South Korea since 1991 and is renegotiated every five years. In the most recent agreement, in February 2019, South Korea agreed to increase its share of the cost to $924 million, an increase of approximately 8 percent. Later in 2019, President Trump demanded a fivefold increase of $5 billion a year, which Administration officials reportedly "justif[ied]...by saying it reflects the costs South Korea would incur if it takes operational control of combined U.S.–South Korean forces in the case of a conflict."[10] This caused strains in the alliance, and on April 1, 2020, 4,000 South Korean workers were furloughed without pay. As of May 2020, the two sides had not resolved the negotiating impasse.

South Korea spends 2.6 percent of its gross domestic product (GDP) on defense—more than is spent by any European ally. Seoul absorbs costs not covered in the cost-sharing agreement, including paying $10 billion, or 93 percent, of the cost of constructing Camp Humphreys, the largest U.S. base on foreign soil. During the past four years, South Korea has purchased $13 billion in arms from the United States.[11]

The Philippines. America's oldest defense relationship in Asia is with the Philippines. The United States seized the Philippines from the Spanish more than a century ago as a result of the Spanish–American War and a subsequent conflict with Philippine indigenous forces.

Unlike other colonial powers, however, the U.S. also put in place a mechanism for the Philippines to gain its independence, transitioning through a period as a commonwealth until the archipelago received full independence in 1946. Just as important, substantial numbers of Filipinos fought alongside the United States against Japan in World War II, establishing a bond between the two peoples. Following World War II and after assisting the newly independent Filipino government against the Communist Hukbalahap movement in the 1940s, the United States and the Philippines signed a mutual defense treaty (MDT).

For much of the period between 1898 and the end of the Cold War, the largest American bases in the Pacific were in the Philippines, centered on the U.S. Navy base in Subic Bay and the complex of airfields that developed around Clark Field (later Clark Air Base). While the Philippines have never had the ability to provide substantial financial support for the American presence, the unparalleled base infrastructure provided replenishment and repair facilities and substantially extended deployment periods throughout the East Asian littoral.

These bases, being reminders of the colonial era, were often centers of controversy. In 1991, a successor to the Military Bases Agreement between the U.S. and the Philippines was submitted to the Philippine Senate for ratification. After a lengthy debate, the Philippines rejected the treaty, compelling American withdrawal from Philippine bases. Given the effects of the 1991 eruption of Mount Pinatubo, which devastated Clark Air Base and damaged many Subic Bay facilities, and the end of the Cold War, it was not felt that closure of the bases would fundamentally damage America's posture in the region.

Moreover, despite the closing of the American bases and consequent slashing of American military assistance, U.S.–Philippine military relations remained close, and assistance began to increase again after 9/11 as U.S. forces supported Philippine efforts to counter Islamic terrorist groups, including the Abu Sayyaf

Group (ASG), in the South of the archipelago. From 2002–2015, the U.S. rotated 500–600 special operations forces regularly through the Philippines to assist in counterterrorism operations. That operation, Joint Special Operations Task Force–Philippines (JSOTF–P), ended during the first part of 2015. The U.S. presence in Mindanao continued at a reduced level until the Trump Administration, alarmed by the terrorist threat there, began Operation Pacific Eagle–Philippines (OPE-P). The presence of 200–300 American advisers proved very valuable to the Philippines in its 2017 battle against Islamist insurgents in Marawi,[12] and these advisers remain there as part of a continuing advise-and-assist mission. During the fourth quarter of 2019:

> U.S. military support to the AFP... consisted primarily of advise and assist operations and intelligence, surveillance, and reconnaissance support. [U.S. Indo-Pacific Command] stated that this support led to the neutralization of two "significant [ISIS-EA] targets" this quarter. U.S. military contractors also provided casualty evacuation support to Philippine troops wounded fighting ISIS-EA in the remote, mountainous regions of the Sulu archipelago.[13]

This is all critical context for the current state of crisis in the U.S.–Philippines alliance. In February of 2020, Philippine President Rodrigo Duterte issued formal notice for the termination of the Philippines–United States Visiting Forces Agreement (VFA). The VFA is an instrument of the MDT. It comprises the procedures governing the deployment of U.S. forces and equipment to the Philippines. It also governs the application of domestic Philippine law to U.S. personnel, which is the most substantive part of the VFA and historically its most controversial.

The VFA undergirds a wide range of around 280 annual exercises between the U.S. and the Philippines. Its termination means the arrangements for each of these exercises or

groups of exercises will have to be negotiated individually. The U.S. conducts exercises with militaries throughout Southeast Asia on this basis. It does not conduct as many with them as it does with the Philippines, however. The loss of the VFA will slow their rate, condition their composition, and expose each element to political pressures in the Philippines. It will inhibit plans to implement base improvement and sharing arrangements under the U.S.–Philippine Enhanced Defense Cooperation Agreement (EDCA). And it will complicate situations in which the U.S. must respond quickly and in an integral way with Philippine forces, as in the case of Marawi in 2017.

Beyond the insurgency threat, the U.S. government has long made it clear that any attack on Philippine government ships or aircraft, or on the Philippine armed forces—by the PRC, for instance—would be covered under the MDT treaty.[14] This makes it incumbent on the U.S.—consistent with its constitutional procedures—to come to the defense of the Philippines. In March 2019, Secretary of State Mike Pompeo reiterated this position and reaffirmed that the South China Sea is part of the Pacific for purposes of the treaty's application.[15] Termination of the VFA will make this more difficult—even at what has been a time of increasing Chinese pressure on the Philippine claims and territories under its jurisdiction in the South China Sea.

The history of U.S.–Philippines defense ties is a demonstration of both Philippine vulnerability as well as the relationship's resilience. In fact, until early 2020, the U.S. and the Philippines productively worked through waves created in their relationship by the election of Duterte four years ago.[16] The termination of the VFA will be a setback in that effort, but the long history of U.S.–Philippines history and vagaries of domestic politics offer hope for a solution that will continue to facilitate close U.S.–Philippines military cooperation.

Thailand. The U.S.–Thai security relationship is built on the 1954 Manila Pact, which established the now-defunct SEATO, and the 1962 Thanat–Rusk agreement.[17] These were supplemented by the 2012 Joint Vision Statement for the Thai–U.S. Defense Alliance.[18] (In 2003, Thailand was designated a "major, non-NATO ally," a status that gave it improved access to American arms sales.)

Thailand's central location has made it an important component of the network of U.S. alliances in Asia. During the Vietnam War, American aircraft based in Thailand ranged from fighter-bombers and B-52s to reconnaissance aircraft. In the first Gulf War and again in the Iraq War, some of those same air bases were essential for the rapid deployment of American forces to the Persian Gulf. Access to these bases remains critical to U.S. global operations.

U.S. and Thai forces exercise together regularly, most notably in the annual Cobra Gold exercises, first begun in 1982. This builds on a partnership that began with the dispatch of Thai forces to the Korean War, where over 1,200 Thai troops died out of some 6,000 deployed. The Cobra Gold exercises are among the world's largest multilateral military exercises. In 2019, it involved roughly 10,000 troops from nine countries, including 4,500 from the U.S.[19]

U.S.–Thailand relations have been strained since 2006. A coup that year and another in 2014 limited military-to-military relations for more than 10 years. In part, this was due to standing U.S. law prohibiting assistance to governments resulting from coups against democratically elected governments. Some of it was due to policy choices by the U.S. government. The U.S. and Thailand, however, have managed to salvage much of their military-to-military cooperation despite this, and now look to normalize relations. This has been made possible by two developments. One, in 2019, Thailand held elections and installed a new civilian government. And two, Washington's new, concerted strategic focus on great-power competition with China. As a result, the U.S. accepted the Thai's flawed electoral model as an opportunity to boost the relationship.

Since the new Thai government was installed in July 2019, the U.S. has moved forward with $575 million in new arms sales, including

60 Stryker armored vehicles (with more to come) and eight AH-6i reconnaissance helicopters, as well as hellfire missiles and other munitions, launchers, and equipment.[20] And in November 2019, Secretary of Defense Mark Esper and Thai Prime Minister/Defense Minister Prayut Chan-o-cha signed the Joint Vision Statement 2020 for the U.S.–Thai Defense Alliance. The new joint statement is similar to the 2012 version. It is a messaging document intended to stress the current relevancy of the military alliance, the founding documents of which can seem anachronistic when read alone. Indeed, this was an intensification of the Trump Administration's attempt to improve U.S.–Thai relations, which since early on sought to get around barriers imposed by its form of government and the previous U.S. Administration.

On the very same day, however, that the U.S.–Thai agreement was signed, Prayut also agreed to step up defense cooperation with China,[21] thereby underscoring the challenge in U.S.–Thailand relations. Thailand has been drifting from the U.S., and toward China, for many years. This process, underway since the end of the Vietnam War, has been accelerating partly because of expanding economic relations between the two states. Relations, however, are also expanding because of the aforementioned complications in U.S.–Thai relations arising from the political situation in Thailand, and a general difference in threat perception concerning China. The U.S. considers China its greatest long-term security challenge. Thailand has no such concerns.

Relations between the Thai and Chinese militaries also have improved over the years. Intelligence officers began formal meetings in 1988. Thai and Chinese military forces have engaged in joint naval exercises since 2005, joint counterterrorism exercises since 2007, and joint marine exercises since 2010 and conducted their first joint air force exercises in 2015.[22] The Thais do more bilateral exercises with the Chinese than any other military in Southeast Asia.[23] The Thais have been buying Chinese military equipment for many years. Purchases in recent years have included significant buys of battle tanks and armored personnel carriers.[24] According to the Stockholm International Peace Research Institute (SIPRI), from 2006–2019, China has been a bigger supplier than the U.S., although behind Sweden and Ukraine.[25] Among these purchases, in 2017, Thailand made the first of three planned submarine purchases in one of the most expensive arms deals in its history.[26] Submarines could be particularly critical to Sino–Thai relations because the attendant training and maintenance will require a greater Chinese military presence at Thai military facilities.

Australia. Australia is one of America's most important allies in the Asia–Pacific. U.S.–Australia security ties date back to World War I, when U.S. forces fought under Australian command on the Western Front in Europe, and deepened during World War II when, after Japan commenced hostilities in the Western Pacific (and despite British promises), Australian forces committed to the North Africa campaign were not returned to defend the continent. As Japanese forces attacked the East Indies and secured Singapore, Australia turned to the United States to bolster its defenses, and American and Australian forces cooperated closely in the Pacific War. Those ties and America's role as the main external supporter for Australian security were codified in the Australia–New Zealand–U.S. (ANZUS) pact of 1951.

A key part of the Obama Administration's "Asia pivot" was rotation of additional United States Air Force units and Marines through northern Australia. After seven years of increasingly larger rotations, the goal of a 2,500-Marine six-month rotation was reached in 2019. The 2019 contingent was the most capable to date. Among other equipment accompanying the Marines were 22 Osprey tiltrotor aircraft, helicopters, and advanced radars.[27] The 2020 deployment went ahead with only 1,200 Marines and less equipment for reasons associated with the COVID-19 crisis.[28]

The U.S. and Australia have also worked to upgrade air force and naval facilities in the area

to "accommodate stealth warplanes and long-range maritime patrol drones" and to provide refueling for visiting warships.[29] Among other things, they are actively partnering on the development of a joint naval base on Papua New Guinea's Manus Island.[30]

Since 2017, U.S.–Australia air force cooperation—an original key element of the "pivot"—has been particularly prominent in Australia's Northern Territory. In 2019, Enhanced Air Cooperation (EAC), a program operated out of Australia's northern bases, "focused…on fifth-generation fighter integration, aero-medical evacuation and aircraft maintenance" and "involved U.S. F-22 Raptor, F-35B Lightning II, F-16 Fighting Falcon and F-15 Eagle fighters, B-52 strategic bombers and C-130J Super Hercules transports…."[31]

Meanwhile, the two nations engage in a variety of security cooperation efforts, including joint space surveillance activities. These were codified in 2014 with an agreement that allows space information data to be shared among the U.S., Australia, the U.K., and Canada.[32]

The two nations' chief defense and foreign policy officials meet annually (most recently in August 2019) in the Australia–United States Ministerial (AUSMIN) process to address such issues of mutual concern as security developments in the Asia–Pacific region, global security and development, and bilateral security cooperation.[33] Australia has also granted the United States access to a number of joint facilities, including space surveillance facilities at Pine Gap, which has been characterized as "arguably the most significant American intelligence-gathering facility outside the United States,"[34] and naval communications facilities on the North West Cape of Australia.[35]

Australia and the United Kingdom are two of America's closest partners in the defense industrial sector. In 2010, the United States approved Defense Trade Cooperation Treaties with Australia and the U.K. that allow for the expedited and simplified export or transfer of certain defense services and items between the U.S. and its two key partners without the need for export licenses or other approvals under the International Traffic in Arms Regulations. This also allows for much greater integration among the American, Australian, and British defense industrial establishments.[36]

Singapore. Singapore is America's closest non-ally partner in the Western Pacific. The agreements which support the security relationship are the 2015 U.S.–Singapore Defense Cooperation Agreement (DCA)—which is an update of a similar 2005 agreement—and the 1990 Memorandum of Understanding Regarding United States Use of Facilities in Singapore—which was renewed in 2019 for another 15 years. Pursuant to these agreements and other understandings, Singapore hosts U.S. naval ships and aircraft, as well as the principle logistics support node for the U.S. Seventh Fleet.

Singapore trains "approximately 1,000 military personnel in the United States each year" on American-produced equipment like F-15SG and F-16C/D fighter aircraft and CH-47 Chinook and AH-64 Apache helicopters.[37] Singapore has most recently been approved to buy the F-35, which makes it the fourth country in the region to do so (the others being American allies Australia, Japan, and South Korea).[38]

New Zealand. For much of the Cold War, U.S. defense ties with New Zealand were similar to those between America and Australia. In 1986, as a result of controversies over U.S. Navy employment of nuclear power and the possible deployment of U.S. naval vessels with nuclear weapons, the U.S. suspended its obligations to New Zealand under the 1951 ANZUS Treaty. Defense relations improved, however, in the early 21st century as New Zealand committed forces to Afghanistan and dispatched an engineering detachment to Iraq. The 2010 Wellington Declaration and 2012 Washington Declaration, while not restoring full security ties, allowed the two nations to resume high-level defense dialogues.[39] As part of this warming of relations, New Zealand rejoined the multinational U.S.-led RIMPAC (Rim of the Pacific Exercises) naval exercises in 2012 and has participated in each iteration since then.

In 2013, U.S. Secretary of Defense Chuck Hagel and New Zealand Defense Minister Jonathan Coleman announced the resumption of military-to-military cooperation, and in July 2016, the U.S. accepted an invitation from New Zealand to make a single port call, reportedly with no change in U.S. policy to confirm or deny the presence of nuclear weapons on the ship.[40] At the time of the visit in November 2016, both sides claimed to have satisfied their respective legal requirements.[41] The Prime Minister expressed confidence that the vessel was not nuclear-powered and did not possess nuclear armaments, and the U.S. neither confirmed nor denied this. The visit occurred in a unique context, including an international naval review and relief response to the Kaikoura earthquake, but the arrangement may ultimately serve as a model for long-term solution to the nuclear impasse between the two nations. Since then, there have been several other ship visits by the U.S. Coast Guard, and in 2017, New Zealand lent the services of one its naval frigates to the U.S. Seventh Fleet following a deadly collision between the destroyer USS *Fitzgerald* and a Philippine container ship that killed seven American sailors.[42]

New Zealand is a member of the elite "five eyes" intelligence alliance with the U.S., Canada, Australia, and the U.K.

Taiwan. When the United States shifted its recognition of the government of China from the Republic of China (on Taiwan) to the People's Republic of China (PRC, the mainland), it also declared certain commitments concerning the security of Taiwan. These commitments are embodied in the Taiwan Relations Act (TRA) and the subsequent "Six Assurances."

The TRA is an American law and not a treaty. Under the TRA, the United States maintains programs, transactions, and other relations with Taiwan through the American Institute in Taiwan (AIT). Except for the Sino–U.S. Mutual Defense Treaty, which had governed U.S. security relations with Taiwan and was terminated by President Jimmy Carter following the shift in recognition to the PRC, all other treaties and international agreements made between the Republic of China and the United States remain in force.

Under the TRA, it is the policy of the United States "to provide Taiwan with arms of a defensive character."[43] The TRA also states that the U.S. "will make available to Taiwan such defense articles and services in such quantity as may be necessary to enable Taiwan to maintain a sufficient self-defense capability."[44] The U.S. has implemented these provisions of the TRA through sales of weapons to Taiwan.

The TRA states that it is also U.S. policy "to consider any effort to determine the future of Taiwan by other than peaceful means, including by boycotts or embargoes, a threat to the peace and security of the Western Pacific area and of grave concern to the United States" and "to maintain the capacity of the United States to resist any resort to force or other forms of coercion that would jeopardize the security, or the social or economic system, of the people on Taiwan."[45] To this end:

> The President is directed to inform the Congress promptly of any threat to the security or the social or economic system of the people on Taiwan and any danger to the interests of the United States arising therefrom. The President and the Congress shall determine, in accordance with constitutional processes, appropriate action by the United States in response to any such danger.[46]

Supplementing the TRA are the "Six Assurances" issued by President Ronald Reagan in a secret July 1982 memo, later publicly released and the subject of a Senate hearing. These assurances were intended to moderate the third Sino–American communiqué, itself generally seen as one of the "Three Communiqués" that form the foundation of U.S.–PRC relations. These assurances of July 14, 1982, were that:

> In negotiating the third Joint Communiqué with the PRC, the United States:
> 1. *has not agreed to set a date for ending arms sales to Taiwan;*

2. *has not agreed to hold prior con-*
    sultations with the PRC on arms
    sales to Taiwan;
3. *will not play any mediation role be-*
    tween Taipei and Beijing;
4. *has not agreed to revise the Taiwan*
    Relations Act;
5. *has not altered its position regarding*
    sovereignty over Taiwan;
6. *will not exert pressure on Taiwan to*
    negotiate with the PRC.[47]

Although the United States sells Taiwan a variety of military equipment and sends observers to its major annual exercises, it does not engage in joint exercises with the Taiwan armed forces. Some Taiwan military officers, however, attend professional military education institutions in the United States. There also are regular high-level meetings between senior U.S. and Taiwan defense officials, both uniformed and civilian.

The United States does not maintain any bases in Taiwan. In 2017, however, the U.S. Congress authorized the U.S. Department of Defense to consider ship visits to Taiwan as part of the FY 2018 National Defense Authorization Act (NDAA). Coupled with other recently passed legislation, including the 2018 Taiwan Travel Act and successive NDAAs, Congress is sending strong signals of support for greater military-to-military interaction. This could lead to a significant increase in the number and/or grade of American military officers visiting Taiwan in the coming years.

Vietnam, Malaysia, and Indonesia. The U.S. has security relationships with several key Southeast Asian countries. None of these relationships is as extensive and formal as America's relationship with Singapore and its treaty allies, but all are of growing significance. The U.S. "rebalance" to the Pacific incorporated a policy of "rebalance within the rebalance" that included efforts to expand relations with this second tier of America's security partners and diversify the geographical spread of forward-deployed U.S. forces. This requirement remains in effect.

Since shortly after the normalization of diplomatic relations between the two countries in 1995, the U.S. and Vietnam also have gradually normalized their defense relationship. The relationship was codified in 2011 with a Memorandum of Understanding Advancing Bilateral Defense Cooperation that covers five areas of operations, including maritime security. The MOU was updated with the 2015 Joint Vision Statement on Defense Cooperation, which includes a reference to "cooperation in the production of new technologies and equipment" and is implemented under a three-year 2018–2020 Plan of Action for United States–Viet Nam Defense Cooperation agreed upon in 2017.[48]

The most significant development with respect to security ties over the past several years has been the relaxation of the ban on sales of arms to Vietnam. The U.S. lifted the embargo on maritime security–related equipment in the fall of 2014 and then ended the embargo on arms sales completely in 2016. The embargo had long served as a psychological obstacle to Vietnamese cooperation on security issues, but lifting it does not necessarily change the nature of the articles that are likely to be sold.

Transfers to date have been to the Vietnamese Coast Guard. These include the provision under the Excess Defense Articles (EDA) program of a decommissioned *Hamilton*-class cutter and 18 Metal Shark patrol boats, as well as infrastructure support.[49] Two dozen more such boats are on order, and in 2019, the U.S. contracted to provide six unmanned aerial vehicles (UAVs) to Vietnam for its Coast Guard.[50] Discussions of bigger-ticket items like P-3 maritime patrol aircraft, although discussed since the relaxation of the embargo, have yet to be concluded. In his 2019 force posture statement, INDOPACOM Commander Admiral Philip Davidson cited as a priority "enhancing Vietnam's maritime capacity, which will be bolstered by Vietnam's acquisition of Scan Eagle UAVs, T-6 trainer aircraft, and a second U.S. Coast Guard cutter."[51] The cutter was subsequently announced by Secretary of Defense Mark Esper the following November in a visit to Vietnam.[52]

The Cooperative Humanitarian and Medical Storage Initiative (CHAMSI) is designed to enhance cooperation on humanitarian assistance and disaster relief by, among other things, prepositioning related American equipment in Da Nang, Vietnam.[53] During Vietnamese Prime Minister Nguyen Xuan Phuc's visit to Washington in 2017, the U.S. and Vietnam reaffirmed their commitment to this initiative, which is being implemented. In 2018, Vietnam participated in RIMPAC for the first time.

There have been two high-profile port calls to Vietnam since 2018. Early that year, the USS *Carl Vinson* visited Da Nang with its escort ships in the first port call by a U.S. aircraft carrier since the Vietnam War, and another carrier, USS *Theodore Roosevelt*, visited Da Nang in March 2020. These are significant signals from Vietnam about its receptivity to partnership with the U.S. military—messages very subtly underscored by Vietnam's *2019 Viet Nam National Defence* white paper.[54]

Nevertheless, significant limits on the U.S.–Vietnam security relationship persist, including a Vietnamese defense establishment that is very cautious in its selection of defense partners, party-to-party ties between the Communist Parties of Vietnam and China, and a Vietnamese foreign policy that seeks to balance relationships with all major powers. The U.S., like others among Vietnam's security partners, remains officially restricted to one port call a year, with an additional one to two calls on Vietnamese bases being negotiable.

The U.S. and Malaysia, despite occasional political differences, "have maintained steady defense cooperation since the 1990s." Examples of this cooperation include Malaysian assistance in the reconstruction of Afghanistan and involvement in anti-piracy operations "near the Malacca Strait and...off the Horn of Africa" as well as "jungle warfare training at a Malaysian facility, bilateral exercises like Kris Strike, and multilateral exercises like Cobra Gold, which is held in Thailand and involves thousands of personnel from several Asian countries plus the United States."[55] The U.S.

has occasionally flown P-3 and/or P-8 patrol aircraft out of Malaysian bases in Borneo.

The U.S. relationship with Malaysia was strengthened under President Barack Obama and has continued on a positive trajectory under the Trump Administration. During former Prime Minister Najib Razak's 2017 visit to Washington, Najib and President Trump committed to strengthening their two countries' bilateral defense ties, including cooperation in the areas of "maritime security, counterterrorism, and information sharing between our defense and security forces." They also "committed to pursu[ing] additional opportunities for joint exercises and training."[56] To this end, in 2018, Malaysia for the first time sent a warship to participate in U.S.-led RIMPAC exercises.[57] The new government in Malaysia is not likely to reverse these gains. Close U.S.–Malaysia defense ties can be expected to continue, albeit quietly.

The U.S.–Indonesia defense relationship was revived in 2005 following a period of estrangement caused by American concerns about human rights. It now includes regular joint exercises, port calls, and sales of weaponry. Because of their impact on the operating environment in and around Indonesia, as well as the setting of priorities in the U.S.–Indonesia relationship, the U.S. is also working closely with Indonesia's defense establishment to institute reforms in Indonesia's strategic defense planning processes.

U.S.–Indonesia military cooperation is encompassed by two agreements, the 2010 Framework Arrangement on Cooperative Activities in the Field of Defense and the 2015 Joint Statement on Comprehensive Defense Cooperation,[58] as well as the 2010 Comprehensive Partnership. These agreements encompass "more than 200 bilateral military engagements a year" and cooperation in six areas: "maritime security and domain awareness; defense procurement and joint research and development; peacekeeping operations and training; professionalization; HA/DR [High Availability/Disaster Recovery]; and countering transnational threats such as terrorism and piracy."[59]

The agreements also frame multiple arms transfers. Most significantly, in 2018, the United States carried through on the transfer of 24 refurbished F-16s to Indonesia under its EDA program and a sale of eight new Apache helicopters. In November 2019, it was reported that Indonesia was planning "to submit a request to buy two squadrons of Lockheed Martin F-16 Block 72 fighters by January 2020."[60]

The U.S. is working across the board at modest levels of investment to help build Southeast Asia's maritime security capacity. In August 2018, for example, Secretary of State Mike Pompeo announced the commitment of $290.5 million in Foreign Military Financing to strengthen maritime security, HA/DR, and peacekeeping capabilities in Southeast Asia. Perhaps most notable, however, is the Maritime Security Initiative (MSI) announced by Secretary of Defense Ashton Carter as the Southeast Asia Maritime Security Initiative in 2015, which pledged $425 million in equipment and training for Southeast Asia over a five-year period and was authorized by Congress in 2016 for a five-year term from 2016–2020. The 2019 National Defense Authorization Act reauthorized the program through 2025, rebranding it the Indo-Pacific Maritime Security Initiative and making Bangladesh, Sri Lanka, and India eligible for funds.[61]

Afghanistan. On October 7, 2001, U.S. forces invaded Afghanistan in response to the September 11, 2001, terrorist attacks on the United States. This marked the beginning of Operation Enduring Freedom to combat al-Qaeda and its Taliban supporters. The U.S., in alliance with the U.K. and the anti-Taliban Afghan Northern Alliance forces, ousted the Taliban from power in December 2001. Most Taliban and al-Qaeda leaders fled across the border into Pakistan's Federally Administered Tribal Areas, where they regrouped and initiated an insurgency in Afghanistan in 2003.

In August 2003, NATO joined the war in Afghanistan and assumed control of the International Security Assistance Force (ISAF). In 2011, at the height of the war, there were 50 troop-contributing nations and nearly 150,000 NATO and U.S. forces on the ground in Afghanistan.

On December 28, 2014, NATO formally ended combat operations and relinquished responsibility to the Afghan security forces, which numbered around 352,000 (including army and police).[62] After Afghan President Ashraf Ghani signed a bilateral security agreement with the U.S. and a Status of Forces Agreement with NATO, the international coalition launched Operation Resolute Support to train and support Afghan security forces. Most U.S. and NATO forces are stationed at bases in Kabul, with tactical advise-and-assist teams located there and in Mazar-i-Sharif, Herat, Kandahar, and Laghman.[63]

In August 2017, while declining to announce specific troop levels, President Trump recommitted America to the effort in Afghanistan and announced that "[c]onditions on the ground—not arbitrary timetables—will guide our strategy from now on."[64] He also suggested that his Administration would pursue a negotiated settlement with the Taliban.

In 2018, U.S. Special Envoy Zalmay Khalilzad initiated talks with the Taliban in Doha, Qatar, in an attempt to find a political solution to the fighting. After months of uncertainty, in February 2020, Ambassador Khalilzad and Taliban co-founder and chief negotiator Abdul Ghani Baradar signed a tentative peace agreement in Doha. There are three key points to the agreement:

First, the Taliban agreed that it will not allow al-Qaeda or any other transnational terrorist group to use Afghan soil. To this end, the Taliban agreed to "guarantees and enforcement mechanisms" to make sure that this remains the case. However, it remains unclear how the so-called guarantees and enforcement mechanisms will work in practice.

Second, the United States and its allies agreed to a timeline for the withdrawal of all forces from Afghanistan. In the short to medium term, U.S. forces will drop to 8,600—roughly the number of troops in Afghanistan when Trump entered office—from the 13,000 in country when negotiations began.

International coalition forces will reduce their troop presence proportionately. Then, if the U.S. assesses that the Taliban is upholding its end of the bargain, the remaining U.S. and international forces will withdraw nine and a half months later.

Third, and most important, talks within Afghanistan between the government and the Taliban will begin. This is the most crucial stage in the peace process. There will be no enduring and meaningful deal unless there is an agreement between the Afghan government and the Taliban. At the time this book was being prepared, because of continued Taliban attacks (albeit at reduced levels when compared to the period before the agreement in Doha), domestic political turmoil in Afghanistan following the 2019 presidential elections, and disagreements between the Afghan government and the Taliban regarding prisoner exchanges, there had been little progress. The COVID-19 global pandemic has added an additional hurdle.

Pakistan. During the early stages of the war in Afghanistan, the U.S. and NATO relied heavily on logistical supply lines running through Pakistan to resupply anti-Taliban coalition forces. Supplies and fuel were carried on transportation routes from the port at Karachi to Afghan–Pakistani border crossing points at Torkham in the Khyber Pass and Chaman in Baluchistan province. For roughly the first decade of the war, about 80 percent of U.S. and NATO supplies traveled through Pakistani territory. This amount has decreased progressively as the U.S. and allied troop presence has shrunk.

U.S.–Pakistan relations suffered an acrimonious rupture in 2011 when U.S. special forces conducted a raid on Osama bin Laden's hideout in Abbottabad not far from facilities run by the Pakistani military. In 2017, President Donald Trump suspended billions of dollars of U.S. military assistance to Pakistan and declared that "[w]e can no longer be silent about Pakistan's safe havens for terrorist organizations, the Taliban, and other groups that pose a threat to the region and beyond."[65]

Between 2001 and 2016, Pakistan received approximately $30 billion in aid and "reimbursements" from the U.S. in the form of coalition support funds (CSF) for its military deployments and operations along the border with Afghanistan. Pakistan has periodically staged offensives into the Federally Administered Tribal Areas, although its operations have tended to target anti-Pakistan militant groups like the Pakistani Taliban rather than those attacking Afghanistan and U.S.-led coalition forces operating there. In 2016, reflecting a trend of growing congressional resistance to military assistance for Pakistan, Congress blocked funds for the provision of eight F-16s to Pakistan.

According to the Congressional Research Service (CRS), U.S. aid appropriations and military reimbursements have fallen continuously since 2013, from $2.60 billion in that year to $2.18 billion in 2014, $1.60 billion in 2015, $1.20 billion in 2016, $590 million in 2017, and $108 million in 2018. This is primarily the product of a major drop in reimbursements from CSF, which once accounted for roughly half of all U.S. aid to Pakistan. This fell from $1.20 billion in 2014 to $700 million in 2015, $550 million in 2016, and zero dollars in 2017, 2018, and 2019. Since 2015, U.S. Administrations have refused to certify that Pakistan has met requirements to crack down on the Haqqani Network, an Afghan terrorist group that resides in northern Pakistan. As the CRS notes, "The NDAA for FY2019 revamped the CSF program, authorizing $350 million to support security enhancement activities along Pakistan's western border, subject to certification requirements that have not been met to date."[66]

As frustration with Pakistan has mounted on Capitol Hill, the Trump Administration has signaled a series of measures designed to hold Pakistan to account for its "double game."[67] In 2018, the U.S. military suspended all $800 million in Coalition Support Funds "due to a lack of Pakistani decisive actions in support of the [U.S.] South Asia Strategy."[68] The Administration has also supported both Pakistan's addition to the Financial Action Task Force (FATF)

"grey list" for failing to fulfill its obligations to prevent the financing of terrorism and its designation as a "Countr[y] of Particular Concern under the International Religious Freedom Act of 1998 for having engaged in or tolerated 'systematic, ongoing, [and] egregious violations of religious freedom."[69] Throughout 2019 and early 2020, Pakistan lobbied to be taken off the FATF grey list while others argued for moving it to the organization's "black list." As of April 2020, Pakistan remained on the grey list.

India. During the Cold War, U.S.–Indian military cooperation was minimal except for a brief period during the Sino–Indian border war in 1962 when the U.S. supplied India with arms and ammunition. The rapprochement was short-lived, however, and the U.S. suspended aid to India following the Second Indo-Pakistan War of 1965. The Indo–U.S. relationship was again characterized by suspicion and mistrust, especially during the 1970s under the Nixon Administration. The principal source of tension was India's robust relationship with Moscow, with which it signed a major defense treaty in 1971, and the U.S. provision of military aid to Pakistan. America's ties with India hit a nadir during the 1971 Indo–Pakistani war when the U.S. deployed the aircraft carrier USS *Enterprise* toward the Bay of Bengal in a show of support for Pakistani forces.

Military ties between the U.S. and India have improved significantly over the past decade as the two sides have moved toward establishment of a strategic partnership based on their mutual concern about rising Chinese military and economic influence and converging interests in countering regional terrorism. The U.S. has contracted to supply between $15 billion and $20 billion worth of U.S. military equipment to India, including C-130J and C-17 transport aircraft, P-8 maritime surveillance aircraft, Chinook airlift helicopters, Apache attack helicopters, artillery batteries, and AN-TPQ-37 Firefinder radar. The two countries also have several information-sharing and intelligence-sharing agreements in place, including one that covers "white" or commercial shipping in the Indian Ocean.

Defense ties between the two countries are poised to expand further as India moves forward with an ambitious military modernization program. In 2015, the U.S. and India agreed to renew and upgrade their 10-year Defense Framework Agreement. During Prime Minister Narendra Modi's visit to the U.S. in June 2016, the two governments finalized the text of a logistics and information-sharing agreement that would allow each country to access the other's military supplies and refueling capabilities through ports and military bases. The signing of the agreement, formally called the Logistics Exchange Memorandum of Agreement (LEMOA), marked a major milestone in the Indo–U.S. defense partnership. During the June 2016 visit, the U.S. also designated India a "major defense partner," a designation unique to India that is intended to facilitate its access to American defense technology. Since then, Indian and U.S. warships have begun to offer each other refueling and resupply services at sea.

The Trump Administration subsequently reaffirmed this status[70] and has taken several additional steps to advance the defense relationship. A Communications and Information Security Memorandum of Agreement (CISMOA) negotiated in 2018 allows for the exchange of encrypted communications and communications equipment. Also in 2018, the Trump Administration granted India Strategic Trade Authorization-1 (STA-1), which eases export control regulations on arms sales to India, among other things. India is only the third Asian country after Japan and South Korea to be granted STA-1 status. The same year, India established a permanent naval attaché representative to U.S. Central Command in Bahrain, fulfilling a long-standing request from New Delhi.

New Delhi and Washington regularly hold joint annual military exercises across all services, including the Yudh Abhyas army exercises, Red Flag air force exercises, and Malabar naval exercise, which added Japan as a regular participant in 2012. In late 2019, India and the U.S. held their first "tri-service" military

exercise and signed an Industrial Security Annex agreement that will facilitate defense cooperation and the sharing of sensitive information with India's private defense sector.

During a trip to India in February 2020, President Trump signed an additional $3.5 billion in defense deals, including arrangements for the sale of additional Apache attack helicopters and MH-60 Seahawk anti-submarine warfare helicopters. Negotiations on the last foundational enabling military cooperation agreement, the Basic Exchange and Cooperation Agreement (BECA), which would facilitate the exchange of geospatial intelligence and navigation services, are ongoing, and the agreement is likely to be signed in 2020.

Quality of Key Allied or Partner Armed Forces in Asia

Because of the lack of an integrated, regional security architecture along the lines of NATO, the United States partners with most of the nations in the Asian region on a bilateral basis. This means that there is no single standard to which all of the local militaries aspire; instead, there is a wide range of capabilities that are influenced by local threat perceptions, institutional interests, physical conditions, historical factors, and budgetary considerations.

Moreover, most Asian militaries have limited combat experience, particularly in high-intensity air or naval combat. Some, like Malaysia, have never fought an external war since gaining independence in the mid-20th century. The Indochina wars, the most recent high-intensity conflicts, are now nearly a half-century old. It is therefore unclear how well Asian militaries have trained for future warfare and whether their doctrine will meet the exigencies of wartime realities.

Based on examinations of equipment, however, we assess that several Asian allies and friends have substantial potential military capabilities supported by robust defense industries and significant defense spending. The defense budgets of Japan, South Korea, and Australia are estimated to be among the world's

15 largest, and the three countries' military forces field some of the world's most advanced weapons, including F-15s in the Japan Air Self Defense Force and ROK Air Force; airborne early warning (AEW) platforms; Aegis-capable surface combatants and modern diesel-electric submarines; and third-generation main battle tanks. As noted, all three nations are also involved in the production and purchase of F-35 fighters.

At this point, both the Japanese and Korean militaries are arguably more capable than most European militaries, at least in terms of conventional forces. Japan's Self Defense Forces, for example, field more tanks, principal surface combatants, and combat-capable aircraft (617, 51, and 546, respectively) than their British counterparts field (227, 20, and 222, respectively).[71] Similarly, South Korea fields a larger military of tanks, principal surface combatants, and combat-capable aircraft (more than 2,321, 26, and 563, respectively) than their German counterparts field (225, 15, and 228, respectively).[72]

Both the ROK and Japan are also increasingly interested in developing missile defense capabilities, including joint development and coproduction in the case of Japan. After much negotiation and indecision, South Korea deployed America's THAAD missile defense system on the peninsula in 2017. It is also pursuing an indigenous missile defense capability. As for Japan, its Aegis-class destroyers are equipped with SM-3 missiles, and it decided in 2017 to install the Aegis Ashore missile defense system to supplement its Patriot missile batteries.[73]

Australia also has very capable armed forces. They are smaller than NATO militaries but have major operational experience, having deployed both to Iraq and to Afghanistan as well as to help the Philippines with its Southern insurgency. Australia's military is currently involved in 13 different operations from the Middle East to the South China Sea.[74]

Singapore's small population and physical borders limit the size of its military, but in terms of equipment and training, it has Southeast Asia's largest defense budget[75] and

fields some of the region's highest-quality forces. Singapore's ground forces can deploy third-generation Leopard II main battle tanks, and its fleet includes four conventional submarines (to be replaced by four new, more capable submarines from Germany)[76] and six frigates and six missile-armed corvettes. Its air force not only has F-15E Strike Eagles and F-16s, but also has one of Southeast Asia's largest fleets of airborne early warning and control aircraft (G550-AEW aircraft) and a squadron of KC-130 tankers that can help to extend range or time on station.[77] In January 2020, Singapore was cleared by the U.S. State Department to purchase 12 F-35 combat aircraft, with an initial order placed for four aircraft and an option to purchase an additional eight.

At the other extreme, the Armed Forces of the Philippines are among the region's weakest military forces. Having long focused on waging counterinsurgency campaigns while relying on the United States for its external security, the Philippines spent only 1.1 percent of GDP on its military in 2018 (the most recent year for which SIPRI data are available).[78] In absolute numbers, its defense budget in 2019 was $3.24 billion.[79] The most modern ships in the Philippine navy are three former U.S. *Hamilton*-class Coast Guard cutters. In 2017, however, South Korea completed delivery of 12 light attack fighter aircraft to the Philippines; the Philippine air force had possessed no jet fighter aircraft since 2005 when the last of its F-5s were decommissioned. The Duterte government has expressed interest in supplementing its current fleet with a follow-on purchase of 12 more.[80]

The armed forces of American allies from outside the region, particularly those of France and the United Kingdom, should also be mentioned. France has overseas bases in New Caledonia and the South Pacific, locally based assets, and 2,900 personnel in the region.[81] It also conducts multiple naval deployments a year out of Metropolitan France. The U.K. is also very active in the region, and given its unparalleled integration with U.S. forces, can employ its capability directly in pursuit of shared objectives. It has a naval logistics facility in Singapore and Royal Gurkhas stationed in Brunei and has been an integral part of a U.S.-led mission to monitor seaborne evasions.

Current U.S. Presence in Asia

U.S. Indo-Pacific Command. Established in 1947 as U.S. Pacific Command (PACOM), USINDOPACOM is the oldest and largest of America's unified commands. According to its Web site:

> USINDOPACOM protects and defends, in concert with other U.S. Government agencies, the territory of the United States, its people, and its interests. With allies and partners, USINDOPACOM is committed to enhancing stability in the Asia–Pacific region by promoting security cooperation, encouraging peaceful development, responding to contingencies, deterring aggression, and, when necessary, fighting to win. This approach is based on partnership, presence, and military readiness.[82]

USINDOPACOM's area of responsibility (AOR) includes not only the expanses of the Pacific, but also Alaska and portions of the Arctic, South Asia, and the Indian Ocean. Its 36 nations represent more than 50 percent of the world's population and include two of the three largest economies and nine of the 10 smallest; the most populous nation (China); the largest democracy (India); the largest Muslim-majority nation (Indonesia); and the world's smallest republic (Nauru). The region is a vital driver of the global economy and includes the world's busiest international sealanes and nine of its 10 largest ports. By any meaningful measure, the Indo–Pacific is also the world's most militarized region, with eight of its 10 largest standing militaries and five of its declared nuclear nations.[83]

Under INDOPACOM are a number of component commands, including:

- **U.S. Army Pacific.** USARPAC is the Army's component command in the

Pacific. Headquartered in Hawaii and with approximately 80,000 soldiers, it supplies Army forces as necessary for various global contingencies and "has sent peacekeeping forces to the Sinai Peninsula, Haîti, East Timor, and Bosnia." Among its 12 subordinate commands are U.S. Army Japan, the 500th Military Intelligence Brigade, and U.S. Army Alaska.

- **U.S. Pacific Air Force.** PACAF is responsible for planning and conducting defensive and offensive air operations in the Asia–Pacific region. It has three numbered air forces under its command: 5th Air Force in Japan; 7th Air Force in Korea; and 11th Air Force, headquartered in Alaska. These air forces field two squadrons of F-15s, two squadrons of F-22s, five squadrons of F-16s, and a single squadron of A-10 ground attack aircraft as well as two squadrons of E-3 early-warning aircraft, tankers, and transports. Other forces that regularly come under PACAF command include B-52, B-1, and B-2 bombers.

- **U.S. Pacific Fleet.** PACFLT normally controls all U.S. naval forces committed to the Pacific, which usually represents 60 percent of the Navy's fleet. It is organized into Seventh Fleet, headquartered in Japan, and Third Fleet, headquartered in California. Seventh Fleet comprises the forward-deployed element of PACFLT and includes the only American carrier strike group (CTF-70, ported at Yokosuka, Japan) and amphibious group (CTF-76, ported at Sasebo, Japan) that are home-ported abroad. The Third Fleet's AOR spans the West Coast of the United States to the International Date Line and includes the Alaskan coastline and parts of the Arctic. In recent years, the involvement of the Third Fleet's five carrier strike groups in the Western Pacific has been eased by the blurring of this boundary between the two fleets' areas of operation under a concept called "Third Fleet Forward." Beginning

in 2015, the conduct of Freedom of Navigation Operations (FONOPS) that challenge excessive maritime claims, a part of the Navy's mission since 1979, has assumed a higher profile as a result of several well-publicized operations in the South China Sea. Under the Trump Administration, the frequency of these operations has increased significantly.

- **U.S. Marine Forces Pacific.** With its headquarters in Hawaii, MARFORPAC controls elements of the U.S. Marine Corps operating in the Asia–Pacific region. Because of its extensive responsibilities and physical span, MARFORPAC controls two-thirds of Marine Corps forces: the I Marine Expeditionary Force (MEF), centered on the 1st Marine Division, 3rd Marine Air Wing, and 1st Marine Logistics Group, and the III Marine Expeditionary Force, centered on the 3rd Marine Division, 1st Marine Air Wing, and 3rd Marine Logistics Group. The I MEF is headquartered at Camp Pendleton, California, and the III MEF is headquartered on Okinawa, although each has various subordinate elements deployed at any time throughout the Pacific on exercises, to maintain presence, or engaged in other activities. MARFORPAC is responsible for supporting three different commands: It is the U.S. Marine Corps component of USINDOPACOM, provides the Fleet Marine Forces to PACFLT, and provides Marine forces for U.S. Forces Korea (USFK).

- **U.S. Special Operations Command Pacific.** SOCPAC has operational control of various special operations forces, including Navy SEALs; Naval Special Warfare units; Army Special Forces (Green Berets); and Special Operations Aviation units in the Pacific region, including elements in Japan and South Korea. It supports the Pacific Command's Theater Security Cooperation Program as well as other plans and contingency responses. SOCPAC

forces also support various operations in the region other than warfighting, such as counterdrug operations, counterterrorism training, humanitarian assistance, and demining activities.

- **U.S. Forces Korea and U.S. Eighth Army.** Because of the unique situation on the Korean Peninsula, two subcomponents of USINDOPACOM—U.S. Forces Korea (USFK) and U.S. Eighth Army—are based in Korea. USFK, a joint headquarters led by a four-star U.S. general, is in charge of the various U.S. military elements on the peninsula. U.S. Eighth Army operates in conjunction with USFK as well as with the United Nations presence in the form of United Nations Command.

Other forces, including space capabilities, cyber capabilities, air and sealift assets, and additional combat forces, may be made available to USINDOPACOM depending on requirements and availability.

- **U.S. Central Command—Afghanistan.** Unlike the U.S. forces deployed in Japan and South Korea, there is no permanent force structure committed to Afghanistan; instead, forces rotate through the theater under the direction of U.S. Central Command (CENTCOM), USINDOPACOM's counterpart in that region of the world. As of January 2017, these forces included:

- **Resolute Support Mission,** including U.S. Forces Afghanistan.

- **Special Operations Joint Task Force—Afghanistan.** This includes a Special Forces battalion based out of Bagram Airfield and additional allied special operations forces at Kabul.

- **9th Air and Space Expeditionary Task Force.** This includes the 155th Air Expeditionary Wing, providing air support from Bagram Airfield; the 451st Air

Expeditionary Group and 455th Expeditionary Operations Group, operating from Kandahar and Bagram Airfields, respectively, providing air support and surveillance operations over various parts of Afghanistan; and the 421st Expeditionary Fighter Squadron, providing close air support from Bagram Airfield.

- **Combined Joint Task Force for Operation Freedom's Sentinel,** centered on Bagram Airfield. This is the main U.S. national support element and has a primary focus on counterterrorism operations.[84]

- **Five Train, Advise, and Assist Commands** in Afghanistan, each of which is a multinational force tasked with improving local capabilities to conduct operations.[85]

Key Infrastructure That Enables Expeditionary Warfighting Capabilities

Any planning for operations in the Pacific will be dominated by the "tyranny of distance." Because of the extensive distances that must be traversed in order to deploy forces, even Air Force units will take one or more days to deploy, and ships measure steaming time in weeks. For instance, a ship sailing at 20 knots requires nearly five days to get from San Diego to Hawaii. From there, it takes a further seven days to get to Guam; seven days to Yokosuka, Japan; and eight days to Okinawa—if ships encounter no interference along the journey.[86]

China's growing anti-access/area denial (A2/AD) capabilities, ranging from an expanding fleet of modern submarines to anti-ship ballistic and cruise missiles, increase the operational risk for deployment of U.S. forces in the event of conflict. China's capabilities not only jeopardize American combat forces that would flow into the theater for initial combat, but also would continue to threaten the logistical support needed to sustain American combat power during the subsequent days, weeks, and months.

American basing structure in the Indo–Pacific region, including access to key allied

facilities, is therefore both necessary and increasingly at risk.

American Facilities

Much as it was in the 20th century, Hawaii remains the linchpin of America's ability to support its position in the Western Pacific. If the United States cannot preserve its facilities in Hawaii, both combat power and sustainability become moot. The United States maintains air and naval bases, communications infrastructure, and logistical support on Oahu and elsewhere in the Hawaiian Islands. Hawaii is also a key site for undersea cables that carry much of the world's communications and data, as well as satellite ground stations.

The American territory of Guam is located 4,600 miles farther west. Obtained from Spain as a result of the Spanish–American War, Guam became a key coaling station for U.S. Navy ships. It was seized by Japan in World War II, was liberated by U.S. forces in 1944, and after the war became an unincorporated, organized territory of the United States. Key U.S. military facilities on Guam include U.S. Naval Base Guam, which houses several attack submarines and possibly a new aircraft carrier berth, and Andersen Air Force Base, one of a handful of facilities that can house B-2 bombers. U.S. task forces can stage out of Apra Harbor, drawing weapons from the Ordnance Annex in the island's South Central Highlands. There is also a communications and data relay facility on the island.

Guam's facilities have improved steadily over the past 20 years. B-2 bombers, for example, began to operate from Andersen Air Force Base in March 2005.[87] These improvements have been accelerated and expanded even as China's A2/AD capabilities have raised doubts about the ability of the U.S. to sustain operations in the Asian littoral. The concentration of air and naval assets as well as logistical infrastructure, however, makes the island an attractive potential target in the event of conflict. The increasing reach of Chinese and North Korean ballistic missiles reflects this growing vulnerability.

The U.S. military has noncombatant maritime prepositioning ships (MPS), which contain large amounts of military equipment and supplies, in strategic locations from which they can reach areas of conflict relatively quickly as associated U.S. Army or Marine Corps units located elsewhere arrive in the areas. U.S. Navy units on Guam and in Saipan, Commonwealth of the Northern Marianas, support prepositioning ships that can supply Army or Marine Corps units deployed for contingency operations in Asia.

Allied and Other Friendly Facilities

For the United States, access to bases in Asia has long been a vital part of its ability to support military operations in the region. Even with the extensive aerial refueling and replenishment skills of the U.S. Air Force and U.S. Navy, it is still essential for the United States to retain access to resupply and replenishment facilities, at least in peacetime. The ability of those facilities to survive and function will directly influence the course of any conflict in the Western Pacific region. Moreover, a variety of support functions, including communications, intelligence, and space support, cannot be accomplished without facilities in the region.

Today, maintaining maritime domain awareness or space situational awareness would be extraordinarily difficult without access to facilities in the Asia–Pacific region. The American alliance network is therefore a matter both of political partnership and of access to key facilities on allied soil.

Japan. In Japan, the United States has access to over 100 different facilities, including communications stations, military and dependent housing, fuel and ammunition depots, and weapons and training ranges, in addition to such major bases as the air bases at Misawa, Yokota, and Kadena and naval facilities at Yokosuka, Atsugi, and Sasebo. The naval facilities support the USS *Ronald Reagan* carrier strike group (CSG), which is home-ported in Yokosuka, and a Marine Expeditionary Strike Group (ESG) centered on the USS *America*, home-ported at Sasebo. Additionally, the

skilled workforce at places like Yokosuka is needed to maintain American forces and repair equipment in time of conflict. Replacing them would take years, if not decades.

This combination of facilities and work-force, in addition to physical location and political support, makes Japan an essential part of any American military response to contingencies in the Western Pacific. Japanese financial support for the American presence also makes these facilities some of the most cost-effective in the world.

The status of one critical U.S. base has been a matter of public debate in Japan for many years. The U.S. Marine Corps' Third Marine Expeditionary Force, based on Okinawa, is the U.S. rapid reaction force in the Pacific. The Marine Air-Ground Task Force, comprised of air, ground, and logistics elements, enables quick and effective response to crises or humanitarian disasters. To improve the political sustainability of U.S. forces by reducing the impact on the local population in that densely populated area, the Marines are relocating some units to Guam and less-populated areas of Okinawa. The latter includes moving a helicopter unit from Futenma to a new facility in a more remote location in northeastern Okinawa. Because of local resistance, construction of the Futenma Replacement Facility at Camp Schwab will not be complete until 2025, but the U.S. and Japanese governments have affirmed their support for the project.

South Korea. The United States also maintains an array of facilities in South Korea. The Army's footprint in South Korea is larger than its footprint in Japan, as the United States and South Korea remain focused on deterring North Korean aggression and preparing for any possible North Korean contingencies. The Army maintains four major facilities (which in turn control a number of smaller sites) at Daegu, Yongsan in Seoul, and Camps Red Cloud/Casey and Humphreys. These facilities support the U.S. 2nd Infantry Division, which is based in South Korea. Other key facilities include air bases at Osan and Kunsan and a naval facility at Chinhae near Pusan.

The Philippines. In 1992, the United States ended a nearly century-long presence in the Philippines when it withdrew from its base in Subic Bay as its lease there ended. The eruption of Mount Pinatubo had already forced the closure of Clark Air Base; the costs of repairing the facility were deemed too high to be worthwhile. In 2014, however, spurred by China's growing assertiveness in the South China Sea, including against Philippine claims such as Mischief Reef (seized in 1995) and Scarborough Shoal (2012), the U.S. and the Philippines negotiated the Enhanced Defense Cooperation Agreement, which allowed for the rotation of American forces through Philippine military bases.

In 2016, the two sides agreed on an initial list of five bases to be used in the Philippines. Geographically distributed across the country, they are Antonio Bautista Air Base in Palawaan, closest to the Spratlys; Basa Air Base on the main island of Luzon and closest to the hotly contested Scarborough Shoal; Fort Magsaysay, also on Luzon and the only facility on the list that is not an air base; Lumbia Air Base in Mindanao, where Manila remains in low-intensity combat with Islamist insurgents; and Mactan-Benito Ebuen Air Base in the central Philippines.[88] In 2018, construction was completed on a humanitarian assistance and disaster relief warehouse located at Basa Air Base in Pampanga, central Luzon, the main Philippine island.[89] In 2019, American F-16s based in South Korea deployed there for a 12-day exercise with Philippine fighter jets.[90]

It remains unclear precisely which additional forces would be rotated through the Philippines as a part of this agreement, which in turn affects the kinds of facilities that would be most needed. The base upgrades and deployments pursuant to the EDCA are part of a broader expansion of U.S.–Philippine defense ties begun under the Aquino government and continued under President Duterte with some adjustments throughout the first half of the Duterte administration. At the time this book was being prepared, the extent of U.S.–Philippines military cooperation, including

implementation of the EDCA, was in doubt as a result of Duterte's on-again, off-again interest in terminating the VFA.

Singapore. The United States does not have bases in Singapore, but it is allowed access to several key facilities that provide essential support for American forward presence. Since the closure of its facilities at Subic Bay, the United States has been allowed to operate the principal logistics command for the Seventh Fleet out of the Port of Singapore Authority's Sembawang Terminal. The U.S. Navy also has access to Changi Naval Base, one of the few docks in the world that can handle a 100,000-ton American aircraft carrier. A small U.S. Air Force contingent operates out of Paya Lebar Air Base to support U.S. Air Force combat units visiting Singapore and Southeast Asia, and Singapore hosts Littoral Combat Ships (LCS) and a rotating squadron of F-16 fighter aircraft.

Australia. The most prominent element of the U.S. presence in Australia is the deployment of U.S. Marines to Darwin in northern Australia. In keeping with Australian sensitivities about permanent American bases on Australian soil, the Marines do not constitute a permanent presence in Australia.[91] Similarly, the United States jointly staffs the Joint Defence Facility Pine Gap and the Joint Geological and Geophysical Research Station at Alice Springs and has access to the Harold E. Holt Naval Communication Station, including its space surveillance radar system, in western Australia.[92]

Finally, the United States is granted access to a number of facilities in Asian states on a contingency or crisis basis. Thus, U.S. Air Force units transited Thailand's U-Tapao Air Base and Sattahip Naval Base during the first Gulf War and during the Iraq War, but they do not maintain a permanent presence there.

Additionally, the U.S. Navy conducts hundreds of port calls throughout the region.

Diego Garcia. The American facilities on the British territory of Diego Garcia are vital to U.S. operations in the Indian Ocean and Afghanistan and provide essential support for operations in the Middle East and East Asia. The island is home to the seven ships of Maritime Prepositioning Squadron-2 (MPS-2), which can support a Marine brigade and associated Navy elements for 30 days.[93] Several elements of the U.S. global space surveillance and communications infrastructure, as well as basing facilities for the B-2 bomber, are also located on the island.

Conclusion

The Asian strategic environment is extremely expansive. It includes half the globe and is characterized by a variety of political relationships among states that possess wildly varying capabilities. The region includes long-standing American allies with relationships dating back to the beginning of the Cold War as well as recently established states and some long-standing adversaries such as North Korea.

American conceptions of the region must therefore recognize the physical limitations imposed by the tyranny of distance. Moving forces within the region (never mind to it) will take time and require extensive strategic lift assets as well as sufficient infrastructure, such as sea and aerial ports of debarkation that can handle American strategic lift assets, and political support. At the same time, the complicated nature of intra-Asian relations, especially unresolved historical and territorial issues, means that the United States, unlike Europe, cannot necessarily count on support from all of its regional allies in responding to any given contingency.

Scoring the Asia Operating Environment

As with the operating environments of Europe and the Middle East, we assessed the characteristics of Asia as they could be expected to facilitate or inhibit America's ability to conduct military operations to defend its vital national interests against threats. Our

assessment of the operating environment utilized a five-point scale that ranges from "very poor" to "excellent" conditions and covers four regional characteristics of greatest relevance to the conduct of military operations:

1. **Very Poor.** Significant hurdles exist for military operations. Physical infrastructure is insufficient or nonexistent, and the region is politically unstable. The U.S. military is poorly placed or absent, and alliances are nonexistent or diffuse.

2. **Unfavorable.** A challenging operating environment for military operations is marked by inadequate infrastructure, weak alliances, and recurring political instability. The U.S. military is inadequately placed in the region.

3. **Moderate.** A neutral to moderately favorable operating environment is characterized by adequate infrastructure, a moderate alliance structure, and acceptable levels of regional political stability. The U.S. military is adequately placed.

4. **Favorable.** A favorable operating environment includes good infrastructure, strong alliances, and a stable political environment. The U.S. military is well placed for future operations.

5. **Excellent.** An extremely favorable operating environment includes well-established and well-maintained infrastructure, strong and capable allies, and a stable political environment. The U.S. military is exceptionally well placed to defend U.S. interests.

The key regional characteristics consisted of:

a. **Alliances.** Alliances are important for interoperability and collective defense, as allies would be more likely to lend support to U.S. military operations. Indicators that provide insight into the strength or health of an alliance include whether the U.S. trains regularly with countries in the region, has good interoperability with the forces of an ally, and shares intelligence with nations in the region.

b. **Political Stability.** Political stability brings predictability for military planners when considering such things as transit, basing, and overflight rights for U.S. military operations. The overall degree of political stability indicates whether U.S. military actions would be hindered or enabled and reflects, for example, whether transfers of power in the region are generally peaceful and whether there have been any recent instances of political instability in the region.

c. **U.S. Military Positioning.** Having military forces based or equipment and supplies staged in a region greatly facilitates the ability of the United States to respond to crises and, presumably, achieve successes in critical "first battles" more quickly. Being routinely present in a region also assists in maintaining familiarity with its characteristics and the various actors that might act to assist or thwart U.S. actions. With this in mind, we assessed whether or not the U.S. military was well positioned in the region. Again, indicators included bases, troop presence, prepositioned equipment, and recent examples of military operations (including training and humanitarian) launched from the region.

d. **Infrastructure.** Modern, reliable, and suitable infrastructure is essential to military operations. Airfields, ports, rail lines, canals, and paved roads enable the U.S. to stage, launch operations from, and logistically sustain combat operations. We combined expert knowledge of regions with publicly available information on critical infrastructure to arrive at our overall assessment of this metric.[94]

For Asia, we arrived at these average scores (rounded to the nearest whole number):

- Alliances: **4—Favorable**

- Political Stability: **3—Moderate**

- U.S. Military Positioning: **4—Favorable**

- Infrastructure: **4—Favorable**

Aggregating to a regional score of: **Favorable**

Operating Environment: Asia

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Alliances				✔	
Political Stability			✔		
U.S. Military Posture				✔	
Infrastructure				✔	
OVERALL				✔	

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Conclusion: Scoring the Global Operating Environment

The United States is a global power with global security interests, and threats to those interests can emerge from any region. Consequently, the U.S. military must be ready to operate in any region when called upon to do so and must account for the range of conditions that it might encounter when planning for potential military operations. This informs its decisions about the type and amount of equipment it purchases (especially to transport and sustain the force); the location or locations from which it might operate; and how easily it can or cannot project and sustain combat power when engaged with the enemy.

Aggregating the three regional scores provides a Global Operating Environment score of **FAVORABLE** in the *2021 Index*.

Global Operating Environment

	VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
Europe				✓	
Middle East			✓		
Asia				✓	
OVERALL				✓	

Europe. Overall, the European region remains a stable, mature, and friendly operating environment. Russia remains the preeminent military threat to the region, both conventionally and unconventionally, but China has become a significant presence through its propaganda, influence operations, and investments in key sectors. Both NATO and many non-NATO European countries have reason to be increasingly concerned about the behavior and ambitions of both Russia and China, although agreement on a collective response to these challenges remains elusive.

The past year saw continued U.S. reengagement with the continent, both militarily and politically, along with modest increases in

Global Operating Environment: Summary

VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT

European allies' defense budgets and capability investment. Despite allies' initial concerns, the U.S. has increased its investment in Europe, and its military position on the continent is stronger than it has been for some time. The economic, political, and societal impacts of the COVID-19 pandemic are only beginning to be felt and will undoubtedly have to be reckoned with for years to come, especially with respect to Europe's relationship with China.

NATO's renewed focus on collective defense has resulted in a focus on logistics. The biggest challenges to the alliance derive from capability and readiness gaps for many European nations, the importance of continuing improvements and exercises in the realm of logistics, a tempestuous Turkey, disparate threat perceptions within the alliance, and the need to establish the ability to mount a robust response to both linear and nonlinear forms of aggression.

For Europe, scores this year remained steady, as they did in 2019 (assessed in the *2020 Index*), with no substantial changes in any individual categories or average scores. The *2021 Index* again assesses the European Operating Environment as "favorable."

The Middle East. Once considered relatively stable, mainly because of the ironfisted rule of authoritarian regimes, the Middle East is now highly unstable and a breeding ground for terrorism. Overall, regional security has deteriorated in recent years. Even though the Islamic State (or at least its physical presence) appears to have been defeated, the nature of its successor is unclear. Iraq's political situation and future relations between Baghdad and the United States will remain difficult as long as a government that is sympathetic to Iran is in power. The regional dispute with Qatar has made U.S. relations in the region even more complex and difficult to manage, although it has not stopped the U.S. military from operating.

The Middle East region's principal security and political challenges are surging transnational terrorism and meddling by Iran, which seeks to extend its influence in the Islamic world. The Arab–Israeli conflict, Sunni–Shia sectarian divides, the rise of Iran's Islamist revolutionary nationalism, and the proliferation of Sunni Islamist revolutionary groups all continue to keep the region at risk of war. America's relationships in the region are based pragmatically on shared security and economic concerns. As long as these issues remain relevant to both sides, the U.S. is likely to have an open door to operate in the Middle East when its national interests require that it do so.

Although circumstances in all measured areas vary throughout the year, in general terms, the *2021 Index* assesses the Middle East Operating Environment as "moderate," but the region's political stability continues to be "unfavorable" and will remain a dark cloud over everything else.

Asia. The Asian strategic environment includes half the globe and is characterized by a variety of political relationships among states that have wildly varying capabilities. This makes Asia far different from Europe, which in turn makes America's relations with the region different from its relations with Europe. American conceptions of Asia must recognize the physical limitations imposed by the tyranny of distance and the challenge of moving forces as necessary to respond to challenges from China and North Korea. The complicated nature of intra-Asian relations and the lack of an integrated, regional security architecture along the lines of NATO make defense of U.S. security interests more challenging than many Americans appreciate.

We continue to assess the Asia region as "favorable" to U.S. interests in terms of alliances, overall political stability, militarily relevant infrastructure, and the presence of U.S. military forces.

Summarizing the condition of each region enables us to get a sense of how they compare in terms of the challenge the U.S. would have in projecting military power and sustaining combat operations in each one. As a whole, the global operating environment currently maintains a score of "favorable," which means that the United States should be able to project

military power anywhere in the world as necessary to defend its interests without substantial opposition or high levels of risk.

Threats to U.S. Vital Interests

Assessing Threats to U.S. Vital Interests

The United States is a global power with global interests. Scaling its military power to threats requires judgments with regard to the importance and priority of those interests, whether the use of force is the most appropriate and effective way to address the threats to those interests, and how much and what types of force are needed to defeat such threats.

This *Index* focuses on three fundamental, vital national interests:

- Defense of the homeland;

- Successful conclusion of a major war that has the potential to destabilize a region of critical interest to the U.S.; and

- Preservation of freedom of movement within the global commons: the sea, air, and outer space domains through which the world conducts business.

The geographical focus of the threats in these areas is further divided into three broad regions: Asia, Europe, and the Middle East.

Obviously, these are not America's only interests. Among many others are the growth of economic freedom in trade and investment, the observance of internationally recognized human rights, and the alleviation of human suffering beyond our borders. None of these other interests, however, can be addressed principally and effectively by the use of military force, nor would threats to them necessarily result in material damage to the foregoing vital national interests. These additional American interests,

however important they may be, therefore are not used in this assessment of the adequacy of current U.S. military power.

There are many publicly available sources that discuss the status, capabilities, and activities of countries with respect to military power. Perhaps the two most often cited as references are *The Military Balance,* published annually by the London-based International Institute for Strategic Studies,[1] and the annual *World-wide Threat Assessment of the US Intelligence Community* (WWTA).[2] The former is an unmatched resource for researchers who want to know, for example, the strength, composition, and disposition of a country's air force or navy. The latter serves as a reference point produced by the U.S. government.

Comparison of our detailed, reviewed analysis of specific countries with both *The Military Balance* and the WWTA reveals two stark limitations in these external sources.

- *The Military Balance* is an excellent, widely consulted source, but it is only a count of military hardware without context in terms of equipment capability, maintenance and readiness, training, manpower, integration of services, doctrine, or the behavior of competitors—those that threaten the national interests of the U.S. as defined in this *Index*.

- The WWTA omits many threats, and its analysis of those that it does address is limited. Moreover, it does not reference underlying strategic dynamics that are key to the evaluation of threats and that may

Threat Categories

Behavior	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Capability	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL

be more predictive of future threats than is a simple extrapolation of current events.

We suspect that this is a consequence of the U.S. intelligence community's withholding from public view its very sensitive assessments, which are derived from classified sources and/or result from analysis of unclassified, publicly available documents, with the resulting synthesized insights becoming classified by virtue of what they reveal about U.S. determinations and concerns. The need to avoid the compromising of sources, methods of collection, and national security findings makes such a policy understandable, but it also causes the WWTA's threat assessments to be of limited value to policymakers, the public, and analysts working outside of the government. Consequently, we do not use the WWTA as a reference, given its quite limited usefulness, but trust that the reader will double-check our conclusions by consulting the various sources cited in the following pages as well as other publicly available reporting that is relevant to challenges to core U.S. security interests that are discussed in this section.

Measuring or categorizing a threat is problematic because there is no absolute reference that can be used in assigning a quantitative score. Two fundamental aspects of threats, however, are germane to this *Index*: the threatening entity's desire or intent to achieve its objective and its physical ability to do so. Physical ability is the easier of the two to assess; intent is quite difficult. A useful surrogate for intent is observed behavior, because this is where intent becomes manifest through action. Thus, a provocative, belligerent pattern of behavior that seriously threatens U.S. vital interests would be very worrisome. Similarly, a comprehensive ability to accomplish objectives even in the face of U.S. military power would be of

serious concern to U.S. policymakers, while weak or very limited abilities would lessen U.S. concern even if an entity behaved provocatively vis-à-vis U.S. interests. It is the combination of the two—behavior and capability—that informs our final score for each assessed actor.

Each categorization used in the *Index* conveys a word picture of how troubling a threat's behavior and set of capabilities have been during the assessed year. The five ascending categories for observed behavior are:

- Benign,

- Assertive,

- Testing,

- Aggressive, and

- Hostile.

The five ascending categories for physical capability are:

- Marginal,

- Aspirational,

- Capable,

- Gathering, and

- Formidable.

As mentioned, these characterizations—behavior and capability—form two halves of an overall assessment of the threats to U.S. vital interests.

We always hold open the potential to add or delete from our list of threat actors. The

inclusion of any state or non-state entity is based solely on our assessment of its ability to present a meaningful challenge to a critical U.S. interest.

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China

Dean Cheng

The Asia region (also known as the Indo-Pacific region) hosts a variety of threats to the U.S. homeland and international common spaces as well as a general threat of regional war that stems from a handful of inter-state rivalries. Included in this range of threats is a growing and increasingly multifaceted set of threats from an increasingly powerful China. America's forward-deployed military bases throughout the Western Pacific, five treaty allies, security partners in Taiwan and Singapore, and growing security partnership with India are keys to the U.S. strategic footprint in Asia, and all are threatened by China.

- Taiwan faces a long-standing, well-equipped, purposely positioned, and increasingly active military threat from China;

- Japan, Vietnam, and the Philippines, by virtue of maritime territorial disputes, are subject to paramilitary, military, and political pressure from China;

- India is geographically positioned between two major security threats: Pakistan to its west and China to its northeast; and

- Pakistan has an unresolved territorial dispute with China that is the cause of periodic tensions.

Threats to the Homeland

In the 2017 National Security Strategy, the Trump Administration made clear that it was shifting the focus of American security planning away from counterterrorism and back toward great-power competition. In particular, it noted that:

> China and Russia challenge American power, influence, and interests, attempting to erode American security and prosperity. They are determined to make economies less free and less fair, to grow their militaries, and to control information and data to repress their societies and expand their influence....
>
> These [and other such] competitions require the United States to rethink the policies of the past two decades—policies based on the assumption that engagement with rivals and their inclusion in international institutions and global commerce would turn them into benign actors and trustworthy partners. For the most part, this premise turned out to be false.[1]

China and Russia are seen as revisionist powers, but they pose very different challenges to the United States. The People's Republic of China (PRC) has a far larger economy, as well as the world's second-largest gross domestic product (GDP), and is intertwined in the global supply chain for crucial technologies,

especially those relating to information and communications technology (ICT). As a result, it has the resources to support its comprehensive program of military modernization, which has been underway for more than two decades and spans the conventional, space, and cyber domains as well as weapons of mass destruction, including nuclear weapons.

At the same time, the PRC has been acting more assertively, even aggressively, against more of its neighbors. Unresolved border and territorial claims have led Beijing to adopt an increasingly confrontational attitude with regard to the South China Sea and India, and cross-Strait tensions have reemerged as a result of Beijing's reaction to the Democratic Progressive Party's victories in Taiwan's 2016 and 2020 elections.

A May 2020 report from the U.S.–China Economic and Security Review Commission warned that China was undermining global health by using its influence at multilateral institutions "to exclude Taiwan from the international response to the [COVID-19] pandemic." The report claimed that "China also intensified its multi-faceted pressure campaign against Taiwan. Chinese military aircraft crossed the median line of the Taiwan Strait three times in the early months of 2020, after only one such incursion in 2019." It further noted that China conducted several provocative military exercises around the island and "continued its efforts to poach Taiwan's remaining diplomatic allies as the virus spread."[2]

Growing Conventional Capabilities. The Chinese People's Liberation Army (PLA) remains one of the world's largest militaries, but its days of having to rely on largely obsolescent equipment are in the past. Nearly two decades of officially acknowledged double-digit growth in the Chinese defense budget have resulted in a comprehensive modernization program that has benefited every part of the PLA. This has been complemented by improvements in Chinese military training and, at the end of 2015, the largest reorganization in the PLA's history.[3] The PLA's overall size has shrunk, including a 300,000-person

cut in the past two years, but its overall capabilities have increased as older platforms have been replaced with newer systems that are much more sophisticated.

A major part of the 2015 reorganization was the establishment of a separate ground forces headquarters and bureaucracy; previously, the ground forces had been the default service providing staffs and commanders. Now the PLA Army (PLAA), responsible for the PLA's ground forces, is no longer automatically in charge of war zones or higher headquarters functions. At the same time, the PLAA has steadily modernized its capabilities, incorporating both new equipment and a new organization. It has shifted from a division-based structure toward a brigade-based one and has been improving its mobility, including heliborne infantry and fire support.[4] These forces are increasingly equipped with modern armored fighting vehicles, air defenses, both tube and rocket artillery, and electronic support equipment.

The PLA Navy (PLAN) is Asia's largest navy. Although the total number of ships has dropped, the PLAN has fielded increasingly sophisticated and capable multi-role ships. Multiple classes of surface combatants are now in series production, including the Type 055 cruiser and the Type 052C and Type 052D guided missile destroyers, each of which fields long-range surface-to-air (SAM) and anti-ship cruise missile systems, as well as the Type 054 frigate and Type 056 corvette.

The PLAN has similarly been modernizing its submarine force. Since 2000, the PLAN has consistently fielded between 50 and 60 diesel-electric submarines, but the age and capability of the force have been improving as older boats, especially 1950s-vintage *Romeo*-class boats, are replaced with newer designs. These include a dozen *Kilo*-class submarines purchased from Russia and domestically designed and manufactured *Song* and *Yuan* classes. All of these are believed to be capable of firing both torpedoes and anti-ship cruise missiles.[5] The Chinese have also developed variants of the *Yuan*, with an air-independent propulsion (AIP) system that reduces the

boats' vulnerability by removing the need to use noisy diesel engines to recharge batteries.[6]

The PLAN has also been expanding its amphibious assault capabilities. The Chinese have announced a plan to triple the size of the PLA naval infantry force (their counterpart to the U.S. Marine Corps) from two brigades totaling 10,000 troops to seven brigades with 30,000 personnel.[7] To move this force, the Chinese have begun to build more amphibious assault ships, including Type 071 amphibious transport docks.[8] Each can carry about 800 naval infantrymen and move them to shore by means of four air-cushion landing craft and four helicopters.

Supporting these expanded naval combat forces is a growing fleet of support and logistics vessels. The 2010 PRC defense white paper noted the accelerated construction of "large support vessels." It also specifically noted that the navy is exploring "new methods of logistics support for sustaining long-time maritime missions."[9] These include tankers and fast combat support ships that extend the range of Chinese surface groups and allow them to operate for more prolonged periods away from main ports. Chinese naval task forces dispatched to the Gulf of Aden have typically included such vessels.

The PLAN has also been expanding its naval aviation capabilities, the most publicized element of which has been a growing carrier fleet. This currently includes not only the *Liaoning*, purchased from Ukraine over a decade ago, but a domestically produced copy that is in workups. While both of these ships have ski jumps for their air wing, the Chinese are also building several conventional takeoff/barrier landing (CATOBAR) carriers (like American or French aircraft carriers) that will employ catapults and therefore allow their air complement to carry more ordnance and/or fuel.[10]

The PLAN's land-based element is modernizing as well, with a variety of long-range strike aircraft, anti-ship cruise missiles, and unmanned aerial vehicles (UAVs) entering the inventory. In addition to more modern versions of the H-6 twin-engine bombers (a version of the Soviet/Russian Tu-16 Badger), the PLAN's Naval Aviation force has added a range of other strike aircraft to its inventory. These include the JH-7/FBC-1 Flying Leopard, which can carry between two and four YJ-82 anti-ship cruise missiles, and the Su-30 strike fighter.

The PLA Air Force (PLAAF), with over 1,700 combat aircraft, is Asia's largest air force. It has shifted steadily from a force focused on homeland air defense to one capable of power projection, including long-range precision strikes against both land and maritime targets. The PLAAF has over 700 fourth-generation fighters (comparable to the U.S. F-15/F-16/F-18). They include the domestically designed and produced J-10 as well as the Su-27/Su-30/J-11 system (comparable to the F-15 or F-18) that dominates both the fighter and strike missions.[11] China is also believed to be preparing to field two stealthy fifth-generation fighter designs. The J-20 is the larger aircraft and resembles the American F-22 fighter. The J-31 appears to resemble the F-35 but with two engines rather than one. The production of advanced combat aircraft engines remains one of the greatest challenges to Chinese fighter design.

The PLAAF is also deploying increasing numbers of H-6 bombers, which can undertake longer-range strike operations, including operations employing land-attack cruise missiles. Like the American B-52 and Russian Tu-95, the H-6 is a 1950s-era design (copied from the Soviet-era Tu-16 Badger bomber), but the latest versions (H-6K) are equipped with updated electronics and engines and are made of carbon composites.

Equally important, the PLAAF has been introducing a variety of support aircraft, including airborne early warning (AEW), command and control (C2), and electronic warfare (EW) aircraft. These systems field state-of-the-art radars and electronic surveillance systems that allow Chinese air commanders to detect potential targets, including low-flying aircraft and cruise missiles, more quickly and gather additional intelligence on adversary radars

and electronic emissions. In addition, more and more of China's combat aircraft are capable of undertaking mid-air refueling, which allows them to conduct extended, sustained operations, and the Chinese aerial tanker fleet (based on the H-6 aircraft) has been expanding.

At the biennial Zhuhai Air Show, Chinese companies have displayed a variety of unmanned aerial vehicles that reflect substantial investments and research and development efforts. The surveillance and armed UAV systems include the Xianglong (Soaring Dragon) and Sky Saber systems. The 2019 U.S. Department of Defense (DOD) report on Chinese capabilities also reported that China had tested a cargo drone, the AT-200, capable of carrying 1.5 tons of cargo.[12] Chinese UAVs have been included in various military parades over the past several years, suggesting that they are being incorporated into Chinese forces, and the 2018 DOD report on Chinese capabilities states that "China's development, production and deployment of domestically-developed reconnaissance and combat UAVs continues to expand."[13]

The PLAAF is also responsible for the Chinese homeland's strategic air defenses. Its array of surface-to-air missile batteries is one of the largest in the world and includes the S-300 (SA-10B/SA-20) and its Chinese counterpart, the Hongqi-9 long-range SAM. In 2018, the Russians began to deliver the S-400 series of long-range SAMs to China. These missiles represent a substantial improvement in PLAAF air defense capabilities, as the S-400 has both anti-aircraft and anti-missile capabilities.[14] China has deployed these SAM systems in a dense, overlapping belt along its coast, protecting the nation's economic center of gravity. Key industrial and military centers such as Beijing are also heavily defended by SAM systems.

Unlike the U.S. military, China's airborne forces are part of the PLAAF. The 15th Airborne Corps has been reorganized from three airborne divisions to six airborne brigades in addition to a special operations brigade, an aviation brigade, and a support brigade. The force has been incorporating indigenously developed airborne mechanized combat vehicles

for the past decade, giving them more mobility and a better ability to engage armored forces.

Nuclear Capability. Chinese nuclear forces are the responsibility of the PLA Rocket Forces (PLARF), one of the three new services created on December 31, 2015. China's nuclear ballistic missile forces include land-based missiles with a range of 13,000 kilometers that can reach the U.S. (CSS-4) and submarine-based missiles that can reach the U.S. when the submarine is deployed within missile range.

The PRC became a nuclear power in 1964 when it exploded its first atomic bomb as part of its "two bombs, one satellite" effort. In quick succession, China then exploded its first thermonuclear bomb in 1967 and orbited its first satellite in 1970, demonstrating the capability to build a delivery system that can reach the ends of the Earth. China chose to rely primarily on a land-based nuclear deterrent instead of developing two or three different basing systems as the United States did.

Furthermore, unlike the United States or the Soviet Union, China chose to pursue only a minimal nuclear deterrent. The PRC fielded only a small number of nuclear weapons, with estimates of about 90 intercontinental ballistic missiles (ICBMs).[15] Its only ballistic missile submarine (SSBN) conducted relatively few deterrence patrols (perhaps none),[16] and its first-generation SLBM, the JL-1, if it ever attained full operational capability had only limited reach. The JL-1's 1,700-kilometer range makes it comparable to the first-generation Polaris A1 missile fielded by the U.S. in the 1960s.

Although it remained stable for several decades, China's nuclear force has been part of its modernization effort. The result has been modernization and some expansion of the Chinese nuclear deterrent. The core of China's ICBM force is the DF-31 series, a solid-fueled, road-mobile system, along with a growing number of longer-range, road-mobile DF-41 missiles that may already be in the PLA operational inventory. The DF-41 may be deployed with multiple independently targetable reentry vehicles (MIRVs).[17] China's medium-range

nuclear forces have similarly shifted to mobile, solid-rocket systems so that they are both more survivable and more easily maintained.

Notably, the Chinese are expanding their ballistic missile submarine fleet. Replacing the one Type 092 *Xia*-class SSBN are perhaps six Type 094 *Jin*-class SSBNs, four of which are already operational. They will likely be equipped with the new, longer-range JL-2 SLBM.[18] Such a system would give the PRC a "secure second-strike" capability, substantially enhancing its nuclear deterrent.

There is also some possibility that the Chinese nuclear arsenal now contains land-attack cruise missiles. The CJ-20, a long-range, air-launched cruise missile carried on China's H-6 bomber, may be nuclear tipped, although there is not much evidence at this time that China has pursued such a capability. China is also believed to be working on a cruise missile submarine that, if equipped with nuclear cruise missiles, would further expand the range of its nuclear attack options.[19]

As a result of its modernization efforts, China's nuclear forces appear to be shifting from a minimal deterrent posture (one suited only to responding to an attack and even then with only limited numbers) to a more robust but still limited deterrent posture. While the PRC will still likely field fewer nuclear weapons than either the United States or Russia, it will field a more modern and diverse set of capabilities than India, Pakistan, or North Korea, its nuclear-armed neighbors. If there are corresponding changes in doctrine, modernization will enable China to employ limited nuclear options in the event of a conflict.

In addition to strategic nuclear forces, the PLARF has responsibility for medium-range and intermediate-range ballistic missile (MRBM and IRBM) forces. These include the DF-21 and DF-26 missiles, the latter of which, with a range of approximately 4,000 kilometers, is "capable of ranging targets in the Indo-Pacific region" as far as away Guam and southern India.[20] It is believed that Chinese missile brigades equipped with these systems may have both nuclear and conventional responsibilities, making any deployment from garrison much more ambiguous from a stability perspective. The expansion of these forces also raises questions about the total number of Chinese nuclear warheads.

Cyber and Space Capabilities. The major 2015 reorganization of the PLA included the creation of the PLA Strategic Support Force (PLASSF), which brings the Chinese military's electronic warfare, network warfare (including cyber), and space warfare forces under a single service umbrella. Previously, these capabilities had been embedded in different departments across the PLA's General Staff Department and General Armaments Department. By consolidating them into a single service, the PLA has created a Chinese "information warfare" force that is responsible for offensive and defensive operations in the electromagnetic and space domains.

Chinese network warfare forces have been identified as conducting a variety of cyber and network reconnaissance operations as well as cyber economic espionage. In 2014, the U.S. Department of Justice charged PLA officers from Unit 61398, then of the General Staff Department's 3rd Department, with theft of intellectual property and implanting of malware in various commercial firms.[21] Members of that unit are thought also to be part of "Advanced Persistent Threat-1," a group of computer hackers believed to be operating on behalf of a nation-state rather than a criminal group. In 2020, the Department of Justice charged a number of PLA officers with one of the largest breaches in history, accusing them of stealing 147 million people's credit ratings and records from Equifax.[22]

Chinese space capabilities gained public prominence in 2007 when the PLA conducted an anti-satellite (ASAT) test in low-Earth orbit against a defunct Chinese weather satellite. The test became one of the worst debris-generating incidents of the Space Age, with several thousand pieces of debris generated, many of which will remain in orbit for over a century. However, the PRC has been conducting space operations since 1970 when it first

orbited a satellite. Equally important, Chinese counter-space efforts have been expanding steadily. The PLA has not only tested ASATs against low-Earth orbit systems, but is also believed to have tested a system designed to attack targets at geosynchronous orbit (GEO), approximately 22,000 miles above the Earth. As many vital satellites are at GEO, including communications and missile early-warning systems, China's ability to target such systems constitutes a major threat.

The creation of the PLASSF, incorporating counter-space forces, reflects the movement of counter-space systems, including direct-ascent ASATs, out of the testing phase. A recent report from the U.S. National Air and Space Intelligence Center (NASIC) notes that Chinese units are now training with anti-satellite missiles.[23]

Threat of Regional War

Three issues, all involving China, threaten American interests and embody the "general threat of regional war" noted at the outset of this section: the status of Taiwan, the escalation of maritime and territorial disputes, and border conflict with India.

Taiwan. China's long-standing threat to end the de facto independence of Taiwan and ultimately to bring it under the authority of Beijing—if necessary, by force—is both a threat to a major American security partner and a threat to the American interest in peace and stability in the Western Pacific.

After easing for eight years, tensions across the Taiwan Strait have resumed as a result of Beijing's reaction to the outcome of Taiwan's 2016 and 2020 presidential elections. Beijing has suspended most direct government-to-government discussions with Taipei and is using a variety of aid and investment efforts to draw away Taiwan's remaining diplomatic partners.

Beijing has also significantly escalated its military activities directed at Taiwan. Chinese fighters, along with airborne early warning aircraft, have increased their exercises southwest of Taiwan, demonstrating a growing ability to

conduct flexible air operations and reduced reliance on ground-based control.[24] The PLA has also undertaken sustained joint exercises to simulate extended air operations, employing both air and naval forces.[25] These activities have continued unabated in the wake of China's struggle with the COVID-19 coronavirus and in some ways have even been intensified.[26]

Regardless of the state of the relationship at any given time, Chinese leaders from Deng Xiaoping and Mao Zedong to Xi Jinping have consistently emphasized the importance of ultimately reclaiming Taiwan. The island—along with Tibet—is the clearest example of a geographical "core interest" in Chinese policy. China has never renounced the use of force and continues to employ political warfare against Taiwan's political and military leadership.

For the Chinese leadership, the failure to effect unification, whether peacefully or through the use of force, would reflect fundamental political weakness in the PRC. For this reason, China's leaders cannot back away from the stance of having to unify the island with the mainland, and the island remains an essential part of the People's Liberation Army's "new historic missions," shaping PLA acquisitions and military planning.

It is widely posited that China's anti-access/area-denial (A2/AD) strategy—the deployment of an array of overlapping capabilities, including anti-ship ballistic missiles (ASBMs), submarines, and long-range cruise missiles, satellites, and cyber weapons—is aimed largely at forestalling American intervention in support of friends and allies in the Western Pacific, including Taiwan. By holding at risk key American platforms and systems (e.g., aircraft carriers), the Chinese seek to delay or even deter American intervention in support of key friends and allies, allowing the PRC to achieve a fait accompli. The growth of China's military capabilities is oriented specifically toward countering America's ability to help Taiwan defend itself.

Chinese efforts to reclaim Taiwan are not limited to overt military means. The "three warfares" highlight Chinese political warfare

methods, including legal warfare/lawfare, public opinion warfare, and psychological warfare. The PRC employs such approaches to undermine both Taiwan's will to resist and America's willingness to support Taiwan. The Chinese goal would be to "win without fighting"—to take Taiwan without firing a shot or with only minimal resistance before the United States could organize an effective response.

Escalation of Maritime and Territorial Disputes. Because the PRC and other countries in the region see active disputes over the East and South China Seas not as differences regarding the administration of international common spaces, but rather as matters of territorial sovereignty, there exists the threat of armed conflict between China and American allies who are also claimants, particularly Japan and the Philippines.

Moreover, because its economic center of gravity is now in the coastal region, China has had to emphasize maritime power to defend key assets and areas. As the world's foremost trading state, China increasingly depends on the seas for its economic well-being. Its factories are powered increasingly by imported oil, and its diets contain a growing percentage of imported food. Chinese products are moved to foreign markets by sea. Consequently, China not only has steadily expanded its maritime power, including its merchant marine and maritime law enforcement capabilities, but also has acted to secure the "near seas" as a Chinese preserve.

Beijing prefers to accomplish its objectives quietly and through nonmilitary means. In both the East and South China Seas, China has sought to exploit "gray zones," gaining control incrementally and deterring others without resorting to the lethal use of force. It uses military and economic threats, bombastic language, and enforcement through legal warfare (including the employment of Chinese maritime law enforcement vessels) as well as military bullying. Chinese paramilitary-implemented, military-backed encroachment in support of expansive extralegal claims could lead to an unplanned armed clash.

Especially risky are the growing tensions between China and Japan and among a number of claimants in the South China Sea. In the former case, the most proximate cause is the dispute over the Senkakus. China has intensified its efforts to assert claims of sovereignty over the Senkaku Islands of Japan in the East China Sea. Beijing asserts both exclusive economic rights within the disputed waters and recognition of "historic" rights to dominate and control those areas as part of its territory.[27] Chinese fishing boats (often believed to be elements of the Chinese maritime militia) and China Coast Guard (CCG) vessels have been encroaching steadily on the territorial waters within 12 nautical miles of the uninhabited islands. As of April 2020, there had been seven incidents in which CCG or other government vessels entered the waters around the Senkakus.[28] In the summer of 2016, China deployed a naval unit (as opposed to CCG) into the area.[29]

Beijing's 2013 declaration of an air defense identification zone (ADIZ) was just part of a broader Chinese pattern of using intimidation and coercion to assert expansive extralegal claims of sovereignty and/or control incrementally. In June 2016, a Chinese fighter made an "unsafe" pass near a U.S. RC-135 reconnaissance aircraft in the East China Sea area. In March 2017, Chinese authorities warned the crew of an American B-1B bomber operating in the area of the ADIZ that they were flying illegally in PRC airspace. In response to the incident, the Chinese Foreign Ministry called for the U.S. to respect the ADIZ.[30] In May, the Chinese intercepted an American WC-135, also over the East China Sea.[31] There have been no publicly reported ADIZ-related confrontations since then.

In the South China Sea, overlapping Chinese, Bruneian, Philippine, Malaysian, Vietnamese, and Taiwanese claims raise the prospect of confrontation. This volatile situation has led to a variety of confrontations between China and other claimants, as well as with Indonesia, which is not claiming territory or rights disputed by anyone but (occasionally) China.

MAP 2

China Looks to Reshape Eurasia With Belt and Road Initiative

Legend:
- Silk road economic belt
- New maritime silk road
- Proposed economic corridors
- Gas pipelines
- Oil pipelines
- Railroad
- Planned or under construction
- Ports with Chinese military presence
- Ports constructed with Chinese involvement
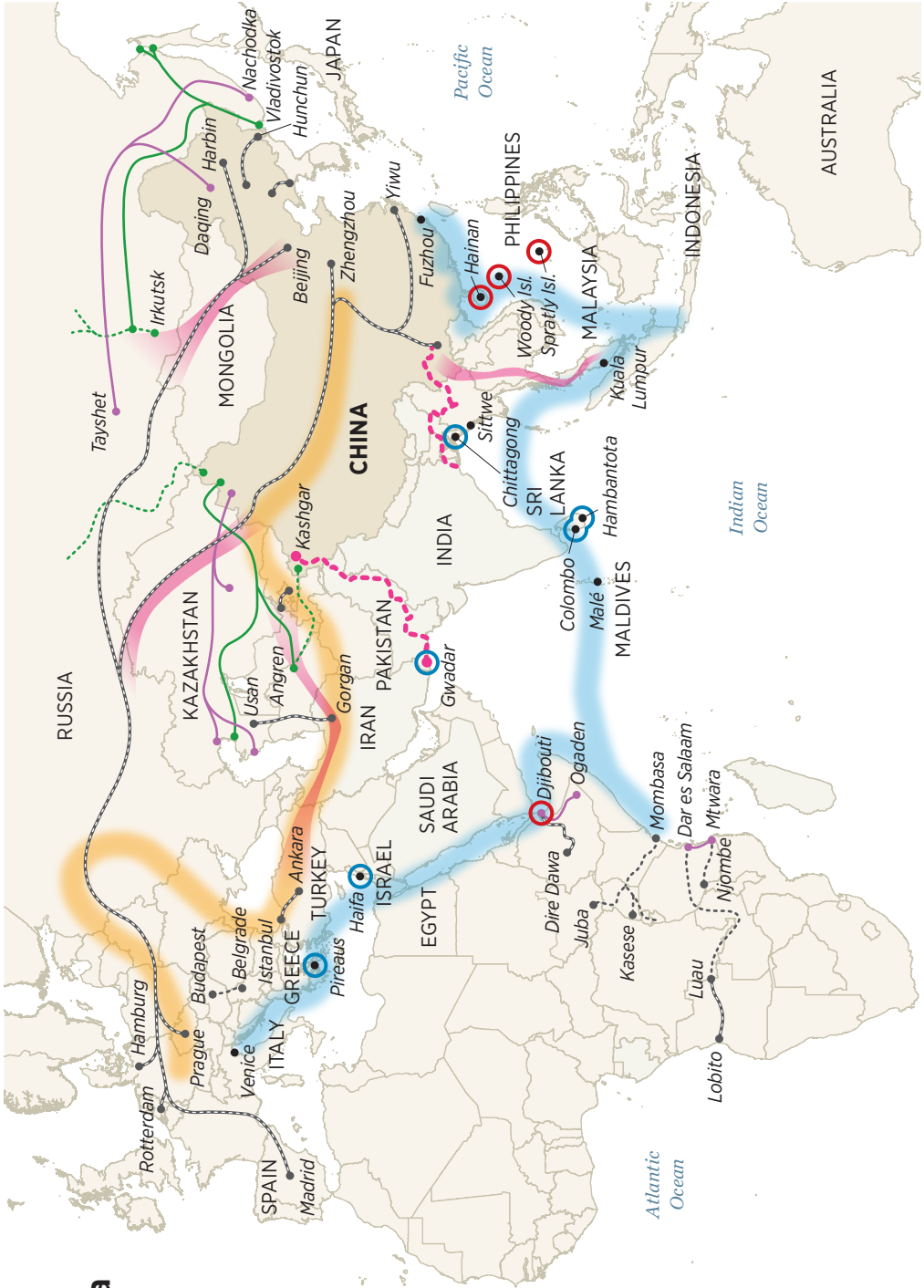
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China–Vietnam tensions in the region, for example, were once again on display early in 2020 when a CCG vessel reportedly rammed and sank a Vietnamese fishing boat near the disputed Paracel islands.[32] Vietnam has also protested the Chinese decision to create additional administrative regions for the South China Sea, one centered on the Paracels and the other centered on the Spratlys.[33] For Beijing, this is part of its legal and administrative "legal warfare" efforts to underscore China's control of the South China Sea region.

Because of the relationship between the Philippines and the United States, tensions between Beijing and Manila are the most likely to lead to American participation. There have been a number of incidents going back to the 1990s. The most contentious occurred in 2012 when a Philippine naval ship operating on behalf of the country's coast guard challenged private Chinese poachers in waters around Scarborough Shoal. The resulting escalation left Chinese government ships in control of the shoal. The Philippines then successfully challenged Beijing in the Permanent Court of Arbitration (PCA) regarding its rights under the U.N. Convention on the Law of the Sea (UNCLOS). There have been consistent concerns since 2016 that the Chinese intended to consolidate their gains in the area by reclaiming the sea around the shoal, but there is no indication that this has happened.

Since the election of Philippine President Rodrigo Duterte in 2016, there has been a general warming in China–Philippines relations. Meanwhile, U.S.–Philippines relations have worsened, most recently as a result of Duterte's decision to serve notice on the abrogation of the Philippines Visiting Forces Agreement with the U.S. Against this backdrop, Duterte has generally sought to sideline the dispute with the Chinese over the South China Sea. While not accepting the authority of the PCA ruling that found against it, China has allowed Filipino fishermen access to areas around Scarborough Shoal in accordance with it.

In each of these cases, the situation is exacerbated by rising Chinese nationalism. In the face of persistent economic challenges, nationalist themes are becoming an increasingly strong undercurrent and affecting policymaking. Although the nationalist phenomenon is not new, it is gaining force and complicating efforts to maintain regional stability.

Governments may choose to exploit nationalism for domestic political purposes, but they also run the risk of being unable to control the genie that they have released. Nationalist rhetoric is mutually reinforcing, which makes countries less likely to back down. The increasing power that the Internet and social media provide to the populace, largely outside of government control, adds elements of unpredictability to future clashes. China's refusal to accept the 2016 Permanent Court of Arbitration findings (which were overwhelmingly in favor of the Philippines) despite both Chinese and Philippine accession to UNCLOS is a partial reflection of such trends.

In case of armed conflict between China and the Philippines or between China and Japan, either by intention or as a result of an accidental incident at sea, the U.S. could be required to exercise its treaty commitments.[34] Escalation of a direct U.S.–China incident is also not unthinkable. Keeping an inadvertent incident from escalating into a broader military confrontation would be difficult, particularly in the East and South China Seas, where naval as well as civilian law enforcement vessels from both China and the U.S. operate in what the U.S. considers to be international waters.

The most significant development in the South China Sea during the past three years has been Chinese reclamation and militarization of seven artificial islands or outposts. In 2015, President Xi promised President Barack Obama that China had no intention of militarizing the islands. That pledge has never been honored. As described by Admiral Harry Harris, Commander, U.S. Pacific Command, in his April 2017 posture statement to the Senate Committee on Armed Services:

China's military-specific construction in the Spratly islands includes the construction

of 72 fighter aircraft hangars—which could support three fighter regiments—and about ten larger hangars that could support larger airframes, such as bombers or special mission aircraft. All of these hangars should be completed this year. During the initial phases of construction China emplaced tank farms, presumably for fuel and water, at Fiery Cross, Mischief and Subi reefs. These could support substantial numbers of personnel as well as deployed aircraft and/or ships. All seven outposts are armed with a large number of artillery and gun systems, ostensibly for defensive missions. The recent identification of buildings that appear to have been built specifically to house long-range surface-to-air missiles is the latest indication China intends to deploy military systems to the Spratlys.[35]

There have been additional developments since the admiral's statement,[36] yet by 2019, the DOD's annual report on the Chinese military found no new militarization,[37] suggesting that it has been completed.

There is the possibility that China will ultimately declare an ADIZ above the South China Sea in an effort to assert its authority over the entire area.[38] There are also concerns that in the event of a downturn in its relationship with the Philippines, China will move against vulnerable targets like Philippines-occupied Second Thomas Shoal or Reed Bank, where during 2019 a Chinese fishing boat rammed and sank a Philippine boat, causing a controversy in Manila. There is also consistent speculation in the Philippines about when the Chinese will start reclamation work at Scarborough. This development in particular would facilitate the physical assertion of Beijing's claims and enforcement of an ADIZ, regardless of the UNCLOS award.

Border Conflict with India. The possibility of armed conflict between India and China, while currently remote, poses an indirect threat to U.S. interests because it could disrupt the territorial status quo and raise nuclear tensions in the region. A border conflict between India and China could also prompt Pakistan to try to take advantage of the situation, further contributing to regional instability.

Long-standing border disputes that led to a Sino–Indian war in 1962 have become a flashpoint again in recent years. In April 2013, the most serious border incident between India and China in over two decades occurred when Chinese troops settled for three weeks several miles inside northern Indian territory on the Depsang Plains in Ladakh. In September 2014, a visit to India by Chinese President Xi Jinping was overshadowed by another flare-up in border tensions when hundreds of Chinese PLA forces reportedly set up camps in the mountainous regions of Ladakh, prompting Indian forces to deploy to forward positions in the region. This border standoff lasted three weeks and was defused when both sides agreed to pull their troops back to previous positions.

In 2017, Chinese military engineers were building a road to the Doklam plateau, an area claimed by both Bhutan and China, and this led to a confrontation between Chinese and Indian forces, Bhutanese authorities having requested assistance from India. The crisis lasted 73 days; both sides pledged to pull back, but Chinese construction efforts in the area have continued.[39] Improved Chinese infrastructure not only would give Beijing the diplomatic advantage over Bhutan, but also could make the Siliguri corridor that links the eastern Indian states with the rest of the country more vulnerable.

India claims that China occupies more than 14,000 square miles of Indian territory in the Aksai Chin along its northern border in Kashmir, and China lays claim to more than 34,000 square miles of India's northeastern state of Arunachal Pradesh. The issue is also closely related to China's concern for its control of Tibet and the presence in India of the Tibetan government in exile and Tibet's spiritual leader, the Dalai Lama.

China is building up military infrastructure and expanding a network of road, rail, and air links in its southwestern border areas. To

CHART 4

Comparing the Economies of China and the Quad

GDP, IN TRILLIONS OF U.S. DOLLARS, IN 2019

Australia
$1.4

U.S.	Japan	India
$20.5	$5.0	$2.7
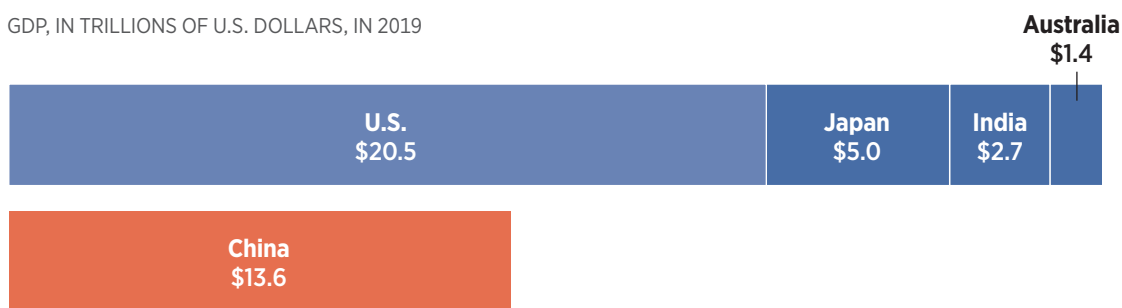
China
$13.6

SOURCE: World Bank Group, "GDP (current US$)—China, Australia, Japan, India, United States," https://data.worldbank.org/indicator/ NY.GDP.MKTP.CD?contextual=default&end=2018&locations=CN-AU-JP-IN-US&most_recent_value_desc=false&start=2000&view=chart (accessed August 19, 2020).

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meet these challenges, the Indian government has also committed to expanding infrastructure development along the disputed border, although China currently holds a decisive military edge.

Threats to the Commons

The U.S. has critical sea, air, space, and cyber interests at stake in the East Asia and South Asia international common spaces. These interests include an economic interest in the free flow of commerce and the military use of the commons to safeguard America's own security and contribute to the security of its allies and partners.

Washington has long provided the security backbone in these areas, and this has supported the region's remarkable economic development. However, China is taking increasingly assertive steps to secure its own interests in these areas independent of U.S. efforts to maintain freedom of the commons for all in the region. Given this behavior, which includes the construction of islands atop previously submerged features, it cannot be assumed that China shares either a common

conception of international space with the United States or an interest in perpetuating American predominance in securing international common spaces.

In addition, as China expands its naval capabilities, it will be present farther and farther away from its home shores. China has now established its first formal overseas military base, having initialed an agreement with the government of Djibouti in January 2017.

Dangerous Behavior in the Maritime and Airspace Common Spaces. The aggressiveness of China's navy, maritime law enforcement forces, and air forces in and over the waters of the East China Sea and South China Sea, coupled with ambiguous, extralegal territorial claims and assertion of control there, poses an incipient threat to American and overlapping allied interests. Chinese military writings emphasize the importance of establishing dominance of the air and maritime domains in any future conflict.

Although the Chinese do not necessarily have sufficient capacity to deny the U.S. the ability to operate in local waters and airspace, the ability of the U.S. to take control in the

early stages of a conflict at acceptable costs has become a matter of greater debate.[40] As its capabilities have expanded, China not only has increasingly challenged long-standing rivals Vietnam and the Philippines, but also has increasingly begun to push toward Indonesia's Natuna Islands as well as into Malaysian-claimed waters.

It is unclear whether China is yet in a position to enforce an ADIZ consistently, but the steady two-decade improvement of the PLAAF and PLAN naval aviation will eventually provide the necessary capabilities. Chinese observations of recent conflicts, including wars in the Persian Gulf, the Balkans, and Afghanistan, have emphasized the growing role of airpower and missiles in conducting "non-contact, non-linear, non-symmetrical" warfare.[41] This growing parity, if not superiority, constitutes a radical shift from the Cold War era when the U.S., with its allies, clearly would have dominated air and naval operations in the Pacific.

Meanwhile, China has also begun to employ nontraditional methods of challenging foreign military operations in what Beijing sees as its territorial waters and airspace. It has employed lasers, for example, against foreign air and naval platforms, endangering pilots and sailors by threatening to blind them.[42]

Increasing Military Space Activities. One of the key force multipliers for the United States is its extensive array of space-based assets. Through its various satellite constellations, the U.S. military can track opponents, coordinate friendly forces, engage in precision strikes against enemy forces, and conduct battle-damage assessments so that its munitions are expended efficiently.

The American military is more reliant than many others on space-based systems because it is also an expeditionary military, meaning that its wars are conducted far from the homeland. Consequently, it requires global rather than regional reconnaissance, communications and data transmission, and meteorological information and support. At this point, only space-based systems can provide this sort of information on a real-time basis. No other country is capable of leveraging space as the U.S. does, and this is a major advantage, but this heavy reliance on space systems is also a key American vulnerability.

China fields an array of space capabilities, including its own navigation and timing satellites, the Beidou/Compass system, and has claimed a capacity to refuel satellites.[43] It has three satellite launch centers and is constructing a fourth. China's interest in space dominance includes not only accessing space, but also denying opponents the ability to do the same. As one Chinese assessment notes, space capabilities provided 70 percent of battlefield communications, over 80 percent of battlefield reconnaissance and surveillance, and 100 percent of meteorological information for American operations in Kosovo. Moreover, 98 percent of precision munitions relied on space for guidance information. In fact, "[i]t may be said that America's victory in the Kosovo War could not [have been] achieved without fully exploiting space."[44]

To this end, the PLA has been developing a range of anti-satellite capabilities that include both hard-kill and soft-kill systems. The former include direct-ascent kinetic-kill vehicles (DA-KKV) such as the system famously tested in 2007, but they also include more advanced systems that are believed to be capable of reaching targets in mid-Earth orbit and even geosynchronous orbit.[45] The latter include anti-satellite lasers for either dazzling or blinding purposes.[46] This is consistent with PLA doctrinal writings, which emphasize the need to control space in future conflicts. "Securing space dominance has already become the prerequisite for establishing information, air, and maritime dominance," says one Chinese teaching manual, "and will directly affect the course and outcome of wars."[47]

Soft-kill attacks need not come only from dedicated weapons, however. The case of Galaxy-15, a communications satellite owned by Intelsat Corporation, showed how a satellite could disrupt communications simply by always being in "switched on" mode.[48] Before it was finally brought under control, it had drifted

through a portion of the geosynchronous belt, forcing other satellite owners to move their assets and juggle frequencies. A deliberate such attempt by China (or any other country) could prove far harder to handle, especially if conducted in conjunction with attacks by kinetic systems or directed-energy weapons.

Most recently, China has landed an unmanned probe at the lunar south pole on the far side of the Moon. This is a major accomplishment because the probe is the first spacecraft ever to land at either of the Moon's poles. To support this mission, the Chinese deployed a data relay satellite to Lagrange Point-2, one of five points where the gravity wells of the Earth and Sun "cancel out" each other, allowing a satellite to remain in a relatively fixed location with minimal fuel consumption. Although the satellite itself may or may not have military roles, its deployment highlights that China will now be using the enormous volume of cis-lunar space (the region between the Earth and Moon) for various deployments. This will greatly complicate American space situational awareness efforts, as it forces the U.S. to monitor a vastly greater area of space for possible Chinese spacecraft. The expected launch of the Chinese Chang'e-5 mission later in 2020, involving lunar sample retrieval (i.e., return to Earth), underscores the Chinese effort to move beyond Earth orbit to cis-lunar space.

Cyber Activities and the Electromagnetic Domain. In 2013, the Verizon Risk Center reported that "[s]tate-affiliated actors tied to China [were] the biggest mover in 2012. Their efforts to steal [intellectual property] comprise about one-fifth of all breaches in this dataset."[49] In addition:

> 96% of espionage cases [in 2012] were attributed to threat actors in China and the remaining 4% were unknown. This may mean that other threat groups perform their activities with greater stealth and subterfuge. But it could also mean that China is, in fact, the most active source of national and industrial espionage in the world today.[50]

In a July 7, 2020, speech, FBI Director Christopher Wray underscored the continuing challenge posed by Chinese espionage, both cyber and traditional: "The greatest long-term threat to our nation's information and intellectual property, and to our economic vitality, is the counterintelligence and economic espionage threat from China. It's a threat to our economic security—and by extension, to our national security." Chinese theft of intellectual property represents "theft on a scale so massive that it represents one of the largest transfers of wealth in human history."[51]

Given the difficulties of attribution, country of origin should not necessarily be conflated with perpetrator, but forensic efforts have associated at least one Chinese military unit with cyber intrusions, albeit many years ago.[52] Since the 2015 Xi–Obama summit where the two sides reached an understanding to reduce cyber economic espionage, Chinese cyber actions have shifted. The overall level of activity appears to be unabated, but the Chinese seem to have moved toward more focused attacks mounted from new sites.

China's cyber-espionage efforts are often aimed at economic targets, reflecting the much more holistic Chinese view of both security and information. Rather than creating an artificial dividing line between military security and civilian security, much less information, the PLA plays a role in supporting both aspects and seeks to obtain economic intellectual property as well as military electronic information.

This is not to suggest that the PLA has not emphasized the military importance of cyber warfare. Chinese military writings since the 1990s have emphasized a fundamental transformation in global military affairs. Future wars will be conducted through joint operations involving multiple services rather than through combined operations focused on multiple branches within a single service. These future wars will span not only the traditional land, sea, and air domains, but also outer space and cyberspace. The latter two arenas will be of special importance because warfare has shifted from an effort to establish material dominance

(characteristic of Industrial Age warfare) to establishing information dominance. This is due to the rise of the information age and the resulting introduction of information technology into all areas of military operations.

Consequently, according to PLA analysis, future wars will most likely be "local wars under informationized conditions." That is, they will be wars in which information and information technology will be both widely applied and a key basis of victory. The ability to gather, transmit, analyze, manage, and exploit information will be central to winning such wars: The side that is able to do these things more accurately and more quickly will be the side that wins. This means that future conflicts will no longer be determined by platform-versus-platform performance and not even by system against system. Rather, conflicts are now clashes between rival arrays of systems of systems.[53]

Chinese military writings suggest that a great deal of attention has been focused on developing an integrated computer network and electronic warfare (INEW) capability. This would allow the PLA to reconnoiter a potential adversary's computer systems in peacetime, influence opponent decision-makers by threatening those same systems in times of crisis, and disrupt or destroy information networks and systems by cyber and electronic warfare means in the event of conflict. INEW capabilities would complement psychological warfare and physical attack efforts to secure "information dominance," which Chinese military writings emphasize as essential for fighting and winning future wars.

It is essential to recognize, however, that the PLA views computer network operations as part of information operations, or information combat. Information operations are specific operational activities that are associated with striving to establish information dominance. They are conducted in both peacetime and wartime, with the peacetime focus on collecting information, improving its flow and application, influencing opposing decision-making, and effecting information deterrence.

Information operations involve four mission areas:

- **Command and Control Missions.** An essential part of information operations is the ability of commanders to control joint operations by disparate forces. Thus, command, control, communications, computers, intelligence, surveillance, and reconnaissance structures constitute a key part of information operations, providing the means for collecting, transmitting, and managing information.

- **Offensive Information Missions.** These are intended to disrupt the enemy's battlefield command and control systems and communications networks, as well as to strike the enemy's psychological defenses.

- **Defensive Information Missions.** Such missions are aimed at ensuring the survival and continued operation of information systems. They include deterring an opponent from attacking one's own information systems, concealing information, and combating attacks when they do occur.

- **Information-Support and Information-Safeguarding Missions.** The ability to provide the myriad types of information necessary to support extensive joint operations and to do so on a continuous basis is essential to their success.[54]

Computer network operations are integral to all four of these overall mission areas. They can include both strategic and battlefield network operations and can incorporate both offensive and defensive measures. They also include protection not only of data, but also of information hardware and operating software.

Computer network operations will not stand alone, however, but will be integrated with electronic warfare operations, as reflected in the phrase "network and electronics unified." Electronic warfare operations are aimed at weakening or destroying enemy electronic

facilities and systems while defending one's own.[55] The combination of electronic and computer network attacks will produce synergies that affect everything from finding and assessing the adversary to locating one's own forces to weapons guidance to logistical support and command and control. The creation of the PLASSF is intended to integrate these forces and make them more complementary and effective in future "local wars under informationized conditions."

Conclusion

Overall, China poses a diverse set of threats and challenges to the U.S., its allies and partners, and its interests in the Indo-Pacific. In both the air and maritime domains, China is ever more capable of challenging American dominance and disrupting the freedom of the commons that benefits the entire region. Territorial disputes related to what the U.S. and its allies consider the commons could draw the U.S. into conflict, as could accidental incidents. Although China probably does not intend to engage in armed conflict with its neighbors, particularly American treaty allies, or with the U.S., it will continue to press its territorial claims at sea in ways that, even if inadvertent, cause incidents that could escalate into broader conflict.

China has a large arsenal of nuclear weapons, multiple demonstrated and tested means of delivery, and mature systems, but it is a more stable actor than North Korea and has a variety of interests that include relations with the United States and its extensive interaction with the international system. In space, the PRC poses a challenge to the United States that is qualitatively different from the challenge posed by any other potential adversary in the post–Cold War environment. It is the first nation to be capable of accessing space on its own while also jeopardizing America's ability to do the same.

Above all, however, China's ongoing and sustained effort to penetrate foreign computer networks poses a major risk to Western security. The Chinese effort to dominate the 5G market only exacerbates this, because 5G will be the backbone for the next generation of telecommunications. The PLA emphasizes the need to suppress and destroy an enemy's information systems while preserving one's own, as well as the importance of computer and electronic warfare in both the offensive and defensive roles. Methods to secure information dominance would include establishing an information blockade; deception, including through electronic means; information contamination; and information paralysis.[56] China sees cyber as part of an integrated capability both for achieving strategic dominance in the Western Pacific region and for influencing global perceptions and balances of power.

The Chinese threat to Taiwan is a long-standing one. China's ability to execute a military action against Taiwan, albeit at high economic, political, and military cost, is improving, and its intent to unify Taiwan with the mainland under the full authority of the PRC central government and to end the island's de facto independence has been consistent over time. With respect to India, the Chinese seem to use border tensions for limited diplomatic and political gain, and India responds in ways that are intended to contain minor incursions and maximize reputational damage to China. Despite limited aims, however, the unsettled situation and gamesmanship along the border could result in miscalculation, accidents, or overreaction.

This *Index* therefore assesses the overall threat from China, considering the range of contingencies, as "aggressive" for level of provocation of behavior and "formidable" for level of capability.

Threats: China

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✓			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability	✓				

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Russia

Luke Coffey and Alexis Mrachek

Russia remains a formidable threat to the United States and its interests in Europe. From the Arctic to the Baltics, Ukraine, and the South Caucasus, and increasingly in the Mediterranean, Russia continues to foment instability in Europe. Despite economic problems, Russia continues to prioritize the rebuilding of its military and funding for its military operations abroad. Russia remains antagonistic to the United States both militarily and politically, and its efforts to undermine U.S. institutions and the NATO alliance continue without let-up. In Europe, Russia uses its energy position along with espionage, cyberattacks, and information warfare to exploit vulnerabilities with the goal of dividing the transatlantic alliance and undermining people's faith in government and societal institutions.

Overall, Russia possesses significant conventional and nuclear capabilities and remains the principal threat to European security. Its aggressive stance in a number of theaters, including the Balkans, Georgia, Syria, and Ukraine, continues both to encourage destabilization and to threaten U.S. interests.

Military Capabilities. According to the International Institute for Strategic Studies (IISS), among the key weapons in Russia's inventory are 340 intercontinental ballistic missiles, 2,800 main battle tanks, more than 5,160 armored infantry fighting vehicles, more than 6,100 armored personnel carriers, and more than 4,342 pieces of artillery. The navy has one aircraft carrier; 49 submarines (including 10 ballistic missile submarines); four cruisers; 13 destroyers; 15 frigates; and 118 patrol and coastal combatants. The air force has 1,183 combat-capable aircraft. The IISS counts 280,000 members of the army. Russia also has a total reserve force of 2,000,000 for all armed forces.[1] In addition, Russian deep-sea research vessels include converted ballistic missile submarines, which hold smaller auxiliary submarines that can operate on the ocean floor.[2]

To avoid political blowback from military deaths abroad, Russia has increasingly deployed paid private volunteer troops trained at Special Forces bases and often under the command of Russian Special Forces. It has used such volunteers in Libya, Syria, and Ukraine because "[t]hey not only provide the Kremlin with plausible political deniability but also apparently take casualties the Russian authorities do not report."[3] In July 2020, for example, Russia deployed 33 Wagner Group mercenaries to Belarus to create additional political turmoil ahead of the August presidential election.[4] Russia also prepared a law enforcement team, likely including military troops, after the election "to help shore up Belarusian leader Alexander Lukashenko if protests against him spiral[ed] out of control."[5] In February 2018, at Deir al-Zour in eastern Syria, 500 pro-Assad forces and Russian mercenaries armed with Russian tanks, artillery, and mortars attacked U.S.-supported Kurdish forces.[6] Approximately 30 U.S. Rangers and Delta Force special operators were also at the base.[7] U.S. air strikes helped to repulse the attack, and "three sources familiar with the matter" estimated that

approximately 300 Russian mercenaries were either killed or wounded.[8]

In January 2019, reports surfaced that 400 Russian mercenaries from the Wagner Group were in Venezuela to bolster the regime of Nicolas Maduro.[9] Russian propaganda in Venezuela has supported the regime and stoked fears of American imperialism. In February 2020, Russian Foreign Minister Sergei Lavrov visited Venezuela to "counteract U.S. sanctions" and show support for Maduro.[10] During the past few years, as the crisis has metastasized and protests against the Maduro regime have grown, Russia has begun to deploy troops and supplies to bolster Maduro's security forces.[11] In December 2018, for example, Russia temporarily deployed two Tu-160 nuclear-capable bombers to Caracas.[12] Russia also exports billions in arms to Venezuela (and has loaned the regime money to purchase Russian arms) along with $70 million–$80 million yearly in nonmilitary goods.[13]

In July 2016, Russian President Vladimir Putin signed a law creating a National Guard with a total strength (both civilian and military) of 340,000, controlled directly by him.[14] He created his National Guard, which is responsible for "enforcing emergency-situation regimes, combating terrorism, defending Russian territory, and protecting state facilities and assets," by amalgamating "interior troops and various law-enforcement agencies."[15] Although Putin could issue a directive to deploy this force abroad,[16] he is more likely to use it to stifle domestic dissent.

The COVID-19 pandemic has severely affected Russia's economic growth.[17] In the first quarter of 2020, economic growth in Russia "slowed to 1.6 percent…before sliding into a projected contraction in the second quarter caused by lockdowns aimed at curbing the new coronavirus outbreak."[18] Because of the steep economic downturns from the coronavirus, Russia will likely have difficulty funding military affairs. However, economic problems at home also can incentivize regimes to pursue military adventures abroad to distract the public and generate positive news for the government. If an autocratic leader relies on military power to maintain political control, there is ample reason to maintain spending on the military in spite of glum economic news.

Russia spent $65.1 billion on its military in 2019, which is 4.5 percent more than it spent in 2018.[19] This increase in spending enabled Russia to rejoin the ranks of the world's top five defense spending nations in 2019.[20]

Much of Russia's military expenditure goes toward modernization of its armed forces. In January 2018, then-Chairman of the Joint Chiefs of Staff and U.S. Marine Corps General Joseph Dunford noted that "[t]here is not a single aspect of the Russian armed forces that has not received some degree of modernization over the past decade."[21] From 2010 to 2019, close to 40 percent of Russia's total military spending was on arms procurement.[22] Taking into account total military expenditure, Russia spent nearly 4 percent of GDP on defense in 2019.[23]

In early 2018, Russia introduced its new State Armament Program 2018–2027, a $306 billion investment in new equipment and force modernization. However, according to the Royal Institute of International Affairs, "as inflation has eroded the value of the rouble since 2011, the new programme is less ambitious than its predecessor in real terms."[24]

Russia's nuclear capabilities have been prioritized for modernization, and approximately 82 percent of its nuclear forces have been modernized.[25] Russia plans to deploy the RS-28 (Satan 2) ICBM by 2021 as a replacement for the RS-36, which is being phased out in the 2020s.[26] The missile, which can carry up to 15 warheads, underwent flight development tests from April–June 2019.[27] According to a March 2020 report, Russia upgraded its facilities for production of the RS-28 missile.[28]

The armed forces also continue to undergo process modernization, which was begun by Defense Minister Anatoly Serdyukov in 2008.[29] Partially because of this modernization, former U.S. Deputy Assistant Secretary of Defense for Strategy and Force Development Elbridge Colby stated in January 2018 that the U.S. military advantage over Russia is eroding.[30]

In April 2020, the Kremlin revealed that it had begun state trials for its T-14 Armata main battle tank in Syria.[31] Aside from the T-14 Armata, Russia has resumed upgrades to the T-72B3 and T-80BVM main battle tanks.[32] Russia's fifth-generation Su-27 fighter fell short of expectations, particularly with regard to stealth capabilities. In May 2018, the government cancelled mass production of the Su-27 because of its high costs and limited capability advantages over upgraded fourth-generation fighters.[33] Russia lost one of its Su-27 jets near the Crimean coast during a planned mission in March 2020.[34]

In October 2018, Russia's sole aircraft carrier, the *Admiral Kuznetsov,* was severely damaged when a dry dock sank and a crane fell, puncturing a hole in the deck and hull.[35] The carrier is not likely to be salvaged. In May 2019, reports surfaced that Russia is seeking to begin building a new nuclear-powered aircraft carrier in 2023 for delivery in the late 2030s, but the procurement's financial and technological feasibility remains questionable.[36]

In March 2017, Russia announced life-extension programs for its *Akula*-class and *Oscar II*–class nuclear-powered submarines, which operate in both the Northern and Pacific Fleets.[37] Russia is also reportedly deploying Kalibr cruise missiles to submarines and surface vessels operating in the Western Atlantic.[38]

Following years of delays, the *Admiral Gorshkov* stealth guided missile frigate was commissioned in July 2018. The second *Admiral Gorshkov*–class frigate, the *Admiral Kasatonov,* began sea trials in April 2019, but according to some analysts, tight budgets and the inability to procure parts from Ukrainian industry (importantly, gas turbine engines) make it difficult for Russia to build the two additional *Admiral Gorshkov*–class frigates as planned.[39] Nevertheless, on April 23, 2019, keel-laying ceremonies took place for the fifth and sixth *Admiral Gorshkov*–class frigates, which reportedly will join Russia's Black Sea fleet.[40]

Russia plans to procure eight *Lider*-class guided missile destroyers for its Northern and Pacific Fleets, but procurement has faced consistent delay.[41] As of April 2020, Russia's Severnoye Design Bureau halted development of the frigates entirely because of financial setbacks.[42]

In November 2018, Russia sold three *Admiral Grigorovich*–class frigates to India. Russia is set to deliver at least two of the frigates to India by 2024.[43] The ships had been intended for the Black Sea Fleet, but Russia found itself unable to produce a replacement engine following Ukraine sanctions. Similar problems have befallen the long-delayed *Admiral Gorshkov*–class procurements. Of the planned 14 frigates, Russia has engines for only two.[44]

Russia's naval modernization continues to prioritize submarines. According to the IISS, "[s]ubmarine building will focus on completing the series of *Borey*-A ballistic-missile boats armed with *Bulava* missiles and Project 08851 *Yasen*-M multi-role submarines, though from the early 2020s construction is expected to begin on the first *Khaski*-class successor."[45] The *Khaski*-class submarines are planned fifth-generation stealth nuclear-powered submarines. They are slated to begin construction in 2023 and to be armed with Zircon hypersonic missiles, which have a reported speed of from Mach 5 to Mach 6.[46] According to a Russian vice admiral, these submarines will be two times quieter than current subs.[47]

Russia also continues to upgrade its diesel electric *Kilo*-class subs.[48] It reportedly inducted the first improved Project 636.6 *Kilo*-class submarine into its Pacific Fleet in November 2019.[49] According to one assessment, the submarines' improvement in noise reduction has caused them to be nicknamed "Black Holes," but "the submarine class lacks a functioning air-independent propulsion system, which reduced the boats' overall stealth capabilities."[50]

Transport remains a nagging problem, and Russia's Defense Minister has stressed the paucity of transport vessels. Russia does not have enough air transport, for example, to airdrop all of its large paratrooper force at one time.[51] In 2017, Russia reportedly needed to purchase civilian cargo vessels and use icebreakers to transport troops and equipment to Syria at

the beginning of major operations in support of the Assad regime.[52]

Although budget shortfalls have hampered modernization efforts overall, analysts believe that Russia will continue to focus on developing high-end systems such as the S-500 surface-to-air missile system.[53] In May 2018, it was reported that Russian testing of the S-500 system struck a target 299 miles away. If true, this is the longest surface-to-air missile test ever conducted, and the S-500's range could have significant implications for European security when the missile becomes operational.[54] According to Sergei Chemezov, CEO of Russian defense conglomerate Rostec, the S-500 system supposedly will enter service "very soon."[55]

Russia's counterspace and countersatellite capabilities are formidable. A Defense Intelligence Agency report released in February 2019 summarized Russian capabilities:

> [O]ver the last two decades, Moscow has been developing a suite of counter-space weapons capabilities, including EW [electronic warfare] to deny, degrade, and disrupt communications and navigation and DEW [directed energy weapons] to deny the use of space-based imagery. Russia is probably also building a ground-based missile capable of destroying satellites in orbit.[56]

In 2018, in 2019, and early in 2020,[57] Russia continued tests on an anti-satellite weapon built to target imagery and communications satellites in low Earth orbit.[58] According to the IISS, modernization priorities for Russia's space force include "restor[ing] Russia's early-warning satellite network, with the re-equipping of the ground-based warning system with *Voronezh* radars nearing completion."[59]

Military Exercises. Russian military exercises, especially snap exercises, are a source of serious concern because they have masked real military operations in the past. Their purpose is twofold: to project strength and to improve command and control. According to Air Force

General Tod D. Wolters, Commander, U.S. European Command (EUCOM):

> Russia employs a *below-the-threshold of armed conflict* strategy via proxies and intermediary forces in an attempt to weaken, divide, and intimidate our Allies and partners using a range of covert, difficult-to-attribute, and malign actions. These actions include information and cyber operations, election meddling, political subversion, economic intimidation, military sales, exercises, and the calculated use of force.[60]

Exercises in the Baltic Sea in April 2018 a day after the leaders of the three Baltic nations met with President Donald Trump in Washington were meant as a message. Russia stated twice in April that it planned to conduct three days of live-fire exercises in Latvia's Exclusive Economic Zone, forcing a rerouting of commercial aviation as Latvia closed some of its airspace.[61] Sweden issued warnings to commercial aviation and sea traffic.[62] It turned out that Russia did not actually fire any live missiles, and the Latvian Ministry of Defense described the event as "a show of force, nothing else."[63] The exercises took place near the Karlskrona Naval Base, the Swedish navy's largest base.[64]

Russia's snap exercises are conducted with little or no warning and often involve thousands of troops and pieces of equipment.[65] In February 2017, for example, Russia ordered snap exercises involving 45,000 troops, 150 aircraft, and 200 anti-aircraft pieces.[66] The reintroduction of snap exercises has "significantly improved the Russian Armed Forces' warfighting and power-projection capabilities," according to one account. "These, in turn, support and enable Russia's strategic destabilisation campaign against the West, with military force always casting a shadow of intimidation over Russia's sub-kinetic aggression."[67]

Snap exercises have been used for military campaigns as well. According to General Curtis M. Scaparrotti, former EUCOM Commander and NATO Supreme Allied Commander

Europe, for example, "the annexation of Crimea took place in connection with a snap exercise by Russia."[68] Such exercises also provide Russian leadership with a hedge against unpreparedness or corruption. "In addition to affording combat-training benefits," the IISS reports, "snap inspections appear to be of increasing importance as a measure against corruption or deception."[69]

Russia conducted its VOSTOK ("East") strategic exercises, held primarily in the Eastern Military District, mainly in August and September of 2018 and purportedly with 300,000 troops, 1,000 aircraft, and 900 tanks taking part.[70] Russia's Defense Minister claimed that the exercises were the largest to take place in Russia since 1981; however, some analysis suggests that the actual number of participating combat troops was in the range 75,000–100,000.[71] One analyst described the extent of the exercise:

> [T]he breadth of the exercise was impressive. It uniquely involved several major military districts, as troops from the Central Military District and the Northern Fleet confronted the Eastern Military District and the Pacific Fleet. After establishing communication links and organizing forces, live firing between September 13–17 [sic] included air strikes, air defence operations, ground manoeuvres and raids, sea assault and landings, coastal defence, and electronic warfare.[72]

Chinese and Mongolian forces also took part, with China sending 3,200 soldiers from the People's Liberation Army along with 900 tanks and 30 fixed-wing aircraft.[73] Chinese participation was a significant change from past iterations of VOSTOK, although Chinese forces were likely restricted largely to the Tsugol training ground, and an uninvited Chinese intelligence ship shadowed the Russian Navy's sea exercises during the exercise.[74]

Threats to the Homeland

Russia is the only state adversary in the Europe region that possesses the capability to threaten the U.S. homeland with both conventional and nonconventional means. Although there is no indication that Russia plans to use its capabilities against the United States absent a broader conflict involving America's NATO allies, the plausible potential for such a scenario serves to sustain the strategic importance of those capabilities.

Russia's National Security Strategy describes NATO as a threat to the national security of the Russian Federation:

> The buildup of the military potential of the North Atlantic Treaty Organization (NATO) and the endowment of it with global functions pursued in violation of the norms of international law, the galvanization of the bloc countries' military activity, the further expansion of the alliance, and the location of its military infrastructure closer to Russian borders are creating a threat to national security.[75]

The same document also clearly states that Russia will use every means at its disposal to achieve its strategic goals: "Interrelated political, military, military-technical, diplomatic, economic, informational, and other measures are being developed and implemented in order to ensure strategic deterrence and the prevention of armed conflicts."[76] A new version of Russia's military doctrine signed by Putin in December 2014 similarly emphasizes the threat allegedly posed by NATO and global strike systems.[77]

Strategic Nuclear Threat. Russia possesses the largest arsenal of nuclear weapons among the nuclear powers (when short-range nuclear weapons are included). It is one of the few nations with the capability to destroy many targets in the U.S. homeland and in U.S.-allied nations as well as the capability to threaten and prevent free access to the commons by other nations.

Russia has both intercontinental-range and short-range ballistic missiles and a varied arsenal of nuclear weapons that can be delivered by sea, land, and air. It also is investing significant

resources in modernizing its arsenal and maintaining the skills of its workforce, and modernization of the nuclear triad will remain a top priority under the new State Armaments Program.[78] However, an aging nuclear workforce could impede this modernization: "[A]lthough Russia's strategic-defence enterprises appear to have preserved some of their expertise, problems remain, for example, in transferring the necessary skill sets and experience to the younger generation of engineers."[79]

Russia currently relies on its nuclear arsenal to ensure its invincibility against any enemy, intimidate European powers, and deter counters to its predatory behavior in its "near abroad," primarily in Ukraine but also concerning the Baltic States.[80] This arsenal serves both as a deterrent to large-scale attack and as a protective umbrella under which Russia can modernize its conventional forces at a deliberate pace, but Russia also needs a modern and flexible military to fight local wars such as those against Georgia in 2008 and the ongoing war against Ukraine that began in 2014. Under Russian military doctrine, the use of nuclear weapons in conventional local and regional wars is seen as de-escalatory because it would cause an enemy to concede defeat. In May 2017, for example, a Russian parliamentarian threatened that nuclear weapons might be used if the U.S. or NATO were to move to retake Crimea or defend eastern Ukraine.[81]

General Wolters discussed the risks presented by Russia's possible use of tactical nuclear weapons in his 2020 EUCOM posture statement:

> Russia's vast non-strategic nuclear weapons stockpile and apparent misperception they could gain advantage in crisis or conflict through its use is concerning. Russia continues to engage in disruptive behavior despite widespread international disapproval and continued economic sanctions, and continues to challenge the rules-based international order and violate its obligations under international agreements. The Kremlin

employs coercion and aggressive actions amid growing signs of domestic unrest. These actions suggest Russian leadership may feel compelled to take greater risks to maintain power, counter Western influence, and seize opportunities to demonstrate a perception of great power status.[82]

Russia has two strategies for nuclear deterrence. The first is based on a threat of massive launch-on-warning and retaliatory strikes to deter a nuclear attack; the second is based on a threat of limited demonstration and "de-escalation" nuclear strikes to deter or terminate a large-scale conventional war.[83] Russia's reliance on nuclear weapons is based partly on their small cost relative to the cost of conventional weapons, especially in terms of their effect, and on Russia's inability to attract sufficient numbers of high-quality servicemembers. In other words, Russia sees its nuclear weapons as a way to offset the lower quantity and quality of its conventional forces.

Moscow has repeatedly threatened U.S. allies in Europe with nuclear deployments and even preemptive nuclear strikes.[84] The Russians justify their aggressive behavior by pointing to deployments of U.S. missile defense systems in Europe even though these systems are not scaled or postured to mitigate Russia's advantage in ballistic missiles and nuclear weapons to any significant degree.

Russia continues to violate the Intermediate-Range Nuclear Forces (INF) Treaty, which bans the testing, production, and possession of intermediate-range missiles.[85] Russia first violated the treaty in 2008 and then systematically escalated its violations, moving from testing to producing to deploying the prohibited missile into the field. Russia fully deployed the SSC-X-8 cruise missile in violation of the INF Treaty early in 2017 and has deployed battalions with the missile at a missile test site, Kapustin Yar, in southern Russia; at Kamyshlov, near the border with Kazakhstan; in Shuya, east of Moscow; and in Mozdok, in occupied North Ossetia.[86] U.S. officials consider

MAP 3

U.S. Troops Greatly Outnumbered Near Russian Border

U.S. troops in Norway and Poland number about 7,000—far less than the 49,300 Russian troops that are, for all intents and purposes, permanently stationed outside its borders on NATO's perimeter.

- ☐ NATO nations
- 🔵 U.S. troops in NATO nations adjacent to Russia
- 🔴 Russian troops
- 🟠 Russian troops in occupied territories

SOURCES: International Institute for Strategic Studies, *The Military Balance 2020: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2020); Defense Manpower Data Center, March 2019; and Heritage Foundation research.

☎ heritage.org

Atlantic Ocean

Arctic Ocean

Norway 1,369 U.S. troops

SWEDEN

FINLAND

RUSSIA

Kaliningrad (Russia)

Belarus 1,500 Russian troops

Moldova 1,500

Ukraine (Crimea) 28k

Ukraine (Donbas) 3k

GERMANY

Poland 5,675

UKRAINE

FRA.

ROMANIA

Georgia 7,000

ITALY

Black Sea

TURKEY

Mediterranean Sea

Armenia 3,300

Syria 5,000
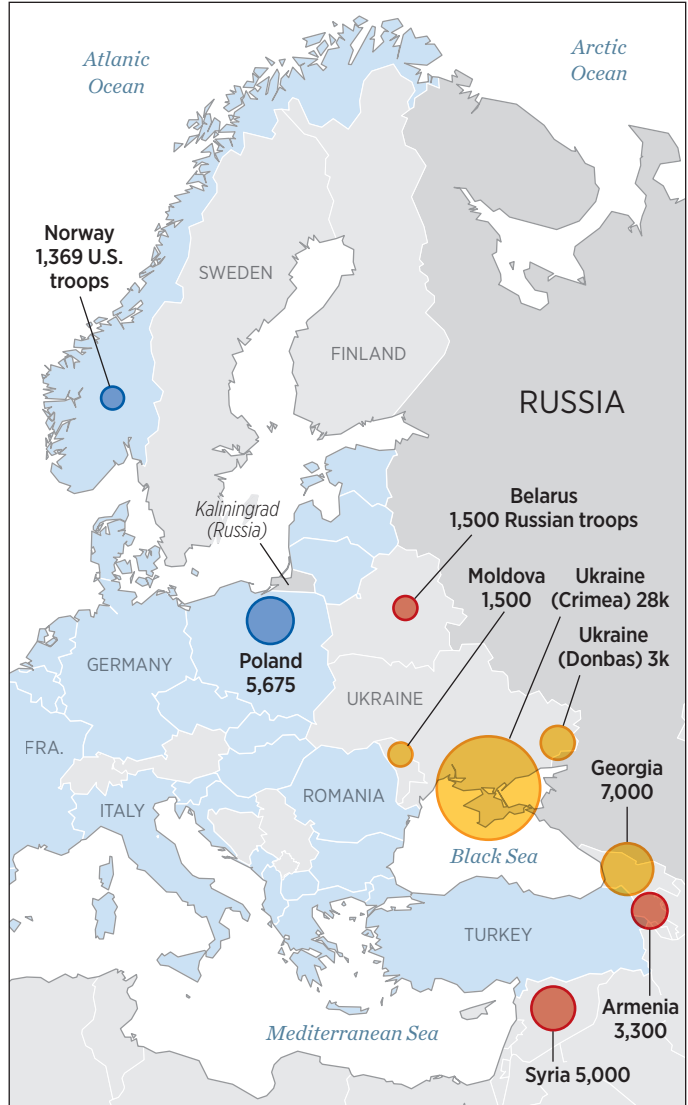
the banned cruise missiles to be fully operational.[87] In December 2018, in response to Russian violations, the U.S. declared Russia to be in material breach of the INF Treaty, a position with which NATO allies were in agreement.[88] The U.S. provided its six-month notice of withdrawal from the INF treaty on February 2, 2019, and officially withdrew from the treaty on August 2.[89]

The sizable Russian nuclear arsenal remains the only threat to the existence of the U.S. homeland emanating from Europe and Eurasia. While the potential for use of this arsenal remains low, the fact that Russia continues to threaten Europe with nuclear attack demonstrates that it will continue to play a central strategic role in shaping both Moscow's military and political thinking and the level of Russia's aggressive behavior beyond its borders.

Threat of Regional War

Many U.S. allies regard Russia as a genuine threat. At times, this threat is of a military

nature. At other times, it involves less conventional tactics such as cyberattacks, utilization of energy resources, and propaganda. Today, as in Imperial times, Russia uses both the pen and the sword to exert its influence. Organizations like the Collective Security Treaty Organization (CSTO) or the Eurasian Economic Union (EEU) attempt to bind regional capitals to Moscow through a series of agreements and treaties.

Russia also uses espionage in ways that are damaging to U.S. interests. In May 2016, a Russian spy was sentenced to prison for gathering intelligence for Russia's Foreign Intelligence Service (SVR) while working as a banker in New York. The spy specifically transmitted intelligence on "potential U.S. sanctions against Russian banks and the United States' efforts to develop alternative energy resources."[90] In October 2019, the U.S. released and deported to Russia Maria Butina, a convicted Russian operative who had infiltrated American conservative political groups to interfere with the 2016 presidential election.[91] The European External Action Service, diplomatic service of the European Union (EU), estimates that 200 Russian spies are operating in Brussels, which also is the headquarters of NATO.[92]

On March 4, 2018, Sergei Skripal, a former Russian GRU colonel who was convicted in 2006 of selling secrets to the United Kingdom and freed in a spy swap between the U.S. and Russia in 2010, and his daughter Yulia were poisoned with Novichok nerve agent by Russian security services in Salisbury, U.K. Hundreds of residents could have been contaminated, including a police officer who was exposed to the nerve agent after responding.[93] It took a year and the work of 190 U.K. Army and Air Force personnel plus contractors to complete the physical cleanup of Salisbury.[94] On March 15, 2018, France, Germany, the U.K., and the U.S. issued a joint statement condemning Russia's use of the nerve agent: "This use of a military-grade nerve agent, of a type developed by Russia, constitutes the first offensive use of a nerve agent in Europe since the Second World War."[95] U.S. intelligence officials

have reportedly linked Russia to the deaths of 14 people in the U.K. alone, many of them Russians who ran afoul of the Kremlin.[96]

Russian intelligence operatives are reportedly mapping U.S. telecommunications infrastructure around the United States, focusing especially on fiber-optic cables.[97] In March 2017, the U.S. charged four people, including two Russian intelligence officials, with directing hacks of user data involving Yahoo and Google accounts.[98] In December 2016, the U.S. expelled 35 Russian intelligence operatives, closed two compounds in Maryland and New York that were used for espionage, and levied additional economic sanctions against individuals who took part in interfering in the 2016 U.S. election.[99]

Russia has also used its relations with friendly nations—especially Nicaragua—for espionage purposes. In April 2017, Nicaragua began using a Russian-provided satellite station at Managua that, even though the Nicaraguan government denies it is intended for spying, is of concern to the U.S.[100] In November 2017, the Russian-built "counter-drug" center at Las Colinas opened, with its future purpose being to support "Russian security engagement with the entire region."[101] According to a Foreign Policy Research Institute report, "Aside from the center, Russian forces have participated in joint raids and operations against drug trafficking [in Nicaragua], capturing as many as 41 presumed traffickers in one particular operation" since 2017.[102] Russia also has an agreement with Nicaragua, signed in 2015, that allows access to Nicaraguan ports for its naval vessels.[103]

Pressure on Central and Eastern Europe. Moscow poses a security challenge to members of NATO that border Russia. Although a conventional Russian attack against a NATO member is unlikely, primarily because it would trigger a NATO response, it cannot be entirely discounted. Russia continues to use cyberattacks, espionage, its significant share of the European energy market, and propaganda to sow discord among NATO member states and undermine the alliance. The Estonian Foreign Intelligence Service's *International*

MAP 4

Russian Interference Zones
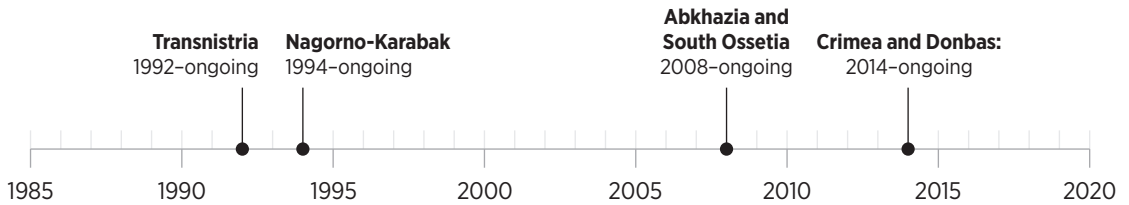
Transnistria
Russia has stationed troops in Transnistria since 1992 when a cease-fire ended the Moldovan civil war.

Nagorno-Karabakh
The Nagorno-Karabakh conflict between Armenia and Azerbaijan came to a head in 1994, when a Russian-brokered ceasefire was signed. Since then, occasional conflicts still occur in the region, which rightfully belongs to Azerbaijan.

Abkhazia and South Ossetia
Since Russia's 2008 invasion of Georgia and the subsequent five-day war, Russian troops have been stationed in both Abkhazia and South Ossetia.

Crimea
In March 2014, Russia illegally annexed the entire Crimean peninsula, and Russian troops have been stationed there ever since.

Donbas
Russia's annexation of Crimea lead to an armed conflict between Russian troops, Russian-backed separatist forces, and Ukrainian soldiers in Ukraine's eastern Donbas region.

SOURCE: Heritage Foundation research.

heritage.org

Security and Estonia 2019 report states clearly that "[t]he only serious threat to regional security, including the existence and sovereignty of Estonia and other Baltic Sea states, emanates from Russia. It involves not only asymmetrical, covert or political subversion, but also a potential military threat."[104]

After decades of Russian domination, the countries in Central and Eastern Europe factor Russia into their military planning and foreign policy formulation in a way that is simply unimaginable in many Western European countries and North America. Estonia and Latvia have sizable ethnic Russian populations, and there is concern that Russia might exploit this as a pretext for aggression—a view that is not without merit in view of Moscow's irredentist rhetoric and Russia's use of this technique to annex Crimea.

According to Lithuania's *National Threat Assessment 2020,* the "main threat to Lithuania's national security is Russia's foreign and security policies driven by the Kremlin's desire to ensure the regime's stability and demonstrate its indispensability to [a] domestic audience."[105] Its *National Threat Assessment 2019* states that Russia "exploits democratic freedoms and rights for its subversive activity" and "actually promotes its aggressive foreign policy" while "pretending to develop cultural relations" in Lithuania.[106] Latvian authorities similarly describe the means used by Russia to claim that it is defending the rights of citizens or Russian compatriots: TV propaganda to push discrediting messages about Latvia and stories in which the rights of Russian citizens are allegedly violated; "spreading interpretations of history favourable to Russia within Russia and abroad, as well as actively engaging in military-memorial work"; and the use of "compatriot support funds and other compatriot policy bodies" targeted at Latvian youth.[107]

Russia has also sought to undermine the statehood and legitimacy of the Baltic States. In January 2018, for example, Putin signed a decree renaming an air force regiment the "Tallinn Regiment" to "preserve holy historical military traditions" and "raise [the] spirit

of military obligation."[108] General Scaparrotti testified in March 2017 that Russian propaganda and disinformation should be viewed as an extension of Russia's military capabilities: "The Russians see this as part of that spectrum of warfare, it's their asymmetric approach."[109]

In 2020, Russia used the COVID-19 pandemic to spread disinformation. For example, in March, various Russian state news sources reported that the U.S. initiated the coronavirus pandemic, that the U.S. deployed the virus as a "biological weapon," or that the virus was a complete hoax created by the United States. Russia did not create this disinformation on its own; it relied on various theories created by China and Iran.[110]

In addition, Russia has sought to use disinformation to undermine NATO's Enhanced Forward Presence (eFP) in the Baltics. In April 2017, for example, Russian hackers planted a false story about U.S. troops being poisoned by mustard gas in Latvia on the Baltic News Service website.[111] Lithuanian parliamentarians and media outlets began to receive e-mails in February 2017 containing a false story that German soldiers had sexually assaulted an underage Lithuanian girl.[112] And U.K. forces in Estonia have been targeted with a fake news story about British troops harassing an elderly Estonian at a hospital.[113]

U.S. troops stationed in Poland for NATO's eFP have been the target of similar Russian disinformation campaigns.[114] A fake story that a U.S. Army vehicle had hit and killed a Lithuanian boy in June during Saber Strike 2018 was meant to undermine public support for NATO exercises.[115] One report summarized that "Russia's state propaganda channels RT and Sputnik remain very keen to exploit to the maximum any incidents involving eFP personnel, and to repeat the Kremlin's anti-NATO and anti-eFP narrative."[116] In particular, recent Russian propaganda has focused on portraying eFP as an "occupying force."[117]

Russia has also demonstrated a willingness to use military force to change the borders of modern Europe. When Kremlin-backed Ukrainian President Viktor Yanukovych failed

to sign an Association Agreement with the EU in 2013, months of street demonstrations led to his ouster early in 2014. Russia responded by sending troops, aided by pro-Russian local militia, to occupy the Crimean Peninsula under the pretext of "protecting Russian people." This led to Russia's eventual annexation of Crimea, the first such forcible annexation of territory in Europe since the Second World War.[118]

Russia's annexation of Crimea has effectively cut Ukraine's coastline in half, and Russia has claimed rights to underwater resources off the Crimean Peninsula.[119] In May 2018, Russia inaugurated the first portion of a $7.5 billion, 11.8-mile bridge connecting Russia with Kerch in occupied Crimea. The project will be fully completed in 2023.[120] The effect on Ukraine's regional economic interests can be seen in the fact that 30 percent of the cargo ships that served Mariupol could not clear the span.[121] In December 2019, Russia completed a new rail bridge over the Kerch Strait that the EU condemned as "yet another step toward a forced integration of the illegally annexed peninsula."[122]

Russia has deployed 28,000 troops to Crimea and has embarked on a major program to build housing, restore airfields, and install new radars there.[123] Deployment of the Monolit-B radar system, for instance, which has a passive range of 450 kilometers, "provides the Russian military with an excellent real-time picture of the positions of foreign surface vessels operating in the Black Sea."[124] In addition, "Russian equipment there includes 40 main battle tanks, 680 armored personnel carriers and 174 artillery systems of various kinds" along with 113 combat aircraft.[125] In March 2019, Russia announced the deployment of nuclear-capable Tupolev Tu-22M3 strategic bombers to Gvardeyskoye air base in occupied Crimea.[126]

Control of Crimea has allowed Russia to use the Black Sea as a platform to launch and support naval operations in the Eastern Mediterranean.[127] The Black Sea fleet has received six *Kilo* diesel submarines and three *Admiral Grigorovich*–class frigates equipped with Kalibr-NK long-range cruise missiles.[128] Russia is also planning to add *Gorshkov*-class frigates to its Black Sea fleet.[129] Kalibr cruise missiles have a range of at least 2,500 kilometers, which places cities from Rome to Vilnius within range of Black Sea–based cruise missiles.[130]

Russia has deployed five S-400 air defense systems with a potential range of around 250 miles to Crimea.[131] In addition, "local capabilities have been strengthened by the Pantsir-S1 (SA-22 Greyhound) short-to-medium-range surface-to-air missile (SAM) and anti-aircraft artillery weapons system, which particularly complements the S-400."[132] Russia also deploys the Bastion P coastal defenses armed with the P-800 Oniks anti-ship cruise missile, which "has a range of up to 300 kilometers and travels at nearly mach 2.5, making it extraordinarily difficult to defeat with kinetic means."[133]

In eastern Ukraine, Russia has helped to foment and sustain a separatist movement. Backed, armed, and trained by Russia, separatist leaders in eastern Ukraine have declared the so-called Lugansk People's Republic and Donetsk People's Republic. Moscow has backed separatist factions in the Donbas region of eastern Ukraine with advanced weapons, technical and financial assistance, and Russian conventional and special operations forces. Approximately 3,000 Russian soldiers are operating in Ukraine.[134] Russian-backed separatists daily violate the September 2014 Minsk I and February 2015 Minsk II cease-fire agreements.[135] These agreements have led to the de facto partition of Ukraine and have created a frozen conflict that remains both deadly and advantageous for Russia. As of February 2019, the war in Ukraine had cost 13,000 lives and had left 30,000 people wounded.[136]

On November 25, 2018, Russian forces blocked the passage of three Ukrainian naval vessels through the Kerch Strait and opened fire on the ships before boarding and seizing them along with 24 Ukrainian sailors.[137] In September 2019, Russia released the sailors in a prisoner swap with Ukraine.[138] Russian harassment of ships sailing through the Kerch

Strait and impeding of free movement had taken place consistently before the November 2018 aggression and continued afterwards.[139] Russian inspections of ships, blockages of the strait, and delays have coalesced to constrict the port of Mariupol, where shipping traffic has been greatly reduced since 2014.[140]

In Moldova, Russia supports the breakaway enclave of Transnistria, where yet another frozen conflict festers to Moscow's liking. According to a Congressional Research Service report:

> Russia stations approximately 1,500 soldiers in Transnistria, a few hundred of which Moldova accepts as peacekeepers. In 2017, the Constitutional Court ruled that Russia's troop presence in Moldova was unconstitutional, and parliament adopted a declaration calling on Russia to withdraw. In 2018, the U.N. General Assembly passed a resolution calling on Russia to withdraw its troops from Moldova "unconditionally and without further delay."
>
> A political settlement to the Transnistrian conflict appears distant. The Moldovan government supports a special local governance status for Transnistria, but Russia and authorities in Transnistria have resisted agreement.
>
> The conflict-resolution process operates in a "5+2" format under the chairmanship of the Organization for Security and Cooperation in Europe (OSCE), with the OSCE, Russia, and Ukraine as mediators and the EU and the United States as observers. The EU also supports conflict management through a Border Assistance Mission to Moldova and Ukraine (EUBAM). EUBAM seeks to help the two countries combat transborder crime, facilitate trade, and resolve the conflict over Transnistria, which shares a long border with Ukraine.[141]

Russia continues to occupy 12 percent of Moldova's territory. In August 2018, Russian and separatist forces equipped with armored personnel carriers and armored reconnaissance vehicles exercised crossing the Dniester River in the demilitarized security zone. Moldovan authorities called the exercises "provocative," and the Organization for Security and Co-operation in Europe (OSCE) Mission to Moldova "expresse[d] its concern."[142] On January 22, 2019, in an effort to enhance its control of the breakaway region, Russia opened an office in Moscow for the Official Representation of the Pridnestrovian Moldavian Republic in the Russian Federation.[143]

Russia's permanent stationing of Iskander missiles in Kaliningrad in 2018 occurred a year to the day after NATO's eFP deployed to Lithuania.[144] Russia reportedly has deployed tactical nuclear weapons, the S-400 air defense system, and P-800 anti-ship cruise missiles to Kaliningrad.[145] Additionally, it plans to reestablish a tank brigade and a "fighter aviation regiment and naval assault aviation (bomber) regiment" in Kaliningrad and to reequip the artillery brigade with new systems.[146] According to the IISS, the majority of Russian air force pilot graduates this past year were sent to Kaliningrad "to improve staffing" in the air force units located there.[147]

Russia also has outfitted a missile brigade in Luga, Russia, a mere 74 miles from the Estonian city of Narva, with Iskander missiles.[148] Iskanders have been deployed to the Southern Military District at Mozdok near Georgia and Krasnodar near Ukraine as well, and Russian military officials have reportedly asked manufacturers to increase the Iskander missiles' range and improve their accuracy.[149]

Nor is Russia deploying missiles only in Europe. In November 2016, Russia announced that it had stationed Bal and Bastion missile systems on the Kuril Islands of Iturup and Kunashir, which are also claimed by Japan.[150] In February 2018, Russia approved the deployment of warplanes to an airport on Iturup, one of the largest islands.[151] In September 2019, Russia announced its plans to deploy additional missile systems on Paramushir and Matua, two islands in the northern portion of the

chain.[152] Russia has stationed 3,500 troops on the Kurile Islands. In December 2018, Japan lodged a formal complaint over the building of four new barracks.[153]

Russia has deployed additional troops and capabilities near its western borders. Bruno Kahl, head of the German Federal Intelligence Service, stated in March 2017 that "Russia has doubled its fighting power on its Western border, which cannot be considered as defensive against the West."[154] In January 2017, Russia's Ministry of Defence announced that four S-400 air defense systems would be deployed to the Western Military District.[155] According to a report published by the Royal Institute of International Affairs:

> Five dedicated storage and maintenance bases have been established in the Western Military District, and another one in the Southern Military District (and a further 15 in the Central and Eastern districts). These, similar to the US Army's POMCUS (Prepositioning Of Materiel Configured in Unit Sets), contain pre-positioned, properly maintained brigade-level assets, and 2.5 units of fire for all equipments.[156]

Russia represents a real and potentially existential threat to NATO member countries in Eastern and Central Europe. Considering Russia's aggression in Georgia and Ukraine, a conventional attack against a NATO member, while unlikely, cannot be ruled out entirely. In all likelihood, Russia will continue to use nonlinear means in an effort to pressure and undermine both these nations and the NATO alliance.

Militarization of the High North. Russia has taken steps to militarize its presence in the Arctic region. In March 2017, a decree signed by Putin gave the Federal Security Service (FSB), which controls law enforcement along the Northern Sea Route (NSR), an Arctic shipping route linking Asia and Europe, additional powers to confiscate land "in areas with special objects for land use, and in the border areas."[157]

Russia's Arctic territory is included within this FSB-controlled border zone. The FSB and its subordinate coast guard have added patrol vessels and have built up Arctic bases, including a coast guard base in Murmansk that was opened in December 2018.[158]

The Russian National Guard, which reports to President Putin,[159] is likewise taking on an increased role in the Arctic and is now charged with protecting infrastructure sites that are deemed to be of strategic importance, including a new liquefied natural gas (LNG) export terminal at Sabetta that was opened in December 2017.[160] The first shipment of LNG from the Sabetta terminal to China via the NSR took place in July 2018.[161] On August 23, 2019, the Russian National Guard set out on the *Akademik Lomonosov*, a floating nuclear power plant, on its way to Pevek. The voyage occurred after a year of preparations in Murmansk.[162]

In May 2018, Putin issued a presidential degree setting a target of 80 million tons shipped across the NSR by 2024.[163] In 2018, only 18 million tons were shipped across the route, but in the first nine months of 2019, shipments increased by 40 percent to 23.37 million tons.[164] To facilitate the achievement of Putin's goal, Russia's state-run Rosatom energy corporation was given nearly sole control of shipping across the NSR in 2018, with the Ministry of Transport retaining only some administrative responsibilities.[165] In March 2019, Russian media reported that the government was drafting stringent navigation rules for the entire length of the NSR outside Russian territorial waters. Under these rules, for example, foreign navies would be required to "post a request with Russian authorities to pass through the *Sevmorput* [NSR] 45 days in advance, providing detailed technical information about the ship, its crew and destination."[166]

The Arctic factors into Russia's basing, procurement, and military structuring. The Arctic-based Northern Fleet accounts for two-thirds of the Russian Navy. A new Arctic command was established in 2015 to coordinate all Russian military activities in the Arctic region.[167] Two Arctic brigades have been formed, and

Arctic Coastal Defense divisions, which will be under the command of the Northern Fleet and stationed in the Kola Peninsula and in Russia's eastern Arctic, are planned.[168] "Russian Arctic troops," however, "have experienced a number of setbacks of late," and plans for the Arctic Coastal Defense divisions "seem to have been shelved for now."[169] A naval deep-water division, based in Gadzhiyevo in the Murmansk region and directly subordinate to the Minister of Defense, was established in January 2018.[170]

Russia also has been investing in military bases in the Arctic. Its base on Alexandra Land, commissioned in 2017, can house 150 soldiers autonomously for up to 18 months.[171] In addition, old Soviet-era facilities have been reopened. The airfield on Kotelny Island, for example, was reactivated in 2013 for the first time in 20 years and scheduled to "be manned by 250 personnel."[172] According to a Center for Strategic and International Studies report, Kotelny Island is equipped with air defense systems such as the Bastion-P and Pantsir-S1, which "create a complex, layered coastal defense arrangement."[173]

In September 2018, the Northern Fleet announced construction plans for a new military complex to house a 100-soldier garrison and anti-aircraft units at Tiksi; in January 2019, Russian authorities claimed that the base was 95 percent completed.[174] Also in 2018, Russia opened an Arctic airfield at Nagurskoye that is equipped with a 2,500-meter landing strip and a fleet of MiG-31 or Su-34 Russian fighters.[175]

In fact, air power in the Arctic is increasingly important to Russia, which has 14 operational airfields in the region along with 16 deep-water ports.[176] In March 2019, Mayor General Igor Kozhin, head of the Russian Naval Air Force, claimed that Russia had successfully tested a new airstrip cover that is effective in "temperatures down to minus 30 centigrades."[177] In 2018, according to the Russian Ministry of Defense, "Russian Tu-142 Bear and Il-38 May maritime patrol and anti-submarine warfare aircraft, as well as Su-24MR Fencer tactical reconnaissance jets, flew more than 100 sorties in total above the Arctic circle."[178]

Russia resumed regular fighter jet combat patrols in the Arctic in 2019.[179] As an example, the Ministry of Defense announced that in January 2019, two Tu-160 bombers flew for 15 hours in international airspace over the Arctic.[180] Over the course of one week in April 2019, Russian fighter and bomber jets flew near the coast of Norway twice. In one instance, two Tu-60 bombers and a MiG-31 flew 13 hours over the Barents, Norwegian, and North Seas. British and Danish jets scrambled to meet the Russian aircraft.[181]

Russian Arctic flights are often aggressive. In May 2017, 12 Russian aircraft simulated an attack against NATO naval forces taking part in the EASTLANT17 exercise near Tromsø, Norway, and later that month, Russian aircraft targeted aircraft from 12 nations, including the U.S., that took part in the Arctic Challenge 2017 exercise near Bodø.[182] In April 2018, Maritime Patrol Aircraft from Russia's Pacific Fleet for the first time exercised locating and bombing enemy submarines in the Arctic, while fighter jets exercised repelling an air invasion in the Arctic region.[183] In March 2020, two Russian strategic heavy bombers flew over U.S. submarines surfaced in the Arctic Ocean, and in April, two maritime Tu-142 reconnaissance and anti-submarine warfare planes flew over the Barents, Norwegian, and North Seas.[184]

The 45th Air Force and Air Defense Army of the Northern Fleet was formed in December 2015, and "[r]adio-radar units and an air defense missile regiment equipped with S-300 missile systems were put on combat duty on the Franz Joseph Land, Novaya Zemlya, Severnaya Zemlya and New Siberian Islands archipelagos."[185] In 2017, Russia activated a new radar complex on Wrangel Island.[186] In 2019, it announced plans to lay a nearly 8,000-mile fiber-optic cable across its Arctic coast, linking military installations along the way from the Kola Peninsula through Vladivostok,[187] but the status of this effort is currently unknown.

In November 2019, Russia announced rocket firings in the Norwegian Sea 20 to 40 nautical miles from the Norwegian coast. The test firings, with little advance notice, were

designed to send a message as they took place in an area through which NATO ships were sailing during the Trident Juncture exercise.[188]

Russia's ultimate goal was to have a combined Russian armed force deployed in the Arctic by 2020,[189] but it appears that Moscow is still working on this. For a few years, Russia was developing three new nuclear icebreakers, and in May 2019, it launched its third and final Arktika nuclear icebreaker.[190] In October 2019, Russia launched "a new combat icebreaking vessel," the *Ivan Papanin*, which is designed to act also as a tugboat and patrol ship.[191] The *Ivan Papanin* is the first in a fleet of icebreaking corvettes that Russia is currently developing.[192]

In July 2017, Russia released a new naval doctrine citing the alleged "ambition of a range of states, and foremost the United States of America and its allies, to dominate the high seas, including in the Arctic, and to press for overwhelming superiority of their naval forces."[193] In May 2017, Russia had announced that its buildup of the Northern Fleet's nuclear capacity is intended "to phase 'NATO out of [the] Arctic.'"[194]

Russia's Northern Fleet is also building newly refitted submarines, including a newly converted *Belgorod* nuclear-powered submarine that was launched in April 2019.[195] The *Belgorod* is expected to carry six Poseidon drones, also known as nuclear torpedoes, and will carry out "covert missions."[196] The submarine will have a smaller mini-sub that will potentially be capable of tampering with or destroying undersea telecommunications cables.[197] According to Russian media reports, the *Belgorod* "will be engaged in studying the bottom of the Russian Arctic shelf, searching for minerals at great depths, and also laying underwater communications."[198] A similar submarine, the *Khabarovsk*, is under construction and was expected to be launched as early as June 2020.[199]

Russia continues to develop and increase its military capabilities in the Arctic region. The likelihood of armed conflict remains low, but physical changes in the region mean that the posture of players will continue to evolve. It is clear that Russia intends to exert a dominant influence. As summarized in EUCOM's 2018 posture statement:

> In the Arctic, Russia is revitalizing its northern fleet and building or renovating military bases along their Arctic coast line in anticipation of increased military and commercial activity. Russia also intends to assert sovereignty over the Northern Sea route in violation of the provisions of the United Nations Convention of the Law of the Sea (UNCLOS). Although the chances of military conflict in the Arctic are low in the near-term, Russia is increasing its qualitative advantage in Arctic operations, and its military bases will serve to reinforce Russia's position with the threat of force.[200]

Destabilization in the South Caucasus. The South Caucasus sits at a crucial geographical and cultural crossroads and has proven to be strategically important, both militarily and economically, for centuries. Although the countries in the region (Armenia, Georgia, and Azerbaijan) are not part of NATO and therefore do not receive a security guarantee from the United States, they have participated to varying degrees in NATO and U.S.-led operations. This is especially true of Georgia, which aspires to join NATO.

Russia views the South Caucasus as part of its natural sphere of influence and stands ready to exert its influence by force if necessary. In August 2008, Russia invaded Georgia, coming as close as 15 miles to the capital city of Tbilisi. A decade later, several thousand Russian troops occupied the two Georgian regions of South Ossetia and Abkhazia.

Russia has sought to deepen its relationship with the two occupied regions. In 2015, it signed so-called integration treaties with South Ossetia and Abkhazia that, among other things, call for a coordinated foreign policy, creation of a common security and defense space, and implementation of a streamlined process for Abkhazians and South Ossetians to receive Russian citizenship.[201] The Georgian

Foreign Ministry criticized the treaties as a step toward "annexation of Georgia's occupied territories,"[202] both of which are still internationally recognized as part of Georgia.

In January 2018, Russia ratified an agreement with the de facto leaders of South Ossetia to create a joint military force—an agreement that the U.S. condemned.[203] In November 2017, the U.S. State Department approved an estimated $75 million sale of Javelin missiles to Georgia, and in June 2018, the State Department approved a sale of Stinger missiles.[204] Russia's "creeping annexation" of Georgia has left towns split in two and families separated by military occupation and the imposition of an internal border (known as "borderization").[205] In May 2020, the U.S. Embassy in Tbilisi revealed that Russian-led security forces were continuing to erect unauthorized fences and reinforcing existing illegal "borderization" efforts near a number of Georgian villages.[206]

Today, Moscow continues to exploit ethnic divisions and tensions in the South Caucasus to advance pro-Russian policies that are often at odds with America's or NATO's goals in the region, but Russia's influence is not restricted to soft power. In the South Caucasus, the coin of the realm is military might. It is a rough neighborhood surrounded by instability and insecurity reflected in terrorism, religious fanaticism, centuries-old sectarian divides, and competition for natural resources.

Russia maintains a sizable military presence in Armenia based on an agreement that gives Moscow access to bases in that country until at least 2044.[207] The bulk of Russia's forces, consisting of 3,300 soldiers, dozens of fighter planes and attack helicopters, 74 T-72 tanks, almost 200 APCs, and an S-300 air defense system, are based around the 102nd Military Base.[208] Russia and Armenia have also signed a Combined Regional Air Defense System agreement. Even after the election of Prime Minister Nikol Pashinyan following the so-called Velvet Revolution, Armenia's cozy relationship with Moscow remains unchanged.[209] Armenian troops have even deployed alongside Russian troops in Syria to the dismay of U.S. policymakers.[210]

Another source of regional instability is the Nagorno–Karabakh conflict, which began in 1988 when Armenia made territorial claims to Azerbaijan's Nagorno–Karabakh Autonomous Oblast.[211] By 1992, Armenian forces and Armenian-backed militias had occupied 20 percent of Azerbaijan, including the Nagorno–Karabakh region and seven surrounding districts. A cease-fire agreement was signed in 1994, and the conflict has been described as frozen since then. Since August 2014, violence has increased noticeably along the Line of Contact between Armenian and Azerbaijani forces. Intense fighting in April 2016 left 200 dead.[212] In the early summer of 2018, Azerbaijani forces successfully launched an operation to retake territory around Günnüt, a small village strategically located in the mountainous region of Azerbaijan's Nakhchivan Autonomous Republic.[213] The 2016 and 2018 incidents marked the only changes in territory since 1994.[214]

This conflict offers another opportunity for Russia to exert malign influence and consolidate power in the region. While its sympathies lie with Armenia, Russia is the largest supplier of weapons to both Armenia and Azerbaijan.[215] As noted by Eurasia expert Eduard Abrahamyan, "for years, Moscow has periodically sought to use the local authorities in Karabakh as a proxy tool of coercive diplomacy against both Baku and Yerevan."[216]

The South Caucasus might seem distant to many American policymakers, but the spillover effect of ongoing conflict in the region can have a direct impact both on U.S. interests and on the security of America's partners, as well as on Turkey and other countries that depend on oil and gas transiting the region. Russia views the South Caucasus as a vital theater and uses a multitude of tools that include military aggression, economic pressure, and the stoking of ethnic tensions to exert influence and control, usually to promote outcomes that are at odds with U.S. interests.

Increased Activity in the Mediterranean. Russia has had a military presence in Syria for decades, but in September 2015, it became the decisive actor in Syria's ongoing

civil war, having saved Bashar al-Assad from being overthrown and strengthened his hand militarily, thus enabling government forces to retake territory lost during the war. Although conflicting strategic interests cause the relationship between Assad and Putin to be strained at times, Assad still needs Russian military support to take back Idlib province, a goal that he likely shares with Putin.[217] Russia's Hmeymim Air Base is located close to Idlib, a source of attacks from rebel fighters and terrorist groups, and Moscow instinctively desires to protect its assets. Assad's only goal is to restore sovereignty over all of Syria; Russia generally is more focused on eliminating terrorism in the region and must manage its relationship with Turkey.

In January 2017, Russia signed an agreement with the Assad regime to expand the naval facility at Tartus (Russia's only naval base on the Mediterranean) "under a 49-year lease that could automatically renew for a further 25 years." In December 2019, it was announced that "Russia will invest $500m in the port of Tartus in its largest ever investment in Syria."[218] According to a May 2020 report, Russia is reinforcing its naval group in the Mediterranean Sea with warships and submarines armed with Kalibr cruise missiles.[219]

The agreement with Syria also includes upgrades to the Hmeymim air base at Latakia, including repairs to a second runway.[220] Russia deployed the S-400 anti-aircraft missile system to Hmeymim in late 2015.[221] It also has deployed the Pantsir S1 system. "The two systems working in tandem provide a 'layered defense,'" according to one account, "with the S-400 providing long-ranged protection against bombers, fighter jets, and ballistic missiles, and the Pantsir providing medium-ranged protection against cruise missiles, low-flying strike aircraft, and drones."[222] Russia currently operates out of Hmeymim air base on a 40-year agreement and continues to entrench its position there, as demonstrated by its recent building of reinforced concrete aircraft shelters.[223]

Russia is using Syria as a testing ground for new weapons systems while obtaining valuable combat experience for its troops. According to Lieutenant General Ben Hodges, former Commander, U.S. Army Europe, Russia has used its intervention in Syria as a "live-fire training opportunity."[224] The IISS similarly reports that Russia has used Syria as "a test bed for the development of joint operations and new weapons and tactics."[225] In fact, Russia has tested hundreds of pieces of new equipment in Syria. In December 2018:

> Russian Deputy Prime Minister Yury Borisov detailed to local media…the various new weapons systems [that] have been introduced to the conflict. These included the Pantsir S1 anti-aircraft and Iskander-M ballistic missile systems on the ground, Tupolev Tu-160 supersonic strategic bombers, Tu-22M3 supersonic bombers and Tu-95 propeller-driven bombers, as well as Mikoyan MiG-29K fighters and Ka-52K Katran helicopters in the air.[226]

Overall, Russian arms sales abroad reportedly topped $13 billion in 2019, exceeding sales in 2018 by more than $2 billion.[227]

Russian pilots have occasionally acted dangerously in the skies over Syria. In May 2017, for example, a Russian fighter jet intercepted a U.S. KC-10 tanker, performing a barrel roll over the top of the KC-10.[228] That same month, Russia stated that U.S. and allied aircraft would be banned from flying over large areas of Syria because of a deal agreed to by Russia, Iran, and Turkey. The U.S. responded that the deal does not "preclude anyone from going after terrorists wherever they may be in Syria."[229] The U.S. and Russia have a deconfliction hotline to avoid midair collisions and incidents, but incidents have occurred on the ground as well as in the air. In November 2018, Ambassador James Jeffrey, U.S. Special Representative for Syria Engagement, told news media that "American and Russian forces have clashed a dozen times in Syria—sometimes with exchanges of fire."[230]

In October 2018, Egyptian President Abdel Fattah al-Sisi signed a strategic cooperation treaty with Russia.[231] In November 2018,

Russia sought to solidify its relations with Egypt, approving a five-year agreement for the two countries to use each other's air bases.[232] Russia is a major exporter of arms to Egypt, which agreed to purchase 20 Su-35 fighter jets in 2018 for $2 billion.[233] Production of the Su-35 jets began in May 2020.[234]

In Libya, Russia continues to support Field Marshal Khalifa Haftar with weapons and military advisers. Russian Special Forces reportedly have been deployed to assist Haftar, and 300 mercenaries from Russia's Wagner Group are believed to be in Libya.[235] Despite its ties to Haftar, Russia has also focused on growing business ties with the Libyan government in Tripoli.[236]

Russia has stepped up its military operations in the Mediterranean significantly, often harassing U.S. and allied vessels taking part in operations against the Islamic State. In April 2020, for example, a U.S. Navy aircraft over the Mediterranean Sea was intercepted by a Russian Su-35 jet—the second time in four days that "Russian pilots made unsafe maneuvers while intercepting US aircraft."[237] The Russian jet had taken off from Hmeymim air base in Syria. This happened again in May when two Russian Su-35 jets unsafely intercepted a U.S. Navy P-8A maritime patrol aircraft over international waters in the Eastern Mediterranean.[238]

From April–August 2017, the U.S. along with British, Dutch, and Spanish allies tracked the *Krasnodar*, a *Kilo*-class submarine, as it sailed from the Baltic Sea to a Russian base in occupied Crimea. The submarine stopped twice in the eastern Mediterranean to launch cruise missiles into Syria and conducted drills in the Baltic Sea and off the coast of Libya. This was one of the first times since the Cold War that the U.S. and NATO allies had tracked a Russian submarine during combat operations.[239] In March 2019, General Scaparrotti testified that:

> The Kremlin has also demonstrated the ability and political will to deploy its modernized military and expand its operational footprint. Last year we observed a historically high combat maritime presence in the East Mediterranean along with military deployments and demonstrations in Syria. Their most advanced and quietest guided missile submarine, the Severodvinsk, conducted extended deployments in the northern Atlantic.[240]

Russia's position in Syria, including its expanded area-access/area-denial capabilities and increased warship and submarine presence, underscores the growing importance of the Mediterranean theater in ensuring Europe's security.

The Balkans. Security has improved dramatically in the Balkans since the 1990s, but violence based on religious and ethnic differences remains an ongoing possibility. These tensions are exacerbated by sluggish economies, high unemployment, and political corruption.

Russia's interests in the Western Balkans are at odds with the ongoing desire of the U.S. and its European allies to encourage closer ties between the region and the transatlantic community:

> Russia seeks to sever the transatlantic bond forged with the Western Balkans… by sowing instability. Chiefly Russia has sought to inflame preexisting ethnic, historic, and religious tensions. Russian propaganda magnifies this toxic ethnic and religious messaging, fans public disillusionment with the West, as well as institutions inside the Balkan nations, and misinforms the public about Russia's intentions and interests in the region.[241]

Senior members of the Russian government have alleged that NATO enlargement in the Balkans is one of the biggest threats to Russia.[242] In June 2017, Montenegro became NATO's 29th member state, joining Albania and Croatia (and soon probably North Macedonia) as NATO members in the Balkans.

Russia stands accused of being behind a failed plot to break into Montenegro's

parliament on election day in 2016, assassinate its former prime minister, and install a pro-Russian government. In May 2019, two Russian nationals believed to be the masterminds behind the plot were convicted in absentia along with 12 other individuals for organizing and carrying out the failed coup. The trial judge stated that the convicted Russians who organized the plot "knowingly tried to terrorize Montenegrins, attack others, threaten and hurt basic constitutional and social structures."[243]

After Russia annexed Crimea, the Montenegrin government backed European sanctions against Moscow and even implemented its own sanctions. Nevertheless, Russia has significant economic influence in Montenegro and in 2015 sought unsuccessfully to gain access to Montenegrin ports for the Russian navy to refuel and perform maintenance. In 2018, "Russia account[ed] for one-third of [foreign direct investment] to Montenegro, and Russian nationals or companies own 40 percent of real estate in the nation—as well as almost one-third of all Montenegrin companies."[244]

North Macedonia's accession to NATO was similarly targeted by Russia, which had warned the nation against joining the alliance and sought to derail the Prespa agreement that paved the way for membership by settling long-standing Greek objections to Macedonia's name.[245] In 2018, after North Macedonia was invited to join NATO, Russia's ambassador to the EU stated that "there are errors that have consequences."[246] In July 2018, Greece expelled two Russian diplomats and banned entry by two Russian nationals because of their efforts to undermine the name agreement; Russian actions in Macedonia included disinformation surrounding the vote, websites and social media posts opposing the Prespa agreement, and payments to protestors as well as politicians and organizations opposing the agreement.[247]

Serbia in particular has long served as Russia's foothold in the Balkans:

Russia's influence in the Balkans centers on Serbia, a fellow religiously orthodox nation with whom it enjoys a close economic, political, and military relationship. Serbia and Russia have an agreement in place allowing Russian soldiers to be based at Niš airport in Serbia. The two countries signed a 15-year military cooperation agreement in 2013 that includes sharing of intelligence, officer exchanges, and joint military exercises. In October [2017], Russia gave Serbia six MiG-29 fighters (which while free, will require Serbia to spend $235 million to have them overhauled). Additionally, Russia plans to supply Serbia with helicopters, T-72 tanks, armored vehicles, and potentially even surface-to-air missile systems.[248]

The so-called Russian–Serbian Humanitarian Center at Niš is "widely believed to be a Russian spy base" and is located "only 58 miles from NATO's Kosovo Force mission based in Pristina."[249]

In February 2020, Serbia purchased the Pantsir S1 air-defense system from Russia, despite objections and potential sanctions from the United States.[250] To increase its role in Serbia, Russia has used its cultural ties, positioning itself as the defender of orthodoxy and investing funds in the refurbishing of orthodox churches. It also has helped to establish more than 100 pro-Russian non-governmental organizations and media outlets in Macedonia.[251]

Serbia and Russia have signed a strategic partnership agreement focused on economic issues. Russia's inward investment is focused on the transport and energy sectors. Except for those in the Commonwealth of Independent States, Serbia is the only country in Europe that has a free trade deal with Russia. In January 2019, Serbia and Russia signed 26 agreements relating to energy, railway construction, and strategic education cooperation.[252]

In a January 2019 state visit to Serbia, Vladimir Putin stated a desire for a free trade agreement between Serbia and the Russian-led Eurasian Economic Union, to be signed by the end of the year. In October 2019, Serbia did sign a trade agreement with the Eurasian Economic

Union after the EU had warned against doing so.[253] In addition, Russia has held out the possibility of $1.4 billion in infrastructure aid to Serbia aimed at building the Turk Stream pipeline and increasing Russia's energy leverage in the region. Russia also has continued to oppose Kosovo's recognition as an independent sovereign country and has condemned Kosovo's creation of its own army.[254]

However, Serbia still participates in military exercises far more without Russia than with Russia. "In 2017," for example, "Serbian forces participated in 2 joint exercises with Russia and Belarus but held 13 exercises with NATO members and 7 with U.S. units."[255] Like Russia, Serbia is a member of NATO's Partnership for Peace program. Additionally, Serbia has been part of the U.S. National Guard's State Partnership Program, partnering with the State of Ohio since 2006.

Russia is also active in Bosnia and Herzegovina—specifically, the ethnically Serb Republika Srpska, one of two substate entities inside Bosnia and Herzegovina that emerged from that country's civil war in the 1990s. Moscow knows that exploiting internal ethnic and religious divisions among the country's Bosniak, Croat, and Serb populations is the easiest way to prevent Bosnia and Herzegovina from entering the transatlantic community.

Republika Srpska's current unofficial leader, Milorad Dodik, has long advocated independence for the region and has enjoyed a very close relationship with the Kremlin. President Željka Cvijanović also claims that Republika Srpska will continue to maintain its partnership with Russia.[256] Recent events in Ukraine, especially the annexation of Crimea, have inspired more separatist rhetoric in Republika Srpska. In September 2018, two weeks before elections in Bosnia and Herzegovina, Russian Foreign Minister Lavrov visited Sarajevo, but he also visited Banja Luka in Republika Srpska, where he visited the site of "a future Serbian–Russian Orthodox cultural center."[257]

In many ways, Russia's relationship with Republika Srpska is akin to its relationship with Georgia's South Ossetia and Abkhazia autonomous regions: more like a relationship with another sovereign state than a relationship with a semiautonomous region inside Bosnia and Herzegovina. When Putin visited Serbia in October 2014, Dodik was treated like a head of state and invited to Belgrade to meet with him. In September 2016, Dodik was treated like a head of state on a visit to Moscow just days before a referendum that chose January 9 as Republika Srpska's "statehood day," a date filled with religious and ethnic symbolism for the Serbs.[258] In October 2018, just days before elections, Dodik again visited Russia where he watched the Russian Grand Prix in a VIP box with Putin.[259] Republika Srpska continues to host its "statehood day" in defiance of a ruling by Bosnia's federal constitutional court that both the celebration and the referendum establishing it were illegal.[260]

On January 9, 2020, Bosnian Serbs again held "statehood day."[261] At the 2018 "statehood day," then-president Dodik and the self-proclaimed leaders of South Ossetia had "signed a memorandum on cooperation between the 'states.'"[262] Russia has reportedly trained a Republika Srpska paramilitary force in Russia at the nearby Niš air base to defend the Serbian entity. It has been reported that "[s]ome of its members fought as mercenaries alongside the Kremlin's proxy separatists in Ukraine."[263] Veterans organizations in Russia and Republika Srpska have developed close ties.[264]

Russia has cultivated strong ties with the security forces of Republika Srpska. Russian police take part in exchanges with the security forces, and Russian intelligence officers reportedly teach at the police academy and local university. On April 4, 2018, the Republika Srpska authorities opened a new $4 million training center "at the site of a former army barracks in Zaluzani, outside Banja Luka." The site serves as the headquarters for "anti-terrorist units, logistics units, and a department to combat organized crime."[265]

Russia does not want Kosovo to be seen as a successful nation pointed toward the West. Rather, it seeks to derail Kosovo's efforts to integrate into the West, often by exploiting the

Serbian minority's grievances. In the most jarring example, in January 2017, a train traveling from Belgrade to Mitrovica, a heavily Serb town in Kosovo, was stopped at the Kosovar border. The Russian-made train was "painted in the colors of the Serbian flag and featured pictures of churches, monasteries, and medieval towns, as well as the words 'Kosovo is Serbian' in 21 languages."[266]

The U.S. has invested heavily in the Balkans since the end of the Cold War. Tens of thousands of U.S. servicemembers have served in the Balkans, and the U.S. has spent billions of dollars in aid there, all in the hope of creating a secure and prosperous region that will someday be part of the transatlantic community.

The foremost external threat to the Balkans is Russia. Russia's interests in the Balkans are at odds with the U.S. goal of encouraging the region to progress toward the transatlantic community. Russia seeks to sever the transatlantic bond forged with the Western Balkans by sowing instability and increasing its economic, political, and military footprint in the region.

Threats to the Commons

Other than cyberspace and (to some extent) airspace, the commons are relatively secure in the European region. Despite Russia's periodic aggressive maneuvers near U.S. and NATO vessels, this remains largely true with respect to the security of and free passage through shipping lanes (with the significant exception of the Kerch Strait). The maritime domain is heavily patrolled by the navies and coast guards of NATO and NATO partner countries; except in remote areas in the Arctic Sea, search and rescue capabilities are readily available; maritime-launched terrorism is not a significant problem; and piracy is virtually nonexistent.

Sea. In May 2018, 17 Russian fighter jets buzzed the HMS *Duncan,* which was serving as the flagship of Standing NATO Maritime Group Two (SNMG2), operating in the Black Sea. Commodore Mike Utley, who was leading SNMG2, stated that the ship was "probably the only maritime asset that has seen a raid of that magnitude in the last 25 years," and

then-British Defense Minister Gavin Williamson described the behavior as "brazen Russian hostility."[267] In April 2018, a fully armed Russian jet buzzed a French frigate operating in the eastern Mediterranean.[268]

Russian threats to the maritime theater also include activity near undersea fiber-optic cables. In July 2019, a Russian submarine reportedly was trying to tap information flowing through undersea cables near Russia's northern shore in the Barents Sea. The cables "carry 95 percent of daily worldwide communications" in addition to "financial transactions worth over $10 trillion a day."[269] Thus, any disruption would cause a catastrophic reduction in the flow of capital.

The *Yantar*, a mother ship to two Russian mini submersibles, is often seen near undersea cables, which it is capable of tapping or cutting, and has been observed collecting intelligence near U.S. naval facilities, including the submarine base at Kings Bay, Georgia.[270] The Russian spy ship *Viktor Leonov* was spotted collecting intelligence within 20 miles of Kings Bay in March 2017 and within 30 miles of Groton, Connecticut, in February 2018.[271]

Airspace. Russia has continued its provocative military flights near U.S. and European airspace over the past year. In April 2020, a U.S. Navy P-8A Poseidon reconnaissance aircraft was intercepted twice by a Russian Air Force Su-35 Flanker-E in international airspace over the Mediterranean Sea. This was the second unsafe intercept between a P-8A Poseidon and Russian fighter over the Mediterranean. In March 2020, American and Canadian fighter jets intercepted two Russian Tu-142 aircraft that had entered the Alaskan Air Defense Identification Zone.[272] Also in March, two Russian Tu-95 Bear strategic bomber aircraft entered Irish-controlled airspace. British Royal Air Force fighters, as well as Norwegian and French quick-reaction aircraft, scrambled to intercept them.[273]

In March and April 2019, the Royal Air Force scrambled fighters twice in five days to intercept Russian bombers flying near U.K. airspace off Scotland while the U.S., Australia,

and 11 NATO allies were taking part in the Joint Warrior exercise in Scotland.[274] Also in March 2019, Italian jets operating from Keflavík in Iceland intercepted two Russian Tu-142 Bear bombers flying in Iceland's air surveillance area.[275]

Aggressive Russian flying has occurred near North American airspace as well. In January 2019, two U.S. F-22s and two Canadian CF-18 fighters scrambled when two Russian Tu-160 Blackjack bombers flew into Arctic airspace patrolled by the Royal Canadian Air Force.[276]

Russian flights have also targeted U.S. ally Japan. Twice in one day in June 2019, two Russian Tupolev Tu-95 bombers entered Japanese airspace—over Minamidaito Island east of Okinawa and over Hachijo Island southeast of Tokyo. Japan sent out fighter jets to warn them.[277] In incidents in January, March, and May 2019, Japan scrambled fighter jets to intercept a Russian Il-38N maritime patrol aircraft (MPA) flying over the Sea of Japan.[278] Nor is it only MPA that fly near Japan; for instance, Russian Su-24 attack aircraft were intercepted in December 2018 and January 2019 incidents.[279] Between April 1, 2018, and March 31, 2019, Japan had to scramble jets 343 times to intercept Russian aircraft, although that was 47 times less than was necessary in the preceding year.[280]

The main threat from Russian airspace incursions, however, remains near NATO territory in Eastern Europe, specifically in the Black Sea and Baltic regions. In the Baltics, "NATO fighters scrambled 130 times in 2017, and 85 Alpha Scrambles had been mounted by mid-November 2018" in response "to provocative Russian air force flights."[281] The situation remained the same in 2019. In May 2020, Russian Su-27 and Su-30 fighter jets intercepted two U.S. B-1B supersonic heavy bombers over international waters of the Black and Baltic Seas.[282] Also in May, NATO jets were scrambled to intercept two Russian Tu-22 bombers that were approaching Romanian airspace.[283] In April 2020, NATO jets scrambled to intercept two Russian fighter jets that were flying over a U.S. Navy destroyer in the Baltic Sea near Lithuania.[284]

In addition, there have been several incidents involving Russian military aircraft flying in Europe without using their transponders. In April 2020, two maritime Tu-142 reconnaissance and anti-submarine warfare planes flew over the Barents, Norwegian, and North Seas but had switched off their transponders. As a result, two Norwegian F-16s were scrambled to identify the planes.[285] In September 2019, a Russian Air Force Sukhoi Su-34 fighter flew over Estonian airspace without filing a flight plan or keeping radio contact with Estonian air navigation officials because the plane's transponder had been switched off. This was the second air violation of Estonia's airspace by a Russian aircraft in 2019.[286] In August 2019, two Russian Su-27 escort jets flew over the Baltic Sea without a flight plan and without turning on their transponders.[287]

Russia's violation of the sovereign airspace of NATO member states is a probing and antagonistic policy that is designed both to test the defense of the alliance and as practice for potential future conflicts. Similarly, Russia's antagonistic behavior in international waters is a threat to freedom of the seas.

Russia's reckless aerial activity in the region also remains a threat to civilian aircraft flying in European airspace. That the provocative and hazardous behavior of the Russian armed forces or Russian-sponsored groups poses a threat to civilian aircraft in Europe was amply demonstrated by the July 2014 downing of Malaysia Airlines Flight MH17, killing all 283 passengers and 15 crewmembers, over the skies of southeastern Ukraine.

Cyber. Russian cyber capabilities are sophisticated and active, regularly threatening economic, social, and political targets around the world. Even more, Moscow appears to be increasingly aggressive in its use of digital techniques, often employing only the slightest veneer of deniability in an effort to intimidate targets and openly defy international norms and organizations. Russia clearly believes that these online operations will be essential to its domestic and foreign policy for the foreseeable future. As former Chief of the Russian General

Staff General Yuri Baluyevsky has observed, "a victory in information warfare 'can be much more important than victory in a classical military conflict, because it is bloodless, yet the impact is overwhelming and can paralyse all of the enemy state's power structures.'"[288]

Russia continues to probe U.S. critical infrastructure. In January 2019, testifying before the Senate Select Committee on Intelligence, then-Director of National Intelligence Daniel R. Coats assessed that:

> Russia has the ability to execute cyber attacks in the United States that generate localized, temporary disruptive effects on critical infrastructure—such as disrupting an electrical distribution network for at least a few hours—similar to those demonstrated in Ukraine in 2015 and 2016. Moscow is mapping our critical infrastructure with the long-term goal of being able to cause substantial damage.[289]

Russia continued to conduct cyberattacks on government and private entities in 2019. In January, "hackers associated with the Russian intelligence services were found to have hacked the Center for Strategic and International Studies," and "[t]he U.S. Democratic National Committee revealed that it had been targeted by Russian hackers in the weeks after the 2018 midterm elections."[290]

In June 2018, the U.S. Treasury Department sanctioned five Russian entities and three Russian individuals for "malign and destabilizing" cyber activities, including "the destructive NotPetya cyber-attack; cyber intrusions against the U.S. energy grid to potentially enable future offensive operations; and global compromises of network infrastructure devices, including routers and switches, also to potentially enable disruptive cyber-attacks."[291] These sanctions built on a joint assessment by the Department of Homeland Security and the FBI that Russian hackers were behind a series of attacks against American network infrastructure devices and the U.S. energy and critical infrastructure sectors.[292]

Nor is the United States Russia's only target. In February 2020, the U.S. and its key allies accused Russia's main military intelligence agency, the GRU, of a broad cyberattack against the Republic of Georgia. According to *The New York Times,* the attack "took out websites and interrupted television broadcasts."[293] The attack was limited, but through its accusation, the U.S. sought to deter Moscow from intervening in the 2020 presidential election. In April 2018 alone, Germany's head of domestic intelligence accused Moscow of attacking his government's computer networks, and the U.K.'s National Cyber Security Center warned that Russian hackers were targeting Britain's critical infrastructure supply chains. Russia continues to employ cyber as a key tool in manipulating and undermining democratic elections in Europe and elsewhere.

In addition to official intelligence and military cyber assets, Russia continues to employ allied criminal organizations (so-called patriotic hackers) to help it engage in cyber aggression. Using these hackers gives Russia greater resources and can help to shield its true capabilities. Patriotic hackers also give the Russian government deniability when it is desired. In June 2017, for example, Putin stated that "[i]f they (hackers) are patriotically-minded, they start to make their own contribution to what they believe is the good fight against those who speak badly about Russia. Is that possible? Theoretically it is possible."[294]

Russia's cyber capabilities are advanced and are a key tool in realizing the state's strategic aims. Russia has used cyberattacks to further the reach and effectiveness of its propaganda and disinformation campaigns, and its ongoing cyberattacks against election processes in the U.S. and European countries are designed to undermine citizens' belief in the veracity of electoral outcomes and erode support for democratic institutions in the longer term. Russia also has used cyberattacks to target physical infrastructure, including electrical grids, air traffic control, and gas distribution systems.

Russia's increasingly bold use of cyber capabilities, coupled with their sophistication and

Moscow's willingness to use them aggressively, presents a serious challenge both to the U.S. and to U.S. interests abroad.

Conclusion

Overall, the threat to the U.S. homeland originating from Europe remains low, but the threat to America's interests and allies in the region remains significant. Behind this threat lies Russia. Although Russia has the military capability to harm and (in the case of its nuclear arsenal) to pose an existential threat to the U.S., it has not conclusively demonstrated the intent to do so.

The situation is different when it comes to America's allies in the region. Through NATO, the U.S. is obliged by treaty to come to the aid of the alliance's European members. Russia continues its efforts to undermine the NATO alliance and presents an existential threat to U.S. allies in Eastern Europe. NATO has been the cornerstone of European security and stability ever since its creation in 1949, and it is in America's interest to ensure that it maintains both the military capability and the political will to fulfill its treaty obligations.

While Russia is not the threat to U.S. global interests that the Soviet Union was during the Cold War, it does pose challenges to a range of America's interests and those of its allies and friends closest to Russia's borders. Russia possesses a full range of capabilities from ground forces to air, naval, space, and cyber. It still maintains the world's largest nuclear arsenal,

and although a strike on the U.S. is highly unlikely, the latent potential for such a strike still gives these weapons enough strategic value vis-à-vis America's NATO allies and interests in Europe to keep them relevant.

Russian provocations that are much less serious than any scenario involving a nuclear exchange pose the most serious challenge to American interests, particularly in Central and Eastern Europe, the Arctic, the Balkans, and the South Caucasus. As the 2019 Worldwide Threat Assessment states:

> Moscow will continue pursuing a range of objectives to expand its reach, including undermining the US-led liberal international order, dividing Western political and security institutions, demonstrating Russia's ability to shape global issues, and bolstering Putin's domestic legitimacy. Russia seeks to capitalize on perceptions of US retrenchment and power vacuums, which it views the United States is unwilling or unable to fill, by pursuing relatively low-cost options, including influence campaigns, cyber tools, and limited military interventions.[295]

For these reasons, the *Index of U.S. Military Strength* continues to assess the threat from Russia as "aggressive" for level of provocation of behavior and "formidable" for level of capability.

Threats: Russia

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✔			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability	✔				

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Iran

James Phillips

Radical Islamist terrorism in its many forms remains the most immediate global threat to the safety and security of U.S. citizens at home and abroad, and Iran-supported terrorists pose some of the greatest potential threats. The Lebanon-based Hezbollah (Party of God) has a long history of executing terrorist attacks against American targets in the Middle East at Iran's direction, and it could be activated to launch attacks inside the United States in the event of a conflict with Iran. Such state-sponsored terrorist attacks pose the greatest potential Iranian threats to the U.S. homeland, at least until Iran develops a long-range ballistic missile capable of targeting the United States.

Threats to the Homeland

Hezbollah Terrorism. Hezbollah, the radical Lebanon-based Shia revolutionary movement, poses a clear terrorist threat to international security. Hezbollah terrorists have murdered Americans, Israelis, Lebanese, Europeans, and citizens of many other nations. Originally founded with support from Iran in 1982, this Lebanese group has evolved from a local menace into a global terrorist network that is strongly backed by regimes in Iran and Syria. Its political wing has dominated Lebanese politics and is funded by Iran and a web of charitable organizations, criminal activities, and front companies. Although it faced intense criticism and public scrutiny after the disastrous August 4, 2020, explosion of a poorly stored cache of ammonium nitrate that destroyed Beirut's port, Hezbollah remains a potent terrorist threat and a dominant political force within Lebanon.

Hezbollah regards terrorism not only as a useful tool for advancing its revolutionary agenda, but also as a religious duty as part of a "global jihad." It helped to introduce and popularize the tactic of suicide bombings in Lebanon in the 1980s, developed a strong guerrilla force and a political apparatus in the 1990s, provoked a war with Israel in 2006, intervened in the Syrian civil war after 2011 at Iran's direction, and has become a major destabilizing influence in the ongoing Arab–Israeli conflict.

Before September 11, 2001, Hezbollah had murdered more Americans than had any other terrorist group. Despite al-Qaeda's increased visibility since then, Hezbollah remains a bigger, better equipped, better organized, and potentially more dangerous terrorist organization, partly because it enjoys the support of the world's two chief state sponsors of terrorism: Iran and Syria. Hezbollah's demonstrated capabilities led former Deputy Secretary of State Richard Armitage to dub it "the A-Team of Terrorists."[1]

Hezbollah has expanded its operations from Lebanon to regional targets in the Middle East and far beyond the region. It now is a global terrorist threat that draws financial and logistical support from its Iranian patrons as well as from the Lebanese Shiite diaspora in the Middle East, Europe, Africa, Southeast Asia, North America, and South America. Hezbollah fundraising and equipment procurement cells have been detected and broken up in the

United States and Canada, and Europe is believed to contain many more of these cells.

Hezbollah has been involved in numerous terrorist attacks against Americans, including:

- The April 18, 1983, bombing of the U.S. embassy in Beirut, which killed 63 people including 17 Americans;

- The October 23, 1983, suicide truck bombing of the Marine barracks at Beirut Airport, which killed 241 Marines and other personnel deployed as part of the multinational peacekeeping force in Lebanon;

- The September 20, 1984, suicide truck bombing of the U.S. embassy annex in Lebanon, which killed 23 people including two Americans;

- The June 25, 1996, Khobar Towers bombing, which killed 19 American servicemen stationed in Saudi Arabia; and

- The January 2007 killing of five American soldiers in Iraq, an attack that was carried out by a Shiite group but planned and supported by Hezbollah.[2]

Hezbollah also was involved in the kidnapping of several dozen Westerners, including 14 Americans, who were held as hostages in Lebanon in the 1980s. The American hostages eventually became pawns that Iran used as leverage in the secret negotiations that led to the Iran–Contra affair in the mid-1980s.

Hezbollah has launched numerous attacks outside of the Middle East. It perpetrated the two deadliest terrorist attacks in the history of South America: the March 1992 bombing of the Israeli embassy in Buenos Aires, Argentina, which killed 29 people, and the July 1994 bombing of a Jewish community center in Buenos Aires that killed 96 people. The trial of those who were implicated in the 1994 bombing revealed an extensive Hezbollah presence in Argentina and other countries in South America.

Hezbollah has escalated its terrorist attacks against Israeli targets in recent years as part of Iran's shadow war against Israel. In 2012, Hezbollah killed five Israeli tourists and a Bulgarian bus driver in a suicide bombing near Burgas, Bulgaria. Hezbollah terrorist plots against Israelis were foiled in Thailand and Cyprus during that same year. In 2015, Hezbollah launched an attack against Israeli soldiers near the Golan Heights, killing two in a barrage of anti-tank missiles.[3]

In 2013, Hezbollah admitted that it had deployed several thousand militia members to fight in Syria on behalf of the Assad regime. By 2015, Hezbollah forces had become crucial in propping up the Assad regime after the Syrian army was hamstrung by casualties, defections, and low morale. Hezbollah also deployed personnel to Iraq after the 2003 U.S. intervention to assist pro-Iranian Iraqi Shia militias that were battling the U.S.-led coalition. In addition, Hezbollah has deployed personnel in Yemen to train and assist the Iran-backed Houthi rebels.

Although Hezbollah operates mostly in the Middle East, it has a global reach and has established a presence inside the United States. Cells in the United States generally are focused on fundraising, including criminal activities such as those perpetrated by over 70 used-car dealerships identified as part of a scheme to launder hundreds of millions of dollars of cocaine-generated revenue that flowed back to Hezbollah.[4]

Covert Hezbollah cells could morph into other forms and launch terrorist operations inside the United States. Given Hezbollah's close ties to Iran and past record of executing terrorist attacks on Tehran's behalf, there is a real danger that Hezbollah terrorist cells could be activated inside the United States in the event of a conflict between Iran and the U.S. or between Iran and Israel. On June 1, 2017, two naturalized U.S. citizens were arrested and charged with providing material support to Hezbollah and conducting preoperational surveillance of military and law enforcement sites in New York City and at Kennedy Airport, the Panama Canal, and the American and Israeli

embassies in Panama.[5] Nicholas Rasmussen, then Director of the National Counterterrorism Center, noted that the June arrests were a "stark reminder" of Hezbollah's global reach and warned that Hezbollah "is determined to give itself a potential homeland option as a critical component of its terrorism playbook," which "is something that those of us in the counterterrorism community take very, very seriously."[6]

On July 9, 2019, a New Jersey man who served as a U.S.-based operative for Hezbollah's terrorism-planning wing for years, was arrested and charged with providing material support to the terrorist group. Alexei Saab, a 42-year-old Lebanon native and naturalized U.S. citizen, scouted such New York City landmarks as the Statue of Liberty and the Empire State Building for possible attacks. When he was indicted in September 2019, he was at least the third American to have been charged since 2017 with being an agent for Hezbollah.[7]

Hezbollah also has a long history of cooperation with criminal networks. On May 27, 2020, U.S. prosecutors announced the indictment of a former Venezuelan politician who sought to recruit terrorists from Hezbollah and Hamas to orchestrate attacks against U.S. interests. Adel El Zabayar, a Venezuelan citizen of Syrian descent who is a close associate of Venezuelan President Nicolas Maduro, traveled to the Middle East in 2014 to obtain weapons and recruit members of Hezbollah and Hamas to train at hidden camps in Venezuela. The goal of this "unholy alliance," according to the U.S. Attorney's Office for the Southern District of New York, was to "create a large terrorist cell capable of attacking United States interests on behalf of the Cartel de Los Soles," a criminal organization that "conspired to export literally tons of cocaine into the U.S."[8]

Iran's Ballistic Missile Threat. Iran has an extensive missile development program that has received key assistance from North Korea, as well as more limited support from Russia and China until the imposition of sanctions by the U.N. Security Council. Although the U.S. intelligence community assesses that Iran does not have an ICBM capability (an intercontinental ballistic missile with a range of 5,500 kilometers or about 2,900 miles), Tehran could develop one in the future. Iran has launched several satellites with space launch vehicles that use similar technology, which could also be adapted to develop an ICBM capability.[9]

On April 22, 2020, Iran launched a military satellite with a new launch vehicle that includes such new features as a light carbon fiber casing and a moving nozzle for flight control that is also used in long-range ballistic missiles—clear evidence that Iran continues to improve its capabilities.[10] Tehran's missile arsenal primarily threatens U.S. bases and allies in the Middle East, but Iran eventually could expand the range of its missiles to include the continental United States.

Threat of Regional War

The Middle East region is one of the most complex and volatile threat environments faced by the United States and its allies. Iran, Hezbollah, and Iran-supported proxy groups pose actual or potential threats both to America's interests and to those of its allies.

Iranian Threats in the Middle East. Iran is led by an anti-Western revolutionary regime that seeks to tilt the regional balance of power in its favor by driving out the U.S. military presence in the region, undermining and overthrowing opposing governments, and establishing its hegemony over the oil-rich Persian Gulf region. It also seeks to radicalize Shiite communities and advance their interests against Sunni rivals. Iran has a long record of sponsoring terrorist attacks against American targets and U.S. allies in the region.

Iran's conventional military forces, although relatively weak by Western standards, loom large compared to those of Iran's smaller neighbors. Iran's armed forces remain dependent on major weapons systems and equipment that date back to before the country's 1979 revolution. The regime's ability to maintain or replace these aging weapons systems, many of which were depleted in the 1980–1988

Iran–Iraq war, has been limited by Western sanctions. Iran has not been able to acquire large numbers of modern armor, combat aircraft, longer-range surface-to-surface missiles, or major naval warships.

Tehran, however, has managed to import modern Russian and Chinese air-to-air, air-to-ground, air defense, anti-armor, and anti-ship missiles to upgrade its conventional military and asymmetric forces.[11] It also has developed its capacity to reverse engineer and build its own versions of ballistic missiles, rockets, unmanned aerial vehicles (UAVs), minisubmarines, and other weapon systems. To compensate for its limited capability to project conventional military power, Tehran has focused on building up its asymmetric warfare capabilities, proxy forces, and ballistic missile and cruise missile capabilities. For example, partly because of the limited capabilities of its air force, Iran developed UAVs during the Iran–Iraq war, including at least one armed model that carried up to six RPG-7 rounds in what was perhaps the world's first use of UAVs in combat.[12]

The July 2015 Iran nuclear agreement, which lifted nuclear-related sanctions on Iran in January 2016, gave Tehran access to about $100 billion in restricted assets and allowed Iran to expand its oil and gas exports, the chief source of its state revenues. Relief from the burden of sanctions helped Iran's economy and enabled Iran to enhance its strategic position, military capabilities, and support for surrogate networks and terrorist groups. In May 2016, Tehran announced that it was increasing its military budget for 2016–2017 to $19 billion—90 percent more than the previous year's budget.[13] Estimating total defense spending is difficult because of Tehran's opaque budget process and the fact that spending on some categories, including Iran's ballistic missile program and military intervention in Syria, is hidden, but the International Institute for Strategic Studies estimates that Iran's defense spending fell from $21.9 billion in 2018 to $17.4 billion in 2019.[14]

The lifting of sanctions also enabled Tehran to emerge from diplomatic isolation and strengthen strategic ties with Russia. Russian President Vladimir Putin traveled to Iran in November 2015 to meet with Supreme Leader Ayatollah Ali Khamenei and other officials. Both regimes called for enhanced military cooperation. During Iranian President Hassan Rouhani's visit to Russia in March 2017, Putin proclaimed his intention to raise bilateral relations to the level of a "strategic partnership."[15] On June 9, 2018, during the Shanghai Cooperation Organization (SCO) summit, Putin noted that Iran and Russia were "working well together to settle the Syrian crisis" and promised Rouhani that he would support Iran's entry into the SCO.[16] And on September 16, 2019, in Ankara, Turkey, ahead of a trilateral meeting with Turkish President Recep Tayyip Erdogan to discuss the situation in Syria, the two presidents met again, and Putin praised Iran's support for the Assad regime.

This growing strategic relationship has strengthened Iran's military capabilities. Tehran announced in April 2016 that Russia had begun deliveries of up to five S-300 Favorit long-range surface-to-air missile systems, which can track up to 100 aircraft and engage six of them simultaneously at a range of 200 kilometers.[17] The missile system, which was considered a defensive weapon not included in the U.N. arms embargo on Iran, was deployed and became operational in 2017, giving Iran a "generational improvement in capabilities" according to Defense Intelligence Agency Director Lieutenant General Robert Ashley.[18]

In 2016, Iranian Defense Minister Hossein Dehghan traveled to Moscow "to negotiate a series of important weapons deals with Russia" that included the purchase of advanced Sukhoi Su-30 Flanker fighter jets. These warplanes would significantly improve Iran's air defense and long-range strike capabilities, although under the terms of the 2015 Iran nuclear agreement, they cannot be delivered until after the U.N. arms embargo on Iran has expired. The agreement is scheduled to expire in October 2020. If Tehran pulled out of the agreement, however, the embargo would continue, precluding the sales. It was also reported

that Tehran was "close to finalizing a deal for purchase and licensed production of Russia's modern T-90S main battle tank."[19]

After the 2015 nuclear agreement, Iran and Russia escalated their strategic cooperation in propping up Syria's embattled Assad regime. Iran's growing military intervention in Syria was partly eclipsed by Russia's military intervention and launching of an air campaign against Assad's enemies in September 2015, but Iran's Islamic Revolutionary Guard Corps (IRGC) and surrogate militia groups have played the leading role in spearheading the ground offensives that have retaken territory from Syrian rebel groups and tilted the military balance in favor of Assad's regime. By October 2015, Iran had deployed an estimated 7,000 IRGC troops and paramilitary forces in Syria, along with an estimated 20,000 foreign fighters from Iran-backed Shiite militias from Lebanon, Iraq, Afghanistan, and Pakistan.[20] Tehran escalated to deploy a force of almost 80,000 Shia militia fighters commanded by nearly 2,000 IRGC officers.[21]

Working closely with Russia, Iran then expanded its military efforts and helped to consolidate a costly victory for the Assad regime. At the height of the fighting in August 2016, Russia temporarily deployed Tu-22M3 bombers and Su-34 strike fighters to an air base at Hamedan in western Iran in order to strike rebel targets in Syria.[22] After the fall of Aleppo in December 2016, which inflicted a crushing defeat on the armed opposition, Tehran sought to entrench a permanent Iranian military presence in Syria, establishing an elaborate infrastructure of military bases, intelligence centers, UAV airfields, missile sites, and logistical facilities. The IRGC also sought to secure a logistical corridor to enable the movement of heavy equipment, arms, and matériel through Iraq and Syria to bolster Hezbollah in Lebanon.

Iran's military presence in Syria and continued efforts to provide advanced weapons to Hezbollah through Syria have fueled tensions with Israel. Israel has launched more than 2,000 air strikes against Hezbollah and Iranian forces to prevent the transfer of sophisticated arms and prevent Iran-backed militias from deploying near Israel's border. On February 10, 2018, Iranian forces in Syria launched an armed drone that penetrated Israeli airspace before being shot down. Israel responded with air strikes on IRGC facilities in Syria. Iranian forces in Syria later launched a salvo of 20 rockets against Israeli military positions in the Golan Heights on May 9, 2018, provoking Israel to launch ground-to-ground missiles, artillery salvos, and air strikes against all known Iranian bases in Syria.[23]

Although Russia has sought to calm the situation, reportedly helping to arrange the withdrawal of Iranian heavy weapons 85 kilometers from Israeli military positions in the Golan Heights, Moscow has "turned a blind eye" to Iranian redeployments and the threat that long-range Iranian weapon systems deployed in Syria pose to Israel.[24] On January 13, 2019, Israel launched an air strike against an Iranian arms depot at Damascus International Airport, and the Israeli government revealed that it had launched over 2,000 missiles at various targets in Syria in 2018.[25] Israel remains determined to prevent Iran from establishing forward bases near its borders, and another clash could rapidly escalate into a regional conflict.

By early 2020, Iran reportedly had reduced its military forces in Syria after successfully defeating the rebel military challenge to the Assad regime.[26] Iran continues to bolster the strength of its proxies and allies in Syria, however, particularly Hezbollah, which has embedded itself in the Syrian army's 1st Corps and is recruiting Syrian fighters near the Golan Heights for future attacks on Israel.[27]

Iran's Proxy Warfare. Iran has adopted a political warfare strategy that emphasizes irregular warfare, asymmetric tactics, and the extensive use of proxy forces. The Islamic Revolutionary Guard Corps has trained, armed, supported, and collaborated with a wide variety of radical Shia and Sunni militant groups, as well as Arab, Palestinian, Kurdish, and Afghan groups that do not share its radical Islamist ideology. The IRGC's elite Quds (Jerusalem) Force has cultivated, trained,

armed, and supported numerous proxies, particularly the Lebanon-based Hezbollah; Iraqi Shia militant groups; Palestinian groups such as Hamas and Palestinian Islamic Jihad; and insurgent groups that have fought against the governments of Afghanistan, Bahrain, Egypt, Israel, Iraq, Jordan, Kuwait, Morocco, Saudi Arabia, Turkey, the United Arab Emirates (UAE), and Yemen.

Iran is the world's foremost state sponsor of terrorism and has made extensive efforts to export its radical Shia brand of Islamist revolution. It has established a network of powerful Shia revolutionary groups in Lebanon and Iraq; has cultivated links with Afghan Shia and Taliban militants; and has stirred Shia unrest in Bahrain, Iraq, Lebanon, Saudi Arabia, and Yemen. In recent years, Iranian arms shipments have been intercepted regularly by naval forces off the coasts of Bahrain and Yemen, and Israel has repeatedly intercepted arms shipments, including long-range rockets, bound for Palestinian militants in Gaza.

U.S. troops in the Middle East have been targeted by Iranian proxies in Lebanon in the 1980s, Saudi Arabia in 1996, and Iraq in the 2000s. In April 2019, the Pentagon released an updated estimate of the number of U.S. personnel killed by Iran-backed militias in Iraq, revising the number upward to at least 603 dead between 2003 and 2011. These casualties, about 17 percent of the American death toll in Iraq, "were the result of explosively formed penetrators (EFP), other improvised explosive devices (IED), improvised rocket-assisted munitions (IRAM), rockets, mortars, rocket-propelled grenades (RPG), small-arms, sniper, and other attacks in Iraq," according to a Pentagon spokesman.[28]

Tehran ratcheted up surrogate attacks in Iraq against U.S. troops in 2019 as part of its aggressive campaign to push back against the U.S. "maximum pressure" sanctions campaign and block the negotiation of a revised nuclear agreement with tighter restrictions. After scores of rocket attacks on Iraqi military bases that hosted U.S. personnel, Iran-controlled Shia militias succeeded in killing an American

contractor on December 27, 2019. The ensuing crisis quickly escalated. The U.S. launched air strikes against the Kataib Hezbollah militia that launched the attack; pro-Iranian militia members retaliated by trying to burn down the U.S. embassy in Baghdad; and Washington responded with a drone strike on January 2, 2020, that killed General Qassem Soleimani, the leader of the IRGC Quds Force, which was orchestrating the attacks. Iran responded with additional proxy attacks and a ballistic missile attack that failed to kill any U.S. troops stationed at Iraqi military bases.[29]

Terrorist Threats from Hezbollah. Hezbollah is a close ally of, frequent surrogate for, and terrorist subcontractor for Iran's revolutionary Islamist regime. Iran played a crucial role in creating Hezbollah in 1982 as a vehicle for exporting its revolution, mobilizing Lebanese Shia, and developing a terrorist surrogate for attacks on its enemies.

Tehran provides the bulk of Hezbollah's foreign support: arms, training, logistical support, and money. The Pentagon has estimated that Iran provides up to $200 million in annual financial support for Hezbollah; other estimates made before the 2015 Joint Comprehensive Plan of Action (JCPOA), commonly known as the Iran nuclear deal ran as high as $350 million annually.[30] After the nuclear deal, which offered Tehran substantial relief from sanctions, Tehran increased its aid to Hezbollah, providing as much as $800 million per year according to Israeli officials.[31] Tehran has been lavish in stocking Hezbollah's expensive and extensive arsenal of rockets, sophisticated land mines, small arms, ammunition, explosives, anti-ship missiles, anti-aircraft missiles, and even unmanned aerial vehicles that Hezbollah can use for aerial surveillance or remotely piloted terrorist attacks. Iranian Revolutionary Guards have trained Hezbollah terrorists in Lebanon's Bekaa Valley and in Iran.

Iran has used Hezbollah as a club to hit not only Israel and Tehran's Western enemies, but many Arab countries as well. Tehran's revolutionary ideology has fueled Iran's hostility to other Middle Eastern governments, many of

which it seeks to overthrow and replace with radical allies. During the Iran–Iraq war, Iran used Hezbollah to launch terrorist attacks against Iraqi targets and against Arab states that sided with Iraq. Hezbollah launched numerous terrorist attacks against Saudi Arabia and Kuwait, which extended strong financial support to Iraq's war effort, and participated in several other terrorist operations in Bahrain and the UAE.

Iranian Revolutionary Guards conspired with the branch of Hezbollah in Saudi Arabia to conduct the 1996 Khobar Towers bombing that killed 19 American military personnel. Hezbollah collaborated with the IRGC's Quds Force to destabilize Iraq after the 2003 U.S. occupation and helped to train and advise the Mahdi Army, the radical anti-Western Shiite militia led by militant Iraqi cleric Moqtada al-Sadr. Hezbollah detachments also have cooperated with IRGC forces in Yemen to train and assist the Houthi rebel movement.

Hezbollah threatens the security and stability of the Middle East and Western interests in the Middle East on a number of fronts. In addition to its murderous actions against Israel, Hezbollah has used violence to impose its radical Islamist agenda and subvert democracy in Lebanon. Some experts believed that Hezbollah's participation in the 1992 Lebanese elections and subsequent inclusion in Lebanon's parliament and coalition governments would moderate its behavior, but political inclusion did not lead it to renounce terrorism.

Hezbollah also poses a potential threat to America's NATO allies in Europe. It established a presence inside European countries in the 1980s amid the influx of Lebanese citizens seeking to escape Lebanon's civil war and took root among Lebanese Shiite immigrant communities throughout Europe. German intelligence officials estimate that about 900 Hezbollah members live in Germany alone. Hezbollah also has developed an extensive web of fundraising and logistical support cells throughout Europe.[32]

France and Britain have been the principal European targets of Hezbollah terrorism, partly because both countries opposed Hezbollah's agenda in Lebanon and were perceived as enemies of Iran, Hezbollah's chief patron. Hezbollah has been involved in many terrorist attacks against Europeans, including:

- The October 1983 bombing of the French contingent of the multinational peacekeeping force in Lebanon, which killed 58 French soldiers (and on the same day the U.S. Marine barracks was bombed);

- The December 1983 bombing of the French embassy in Kuwait;

- The April 1985 bombing of a restaurant near a U.S. base in Madrid, Spain, which killed 18 Spanish citizens;

- A campaign of 13 bombings in France in 1986 that targeted shopping centers and railroad facilities, killing 13 people and wounding more than 250; and

- A March 1989 attempt to assassinate British novelist Salman Rushdie that failed when a bomb exploded prematurely, killing a terrorist in London.

Hezbollah's attacks in Europe trailed off in the 1990s after the group's Iranian sponsors accepted a truce in their bloody 1980–1988 war with Iraq and no longer needed a surrogate to punish states that Tehran perceived as supporting Iraq. Significantly, European participation in Lebanese peacekeeping operations, which became a lightning rod for Hezbollah terrorist attacks in the 1980s, could become an issue again if Hezbollah attempts to revive its aggressive operations in southern Lebanon. Troops from European Union (EU) member states could someday find themselves attacked by Hezbollah with weapons financed by Hezbollah supporters in their home countries.

Hezbollah operatives have been deployed in countries throughout Europe, including Belgium, Bulgaria, Cyprus, France, Germany, and Greece.[33]

MAP 5

Iranian Missile Systems: Maximum Ranges

— **2,000 km**
Shahab 3/Emad-1/Sejjil MRBMs

— **750 km**
Qiam-1 SRBM

— **700 km**
Zolfaghar SRBM

— **500 km**
Shahab 2 SRBM and Fateh-110

— **300 km**
Shahab 1

SOURCE: U.S. Defense Intelligence Agency, *Iran Military Power*, 2019, p. 43, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Iran_Military_Power_LR.pdf (accessed August 19, 2020).

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Mounting Missile Threat. Iran possesses the largest number of deployed missiles in the Middle East.[34] Testifying before the House Armed Services Committee in March 2020, the commander of CENTCOM, Marine Corps General Kenneth McKenzie, estimated that Iran has "about 2500 to 3000 ballistic missiles."[35] In June 2017, Iran launched mid-range missiles from its territory against opposition targets in Syria. This was Iran's first such operational use of mid-range missiles in almost 30 years, but it was not as successful as Tehran might have hoped. It was reported that three of the five missiles launched missed Syria altogether and landed in Iraq and that the remaining two landed in Syria but missed their intended targets by miles.[36]

Iran launched a much more successful attack on September 14, 2019, using at least 18 UAVs and three low-flying cruise missiles to destroy parts of the Saudi oil processing facility at Abqaiq and the oil fields at Khurais. The precisely targeted attack shut down half of Saudi oil production, which is approximately equivalent to 5 percent of global oil production. Although Iran denied responsibility, U.S. intelligence sources identified the launch site as the Ahvaz air base in southwest Iran, about 650 kilometers north of Abqaiq.[37]

Iran also used ballistic missiles to attack two Iraqi bases hosting U.S. military personnel on January 8, 2020, in retaliation for an earlier U.S. strike that killed IRGC Quds Force commander General Qassem Soleimani. Iran launched 16 short-range ballistic missiles across the border from three bases inside Iran, with 12 reaching the targeted bases: 11 struck al-Asad air base in western Iraq, and one struck a base near the northern Iraqi city of Irbil.[38] No U.S. personnel were killed, although over 100 were later treated for traumatic brain injuries.

The backbone of the Iranian ballistic missile force is the Shahab series of road-mobile surface-to-surface missiles, which are based on Soviet-designed Scud missiles. The Shahab missiles are potentially capable of carrying nuclear, chemical, or biological warheads in addition to conventional high-explosive warheads. Their relative inaccuracy (compared to NATO ballistic missiles) limits their effectiveness unless they are employed against large soft targets like cities.

Tehran's heavy investment in such weapons has fueled speculation that the Iranians intend eventually to replace the conventional warheads on their longer-range missiles with nuclear warheads. As the Nuclear Threat Initiative has observed, "Iran's rapidly improving missile capabilities have prompted concern from international actors such as the United Nations, the United States and Iran's regional neighbors."[39]

Iran is not a member of the Missile Technology Control Regime, and it has sought aggressively to acquire, develop, and deploy a wide spectrum of ballistic missile, cruise missile, and space launch capabilities. During the 1980–1988 Iran–Iraq war, Iran acquired Soviet-made Scud-B missiles from Libya and later acquired North Korean–designed Scud-C and No-dong missiles, which it renamed the Shahab-2 (with an estimated range of 500 kilometers or 310 miles) and Shahab-3 (with an estimated range of 900 kilometers or 560 miles). It now can produce its own variants of these missiles as well as longer-range Ghadr-1 and Qiam missiles.[40]

Iran's Shahab-3 and Ghadr-1, which is a modified version of the Shahab-3 with a smaller warhead but greater range (about 1,600 kilometers or 1,000 miles), are considered more reliable and advanced than the North Korean No-dong missile from which they are derived. Although early variants of the Shahab-3 missile were relatively inaccurate, Tehran was able to adapt and employ Chinese guidance technology to improve strike accuracy significantly.[41] In 2014, then-Defense Intelligence Agency Director Lieutenant General Michael T. Flynn warned that:

> Iran can strike targets throughout the region and into Eastern Europe. In addition to its growing missile and rocket inventories, Iran is seeking to enhance [the] lethality and effectiveness of existing

systems with improvements in accuracy and warhead designs. Iran is developing the Khalij Fars, an anti-ship ballistic missile which could threaten maritime activity throughout the Persian Gulf and Strait of Hormuz.[42]

Iran's ballistic missiles pose a growing threat to U.S. bases and allies from Turkey, Israel, and Egypt to the west to Saudi Arabia and the other Gulf states to the south and Afghanistan and Pakistan to the east. Iran also has become a center for missile proliferation by exporting a wide variety of ballistic missiles, cruise missiles, and rockets to the Assad regime in Syria and proxy groups such as Hezbollah, Hamas, Palestinian Islamic Jihad, the Houthi rebels in Yemen, and Iraqi militias. The Houthi Ansar Allah group has launched Iranian-supplied ballistic missiles and armed drones against targets in Saudi Arabia and the UAE, which launched a military campaign against them in 2015 in support of Yemen's government.

However, it is Israel, which has fought a shadow war with Iran and its terrorist proxies, that is most at risk from an Iranian missile attack. In case the Israeli government had any doubt about Iran's implacable hostility, the Revolutionary Guards, which control most of Iran's strategic missile systems, displayed a message written in Hebrew on the side of one of the Iranian missiles tested in March 2016: "Israel must be wiped off the earth."[43] The development of nuclear warheads for Iran's ballistic missiles would significantly degrade Israel's ability to deter major Iranian attacks, an ability that the existing (but not officially acknowledged) Israeli monopoly on nuclear weapons in the Middle East currently provides.

For Iran's radical regime, hostility to Israel, which Iran sometimes calls the "Little Satan," is second only to hostility to the United States, which the leader of Iran's 1979 revolution, Ayatollah Khomeini, dubbed the "Great Satan." But Iran poses a greater immediate threat to Israel than it does to the United States: Israel is a smaller country with fewer military capabilities, is located much closer to Iran, and already is within range of Iran's Shahab-3 missiles. Moreover, all of Israel can be hit with the thousands of shorter-range rockets that Iran has provided to Hezbollah in Lebanon and to Hamas and Palestinian Islamic Jihad in Gaza.

Weapons of Mass Destruction. Tehran has invested tens of billions of dollars since the 1980s in a nuclear weapons program that it sought to conceal within its civilian nuclear power program. It built clandestine but subsequently discovered underground uranium-enrichment facilities near Natanz and Fordow and a heavy-water reactor near Arak that would generate plutonium to give it a second potential route to nuclear weapons.[44]

Before the 2015 nuclear deal, Iran had accumulated enough low-enriched uranium to build eight nuclear bombs (assuming the uranium was enriched to weapon-grade levels). In November 2015, the Wisconsin Project on Nuclear Arms Control reported that "[b]y using the approximately 9,000 first generation centrifuges operating at its Natanz Fuel Enrichment Plant as of October 2015, Iran could theoretically produce enough weapon-grade uranium to fuel a single nuclear warhead in less than 2 months."[45] Clearly, the development of a nuclear bomb would greatly amplify the threat posed by Iran. Even if Iran did not use a nuclear weapon or pass it on to one of its terrorist surrogates to use, the regime could become emboldened to expand its support for terrorism, subversion, and intimidation, assuming that its nuclear arsenal would protect it from retaliation as has been the case with North Korea.

On July 14, 2015, President Barack Obama announced that the United States and Iran, along with China, France, Germany, Russia, the United Kingdom, and the EU High Representative for Foreign Affairs and Security Policy, had reached "a comprehensive, long-term deal with Iran that will prevent it from obtaining a nuclear weapon."[46] The short-lived agreement, however, did a much better job of dismantling sanctions against Iran than it did of dismantling Iran's nuclear infrastructure, much of

which was allowed to remain functional subject to weak restrictions, some of them only temporary. This flaw led President Donald Trump to withdraw the U.S. from the agreement on May 8, 2018, and reimpose sanctions.[47]

In fact, the agreement did not specify that any of Iran's covertly built facilities would have to be dismantled. The Natanz and Fordow uranium enrichment facilities were allowed to remain in operation, although the latter facility was to be repurposed at least temporarily as a research site. The heavy-water reactor at Arak was also retained with modifications that will reduce its yield of plutonium. All of these facilities, built covertly and housing operations prohibited by multiple U.N. Security Council resolutions, were legitimized by the agreement.

The Iran nuclear agreement marked a risky departure from more than five decades of U.S. nonproliferation efforts under which Washington opposed the spread of sensitive nuclear technologies, such as uranium enrichment, even for allies. Iran got a better deal on uranium enrichment under the agreement than such U.S. allies as the United Arab Emirates, South Korea, and Taiwan have received from Washington in the past. In fact, the Obama Administration gave Iran better terms on uranium enrichment than President Gerald Ford's Administration gave the Shah of Iran, a close U.S. ally before the 1979 revolution, who was denied independent reprocessing capabilities.

President Trump's decision to withdraw from the nuclear agreement marked a return to long-standing U.S. nonproliferation policy. Iran, Britain, France, Germany, the EU, China, and Russia sought to salvage the agreement, but the strength of the U.S. nuclear sanctions that were fully reimposed by November 4, 2018, after a 180-day wind-down period makes this unlikely.

Iran initially adopted a policy of "strategic patience," seeking to preserve as much of the agreement's relief from sanctions as it could while hoping to outlast the Trump Administration and deal with a presumably more pliable successor Administration after the 2020 elections. The Trump Administration,

however, ratcheted up sanctions to unprecedented levels under its "maximum pressure" campaign. On April 8, 2019, it designated Iran's Revolutionary Guards as a foreign terrorist organization. Because the Revolutionary Guards are extensively involved in Iran's oil, construction, and defense industries, this allowed U.S. sanctions to hit harder at strategic sectors of Iran's economy.[48] On April 22, 2019, Secretary of State Mike Pompeo announced that the Administration would eliminate waivers for Iran's remaining oil exports on May 2 and seek to zero them out entirely.[49]

Although President Trump has made it clear that he seeks a new agreement on Iran's nuclear program, Tehran has refused to return to the negotiating table. Instead, it has sought to pressure European states into protecting it from the effects of U.S. sanctions.

On May 8, 2019, Iranian President Rouhani announced that Iran would no longer comply with the 2015 nuclear agreement's restrictions on the size of Iran's stockpiles of enriched uranium and heavy water.[50] Tehran gave the Europeans 60 days to deliver greater sanctions relief, specifically with respect to oil sales and banking transactions, and warned that if this ultimatum was not met by July 7, 2019, it would incrementally violate the restrictions set by the JCPOA. Since then, Iran has escalated its noncompliance with the agreement every 60 days in a series of major violations that include breaching the caps on uranium enrichment, research and development of advanced centrifuges, numbers of operating centrifuges, and resuming enrichment at the fortified Fordow facility. When announcing the fifth breach in January 2020, Iran stated that its uranium enrichment program no longer faced any restrictions.[51]

By late February 2020, Iran had accumulated about 1,510 kilograms of low-enriched uranium, enough to give it a breakout estimate (the time needed to produce enough weapon-grade uranium for one nuclear weapon) of "3.8 months, with a range of 3.1 to 4.6 months."[52] This worst-case estimate of how long it would take Tehran to acquire the enriched uranium

necessary for a nuclear weapon at its known nuclear facilities is likely to shrink further as Iran adds new centrifuges and expands its stockpile of enriched uranium.

Iran also is a declared chemical weapons power that claims to have destroyed all of its stockpiles of chemical weapons, but it has never fully complied with the Chemical Weapons Convention or declared its holdings.[53] U.S. intelligence agencies have assessed that Iran maintains "the capability to produce chemical warfare (CW) agents and 'probably' has the capability to produce some biological warfare agents for offensive purposes, if it made the decision to do so."[54]

Iranian Threats to Israel. In addition to ballistic missile threats from Iran, Israel faces the constant threat of attack from Palestinian, Lebanese, Egyptian, Syrian, and other Arab terrorist groups, including many supported by Iran. The threat posed by Arab states, which lost four wars against Israel in 1948, 1956, 1967, and 1973 (Syria and the PLO lost a fifth war in 1982 in Lebanon), has gradually declined. Egypt and Jordan have signed peace treaties with Israel, and Iraq, Libya, Syria, and Yemen have been distracted by civil wars. However, although the conventional military threat to Israel from Arab states has declined, unconventional military and terrorist threats, especially from an expanding number of sub-state actors, have risen substantially.

Iran has systematically bolstered many of these groups even when it did not necessarily share their ideology. Today, Iran's surrogates, Hezbollah and Palestinian Islamic Jihad, along with more distant ally Hamas, pose the chief immediate security threats to Israel. After Israel's May 2000 withdrawal from southern Lebanon and the September 2000 outbreak of fighting between Israelis and Palestinians, Hezbollah stepped up its support for such Palestinian extremist groups as Hamas, Palestinian Islamic Jihad, the al-Aqsa Martyrs' Brigades, and the Popular Front for the Liberation of Palestine. It also expanded its own operations in the West Bank and Gaza and provided funding for specific attacks launched by other groups.

In July 2006, Hezbollah forces crossed the Lebanese border in an effort to kidnap Israeli soldiers inside Israel, igniting a military clash that claimed hundreds of lives and severely damaged the economies on both sides of the border. Hezbollah has since rebuilt its depleted arsenal with help from Iran and Syria. According to official Israeli estimates, Hezbollah has amassed around 150,000 rockets, including a number of long-range Iranian-made missiles capable of striking cities throughout Israel.[55] In recent years, under cover of the war in Syria, Iran has provided Hezbollah with increasingly sophisticated, accurate, and longer-range weapons as well as guidance kits that upgrade the accuracy of older rockets.[56] Iran and Hezbollah also have established another potential front against Israel in Syria in addition to Lebanon and Gaza.

Since Israel's withdrawal from the Gaza Strip in 2005, Hamas, Palestinian Islamic Jihad, and other terrorist groups have fired more than 11,000 rockets into Israel, sparking wars in 2008–2009, 2012, and 2014.[57] Over 5 million Israelis out of a total population of 8.1 million live within range of rocket attacks from Gaza, although the successful operation of the Iron Dome anti-missile system greatly mitigated this threat during the Gaza conflict in 2014. In that war, Hamas also unveiled a sophisticated tunnel network that it used to infiltrate Israel so that it could launch attacks on Israeli civilians and military personnel. In early May 2019, Palestinian Islamic Jihad ignited another round of fighting in Gaza in which about 700 rockets were fired at Israel.[58] Gaza remains a flash point that could trigger another conflict with little warning.

Threats to Saudi Arabia and Other Members of the Gulf Cooperation Council. Saudi Arabia and the five other Arab Gulf States—Bahrain, Kuwait, Oman, Qatar, and the United Arab Emirates—formed the Gulf Cooperation Council (GCC) in 1981 to deter and defend against Iranian aggression. Iran remains the primary external threat to their security. Tehran has supported groups that launched terrorist attacks against Bahrain, Kuwait,

Saudi Arabia, and Yemen. It sponsored the Islamic Front for the Liberation of Bahrain, a surrogate group that plotted a failed 1981 coup against Bahrain's ruling Al Khalifa family, the Sunni rulers of the predominantly Shia country. Iran also has long backed Bahraini branches of Hezbollah and the Dawa Party.

When Bahrain was engulfed in a wave of Arab Spring protests in 2011, its government charged that Iran again exploited the protests to back the efforts of Shia radicals to overthrow the royal family. Saudi Arabia, fearing that a Shia revolution in Bahrain would incite its own restive Shia minority, led a March 2011 GCC intervention that backed Bahrain's government with about 1,000 Saudi troops and 500 police from the UAE.

Bahrain has repeatedly intercepted shipments of Iranian arms, including sophisticated bombs employing explosively formed penetrators. The government withdrew its ambassador to Tehran when two Bahrainis with ties to the IRGC were arrested after their arms shipment was intercepted off Bahrain's coast in July 2015.

Iranian hard-liners have steadily escalated pressure on Bahrain. In March 2016, a former IRGC general who is a close adviser to Ayatollah Khamenei stated that "Bahrain is a province of Iran that should be annexed to the Islamic Republic of Iran."[59] After Bahrain stripped a senior Shiite cleric, Sheikh Isa Qassim, of his citizenship, General Qassim Suleimani, commander of the IRGC's Quds Force, threatened to make Bahrain's royal family "pay the price and disappear."[60]

Saudi Arabia has criticized Iran for supporting radical Saudi Shiites, intervening in Syria, and supporting Shiite Islamists in Lebanon, Iraq, and Yemen. In January 2016, Saudi Arabia executed a Shiite cleric charged with sparking anti-government protests and cut diplomatic ties with Iran after Iranian mobs enraged by the execution, attacked and set fire to the Saudi embassy in Tehran.[61]

In addition to military threats from Iran, Saudi Arabia and the other GCC states face terrorist threats and possible rebellions by Shia or other disaffected internal groups supported by Tehran. Iran has backed Shiite terrorist groups against Saudi Arabia, Bahrain, and Kuwait and has supported the Shiite Houthi rebels in Yemen. In March 2015, Saudi Arabia led a 10-country coalition that launched a military campaign against Houthi forces and provided support for ousted Yemeni President Abdu Rabu Mansour Hadi, who took refuge in Saudi Arabia. The Saudi Navy also established a blockade of Yemeni ports to prevent Iran from aiding the rebels.

The Houthis have retaliated by launching Iranian-supplied missiles at military and civilian targets in Saudi Arabia and the UAE, including ballistic missile attacks on airports, Riyadh, and other cities as well as cruise missile strikes. In December 2017, the Houthis launched a cruise missile attack on an unfinished nuclear reactor in Abu Dhabi. The Houthis also have made extensive use of UAVs and UCAVs (unmanned combat aerial vehicles, or armed drones). A Houthi UCAV attacked a military parade in Yemen in January 2019, killing at least six people including Yemen's commander of military intelligence, and longer-range UCAVs were used in a coordinated attack on Saudi Arabia's East–West pipeline on May 14, 2019.[62]

The August 13, 2020, announcement of a peace agreement between Israel and the United Arab Emirates could lead Iran to escalate tensions with the UAE, which it strongly criticized for improving ties with Israel. Tehran could retaliate by supporting terrorist attacks or sabotage against UAE targets by hardline Palestinian groups or its own proxies.

Threats to the Commons

The United States has critical interests at stake in the Middle Eastern commons: sea, air, space, and cyber. The U.S. has long provided the security backbone in these areas, and this security in turn has supported the region's economic development and political stability.

Maritime. Maintaining the security of the sea lines of communication in the Persian Gulf, Arabian Sea, Red Sea, and Mediterranean Sea is a high priority for strategic, economic, and

energy security purposes. In 2019, the Persian Gulf region produced about 31 percent of total world crude oil and held about 48 percent of global proved crude oil reserves.[63] The Persian Gulf is a crucial source of oil and gas for energy-importing states, particularly China, India, Japan, South Korea, and many European countries. Interstate conflict or terrorist attacks could easily interrupt the flow of that oil.

Bottlenecks such as the Strait of Hormuz, Suez Canal, and Bab el-Mandeb Strait are potential choke points for restricting the flow of oil, international trade, and the deployment of U.S. and allied naval forces. The chief potential threat to the free passage of ships through the Strait of Hormuz, the world's most important maritime choke point, is Iran. Approximately 21 million barrels per day, which is the equivalent of about 21 percent of global petroleum liquids consumption, flowed through the strait in 2018.[64]

Iran has trumpeted the threat that it could pose to the free flow of oil exports from the Gulf if it is attacked or a cutoff of its own oil exports is threatened. Iran's leaders have threatened to close the Strait of Hormuz, the jugular vein through which most Gulf oil exports flow to Asia and Europe. Although the United States has greatly reduced its dependence on oil exports from the Gulf, it still would sustain economic damage in the event of a spike in world oil prices, and many of its European and Asian allies and trading partners import a substantial portion of their oil needs from the region.

Supreme Leader Ayatollah Ali Khamenei has repeatedly played up Iran's threat to international energy security, proclaiming in 2006 that "[i]f the Americans make a wrong move toward Iran, the shipment of energy will definitely face danger, and the Americans would not be able to protect energy supply in the region."[65] Iranian officials often reiterate these threats during periods of heightened tension. For example, the chief of staff of Iran's army, Major General Mohammad Baqeri, warned on April 28, 2019, that "if our oil does not pass, the oil of others shall not pass the Strait of Hormuz either."[66]

Less than one month later, Iran began to intensify its intimidation tactics against international shipping near the strait. On May 12, 2019, four oil tankers were damaged by mysterious explosions off the coast of the UAE in the Gulf of Oman. Then-U.S. National Security Adviser John Bolton stated that "naval mines almost certainly from Iran" were the cause of the damage.[67] On June 13, two more tankers were attacked in the Gulf of Oman. Even though Iranian Revolutionary Guards were filmed removing an unexploded limpet mine from one of the damaged ships, Tehran continued to deny its involvement in all of the attacks.[68] On June 19, an IRGC surface-to-air missile shot down a U.S. surveillance drone in international air space. The U.S. initially planned to launch retaliatory strikes, but President Trump called off the operation.[69]

Iran continued its aggressive behavior, launching a sophisticated UCAV and cruise missile attack on Saudi oil facilities in September 2019. A series of rocket attacks on Iraqi bases containing U.S. troops in late 2019 by Iranian-controlled Iraqi militias provoked U.S. retaliatory air strikes against those militias and the January 2020 UCAV strike that killed General Qassem Soleimani, commander of the IRGC Quds Force. Rocket attacks by Iraqi militias have continued, and tensions remain high in Gulf waters. On May 10, 2020, a missile launched from an Iranian Navy frigate struck another Iranian naval vessel during a military exercise in the Gulf of Oman, killing at least 19 sailors and wounding 15.[70] The incident raised questions about the competence and training of Iran's naval forces.

Iran has a long history of attacking oil shipments in the Gulf. During the Iran–Iraq war, each side targeted the other's oil facilities, ports, and oil exports. Iran escalated attacks to include neutral Kuwaiti oil tankers and terminals and clandestinely laid mines in Persian Gulf shipping lanes while its ally Libya clandestinely laid mines in the Red Sea. The United States defeated Iran's tactics by reflagging Kuwaiti oil tankers, clearing the mines, and escorting ships through the Persian Gulf,

MAP 6

Iranian Naval Headquarters

● Islamic Republic of Iran Navy Headquarters   ● Islamic Revolutionary Guard Corps Navy Headquarters

ARMENIA
AZERBAIJAN
Baku
TURKMENISTAN
TURKEY
Caspian Sea

AFGHANISTAN

Bandar-e Anzali
IRIN 4th ND

Tehran
IRIN HQ

IRAN

Baghdad
IRAQ

Bandar-e Mahshahr
IRGCN 3rd ND

Bandar-e Bushehr
IRGCN 2nd ND

KUWAIT

Bandar-e Asaluyeh
IRGCN 4th ND

Bandar-e Lengeh
IRGCN 5th ND

PAKISTAN

Bandar Abbas
IRGCN HQ & 1st ND

Strait of Hormuz

Gulf of Oman

Jask
IRIN 2nd ND

Chah Bahar
IRIN 3rd ND

Persian Gulf

Dubai
Abu Dhabi

BAHRAIN
QATAR
SAUDI ARABIA
UAE
OMAN

ND — Naval district
SOURCE: Defense Intelligence Agency, *Iran Military Power*, 2019, p. 48, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Iran_Military_Power_LR.pdf (accessed August 19, 2020).

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but a large number of commercial vessels were damaged during the "Tanker War" from 1984 to 1987.

Iran's demonstrated willingness to disrupt oil traffic through the Persian Gulf to place economic pressure on Iraq is a red flag to U.S. military planners. During the 1980s Tanker War, Iran's ability to strike at Gulf shipping was limited by its aging and outdated weapons systems and the arms embargo imposed

by the U.S. after the 1979 revolution, but since the 1990s, Iran has been upgrading its military with new weapons from North Korea, China, and Russia, as well as with weapons manufactured domestically.

Since the Iran–Iraq war, Tehran has invested heavily in developing its naval forces, particularly the IRGC Navy, along unconventional lines. Today, Iran boasts an arsenal of Iranian-built missiles based on Russian and

Chinese designs that pose significant threats to oil tankers as well as warships. Iran has deployed mobile anti-ship missile batteries along its 1,500-mile Gulf coast and on many of the 17 Iranian-controlled islands in the Gulf, as well as modern anti-ship missiles mounted on fast attack boats, submarines, oil platforms, and vessels disguised as civilian fishing boats. Six of Iran's 17 islands in the Gulf—Forur, Bani Forur, Sirri, and three islands seized from the United Arab Emirates: Abu Musa, Greater Tunb, and Lesser Tunb—are particularly important because they are located close to the shipping channels that all ships must use near the Strait of Hormuz.

Iran has imported Russian submarines, North Korean minisubmarines, and a wide variety of advanced Chinese anti-ship missiles and has a significant stock of Chinese-designed anti-ship cruise missiles, including the older HY-2 Seersucker and the more modern CSS-N-4 Sardine and CSS-N-8 Saccade models. It also has reverse engineered Chinese missiles to produce its own Ra'ad and Noor anti-ship cruise missiles. More recently, Tehran has produced and deployed more advanced anti-ship cruise missiles, the Nasir and Qadir.[71] Shore-based missiles deployed along Iran's coast would be augmented by aircraft-delivered laser-guided bombs and missiles as well as by television-guided bombs.

Iran has a large supply of anti-ship mines, including modern mines that are far superior to the simple World War I–style contact mines that it used in the 1980s. In addition to expanding the quantity of its mines from an estimated 1,500 during the Iran–Iraq war to more than 5,000 in 2019, Tehran has increased their quality.[72] It has acquired significant stocks of "smart mines" including versions of the Russian MDM-6, Chinese MC-52, and Chinese EM-11, EM-31, and EM-55 mines.[73] One of Iran's most lethal mines is the Chinese-designed EM-52 "rocket" mine, which remains stationary on the sea floor and fires a homing rocket when a ship passes overhead.

Iran can deploy mines or torpedoes from its three *Kilo*-class submarines, purchased from Russia, which are based at Bandar Abbas, Iran's largest seaport and naval base. These submarines could be difficult to detect for brief periods when running silent and remaining stationary on a shallow bottom just outside the Strait of Hormuz.[74] Iran could also use minisubmarines, helicopters, or small boats disguised as fishing vessels to deploy its mines. Iran's robust mine warfare capability and the limited capacity for countermine operations by the U.S. Navy and allied navies pose major challenges to Gulf maritime security.[75]

Iran has developed two separate naval forces. The regular navy takes the lead in the Caspian Sea and outside the Strait of Hormuz in the Gulf of Oman, and the Islamic Revolutionary Guard Corps Navy is Iran's dominant force inside the Persian Gulf. The IRGC Navy has developed an effective asymmetric naval warfare strategy that could enable it to counter the superior firepower and technology of the U.S. Navy and its GCC allies, at least for a short period. It has adopted swarming tactics using well-armed fast attack boats to launch surprise attacks against larger and more heavily armed naval adversaries.

The commander of the IRGC Navy bragged in 2008 that it had brought guerilla warfare tactics to naval warfare: "We are everywhere and at the same time nowhere."[76] The IRGC has honed such unconventional tactics as deploying remote-controlled radar decoy boats and boats packed with explosives to confuse defenses and attack adversaries. The IRGC also could deploy naval commandos trained to attack using small boats, minisubmarines, and even jet skis, as well as underwater demolition teams that could attack offshore oil platforms, moored ships, ports, and other facilities.

On April 28, 2015, the Revolutionary Guard naval force seized the *Maersk Tigris*, a container ship registered in the Marshall Islands, near the Strait of Hormuz. Tehran claimed that it seized the ship because of a previous court ruling ordering the Maersk Line, which charters the ship, to make a payment to settle a dispute with a private Iranian company. The ship was

later released after being held for more than a week.[77] On May 14, 2015, the *Alpine Eternity*, an oil tanker flagged in Singapore, was surrounded and attacked by Revolutionary Guard gunboats in the Strait of Hormuz when it refused to be boarded. Iranian authorities alleged that it had damaged an Iranian oil platform in March, but the ship's owners maintained that it had hit an uncharted submerged structure.[78]

The Revolutionary Guard's aggressive tactics in using commercial disputes as pretexts for illegal seizures of transiting vessels prompted the U.S. Navy to escort American and British-flagged ships through the Strait of Hormuz for several weeks in May before tensions eased.

The July 2015 nuclear agreement did not alter the confrontational tactics of the Revolutionary Guards in the Gulf.[79] IRGC naval forces frequently challenged U.S. naval forces in a series of incidents. IRGC missile boats launched rockets within 1,500 yards of the carrier *Harry S. Truman* near the Strait of Hormuz in late December 2015, flew drones over U.S. warships, and detained and humiliated 10 American sailors in a provocative January 12, 2016, incident.[80] Despite the fact that the two U.S. Navy boats carrying the sailors had drifted inadvertently into Iranian territorial waters, the vessels had the right of innocent passage, and their crews should not have been disarmed, forced onto their knees, filmed, and exploited in propaganda videos.

In 2017, for unknown reasons, Iran temporarily halted the harassment of U.S. Navy ships. According to U.S. Navy reports, Iran instigated 23 "unsafe and/or unprofessional" interactions with U.S. Navy ships in 2015, 35 in 2016, and 14 in the first eight months of 2017, with the last incident occurring on August 14, 2017.[81] Although this was a welcome development, the provocations resumed in April 2020 when 11 IRGC Navy gunboats harassed six U.S. Navy vessels conducting exercises in the international waters of the North Arabian Gulf.[82] One week later, President Trump warned that U.S. Navy forces were authorized to destroy any Iranian vessels that harassed them.

If Tehran were to attack ships transiting the Strait of Hormuz, the United States and its allies have the capacity to counter Iran's maritime threats and restore the flow of oil exports, but "the effort would likely take some time—days, weeks, or perhaps months—particularly if a large number of Iranian mines need to be cleared from the Gulf."[83] Naval warfare experts estimated in May 2019 that by using its combined coastal missile batteries, mines, submarines, and naval forces, Iran could close the strait for up to four weeks.[84] Such an aggressive move would be very costly and risky for Tehran. Closing the strait would also block Iran's oil exports and many of its imports, including food and medicine. Moreover, most of Iran's naval forces, naval bases, and other military assets could be destroyed in the resulting conflict.

In addition to using its own forces, Tehran could use its extensive network of clients in the region to sabotage oil pipelines and other infrastructure or to strike oil tankers in port or at sea. Iranian Revolutionary Guards deployed in Yemen reportedly played a role in the unsuccessful October 9 and 12, 2016, missile attacks launched by Houthi rebels against the USS *Mason*, a U.S. Navy warship, near the Bab el-Mandeb Strait in the Red Sea.[85] The Houthis denied that they launched the missiles, but they did claim responsibility for an October 1, 2016, attack on a UAE naval vessel and the suicide bombing of a Saudi warship in February 2017.

Houthi irregular forces have deployed mines along Yemen's coast, used a remote-controlled boat packed with explosives in an unsuccessful attack on the Yemeni port of Mokha in July 2017, and have launched several unsuccessful naval attacks against ships in the Red Sea. Houthi gunboats also attacked and damaged a Saudi oil tanker near the port of Hodeidah on April 3, 2018.

U.N. investigators have concluded that the Houthis also operate UAVs with a range of up to 1,500 kilometers (930 miles), several of which were used to attack Saudi Arabia's East–West pipeline on May 14, 2019.[86] This attack, along with attacks on oil tankers in the Gulf of Oman two days earlier, likely was a signal

from Tehran that it can also disrupt oil shipments outside the Persian Gulf in a crisis. The Houthis have staged numerous UCAV attacks on Saudi targets along with a cruise missile attack on June 12, 2019, and an attack by 10 ballistic missiles on August 25.[87] The Houthis also claimed responsibility for the September 14, 2019, attacks on Saudi oil facilities at Abqaiq, but U.S. officials asserted that intelligence reports identified Iran as the staging ground for the attacks.[88]

Airspace. The Middle East is particularly vulnerable to attacks on civilian aircraft. Large quantities of arms, including man-portable air defense systems, were looted from arms depots in Libya, Iraq, Syria, and Yemen during their civil wars and could find their way into the hands of Iranian-supported groups. Iran has provided anti-aircraft missiles to Hezbollah, Iraqi militias, and the Houthi rebels in Yemen. The Houthis also have attacked Saudi airports with ballistic missiles and armed drones, although they may have been targeting nearby military facilities.[89]

Perhaps the greatest Iranian threat to civil aviation would come in the event of a military clash in the crowded skies over the Persian Gulf. The U.S. Federal Aviation Administration issued a warning to commercial airlines on May 16, 2019, during a period of heightened tensions with Iran, explaining that civilian planes risked being targeted by the Iranian military as a result of "miscalculation or misidentification."[90] Tragically, this warning foreshadowed the January 8, 2020, shooting down of Ukraine International Airlines Flight 752 that killed 176 passengers and crew, most of them Iranians. Several hours earlier, Iran had launched a ballistic missile attack on Iraqi bases hosting U.S. troops, and Iranian officials later admitted that they had kept Tehran's airport open in the hope that the presence of passenger jets could act as a deterrent against an American attack on the airport or a nearby military base.[91]

Space. Iran has launched satellites into orbit, but there is no evidence that it has an offensive space capability. Tehran successfully launched three satellites in February 2009,

June 2011, and February 2012 using the Safir space launch vehicle, which uses a modified Ghadr-1 missile for its first stage and has a second stage that is based on an obsolete Soviet submarine-launched ballistic missile, the R-27.[92] The technology probably was transferred by North Korea, which built its BM-25 missiles using the R-27 as a model.[93] Safir technology could be used to develop long-range ballistic missiles.

Iran claimed that it launched a monkey into space and returned it safely to Earth twice in 2013.[94] Tehran also announced in June 2013 that it had established its first space tracking center to monitor objects in "very remote space" and help manage the "activities of satellites."[95] On July 27, 2017, Iran tested a Simorgh (Phoenix) space launch vehicle that it claimed could place a satellite weighing up to 250 kilograms (550 pounds) in an orbit of 500 kilometers (311 miles).[96] However, the satellite launch failed, as did another Simorgh-boosted satellite launch in January 2019.[97]

In April 2020, Tehran finally discarded the pretense that its space program was dedicated exclusively to peaceful purposes. On April 22, Iran's Revolutionary Guards launched a Noor (Light) satellite into a low Earth orbit to celebrate the 41st anniversary of the founding of the IRGC. Launched from a secret missile base, the new spy satellite's path takes it over North Africa and the central Mediterranean, putting Israel within its potential field of vision approximately every 90 minutes.[98] Although the satellite was dismissed as a "tumbling webcam in space" by General Jay Raymond, commander of U.S. Space Command, Iran's real achievement focused more on the previously unheard-of satellite carrier, the Qased (Messenger), a three-stage system that used both solid and liquid fuel.[99] The technical advances required to launch a satellite are similar to those required to launch an ICBM, and the use of solid fuel could allow Iran to launch a missile more quickly—something that is crucial in an offensive weapon.

Cyber Threats. Iranian cyber capabilities present a significant threat to the U.S. and its

allies. Iran has developed offensive cyber capabilities as a tool of espionage and sabotage and claims "to possess the 'fourth largest' cyber force in the world—a broad network of quasi-official elements, as well as regime-aligned 'hacktivists,' who engage in cyber activities broadly consistent with the Islamic Republic's interests and views."[100]

The creation of the "Iranian Cyber Army" in 2009 marked the beginning of a cyber offensive against those whom the Iranian regime regards as enemies. A hacking group dubbed the Ajax Security Team, believed to be operating out of Iran, has used malware-based attacks to target U.S. defense organizations and has breached the Navy Marine Corps Intranet.[101] The group also has targeted dissidents within Iran, seeding versions of anti-censorship tools with malware and gathering information about users of those programs.[102] Iran has invested heavily in cyber activity, reportedly spending "over $1 billion on its cyber capabilities in 2012 alone."[103]

An April 2015 study released by the American Enterprise Institute reported that hostile Iranian cyber activity had increased significantly since the beginning of 2014 and could threaten U.S. critical infrastructure. The Islamic Revolutionary Guard Corps and Sharif University of Technology are two Iranian institutions that investigators have linked to efforts to infiltrate U.S. computer networks.[104]

Iran allegedly has used cyber weapons to engage in economic warfare, most notably the sophisticated and debilitating "[distributed] denial-of-service (DDoS) attacks against a number of U.S. financial institutions, including the Bank of America, JPMorgan Chase, and Citigroup."[105] In February 2014, Iran launched a crippling cyberattack against the Sands Casino in Las Vegas, owned by Sheldon Adelson, a leading supporter of Israel and critic of the Iranian regime.[106] In 2012, Tehran was suspected of launching both the "Shamoon" virus attack on Saudi Aramco, the world's largest oil-producing company—an attack that destroyed approximately 30,000 computers—and an attack on Qatari natural gas company Rasgas's computer networks.[107]

Israel has been a major target of Iranian cyberattacks. Iranian hackers launched denial-of-service attacks against the infrastructure of the Israel Defense Forces in 2014. On April 24, 2020, an Iranian cyberattack targeted the command and control center of Israel's Water Authority, disrupting operations of Israeli water and sewage facilities. According to an Israeli cyber expert, the operation was "a first-of-its-kind attack and they were not far from inflicting human casualties."[108] Israel retaliated with a May 9, 2020, cyberattack that disrupted operations at one of Iran's most important port facilities, the Shahid Rajaee terminal in Bandar Abbas.[109]

U.S. officials warned of a surge of sophisticated computer espionage by Iran in the fall of 2015 that would include a series of cyberattacks against State Department officials.[110] In March 2016, the Justice Department indicted seven Iranian hackers for penetrating the computer system that controlled a dam in the State of New York.[111] In April 2020, Iran-linked hackers targeted staff at the World Health Organization and the U.S. pharmaceutical company Gilead Sciences Inc., a leader in developing a treatment for the COVID-19 virus.[112]

The growing sophistication of these and other Iranian cyberattacks, together with Iran's willingness to use these weapons, has led various experts to characterize Iran as one of America's most cyber-capable opponents. Iranian cyber forces have gone so far as to create fake online personas in order to extract information from U.S. officials through such accounts as LinkedIn, YouTube, Facebook, and Twitter.[113] Significantly, the FBI sent the following cyber alert to American businesses on May 22, 2018:

The FBI assesses [that] foreign cyber actors operating in the Islamic Republic of Iran could potentially use a range of computer network operations—from scanning networks for potential vulnerabilities to data deletion attacks—against U.S.-based networks in response to the U.S. government's withdrawal from the Joint Comprehensive Plan of Action (JCPOA).[114]

Conclusion

Iran represents by far the most significant security challenge to the United States, its allies, and its interests in the greater Middle East. Its open hostility to the United States and Israel, sponsorship of terrorist groups like Hezbollah, and history of threatening the commons underscore the problem it could pose. Today, Iran's provocations are mostly a concern for the region and America's allies, friends, and assets there. Iran relies heavily on irregular (to include political) warfare against others in the region and fields more ballistic missiles than any of its neighbors. The development of its ballistic missiles and potential nuclear capability also mean that it poses a long-term threat to the security of the U.S. homeland.

According to the International Institute for Strategic Studies, among the key weapons in Iran's inventory are up to 50 medium-range ballistic missile launchers, as many as 100 short-range ballistic missile launchers, 333 combat-capable aircraft, 1,513 or more main battle tanks, 640 or more armored personnel carriers, 19 tactical submarines, seven corvettes, and 15 amphibious landing ships. There are 610,000 personnel in the armed forces, including 350,000 in the Army, 190,000 in the Islamic Revolutionary Guard Corps, 37,000 in the Air Force, 15,000 in Air Defense, and 18,000 in the Navy. With regard to these capabilities, the IISS assesses that:

The armed forces are numerous by regional standards and its personnel are reasonably well trained, with some benefitting from operational experience. The IRGC's Quds Force is a principal element of Iran's military power abroad, while elements of the Basij militia also play a foreign role. There are suggestions that Iran has developed an enhanced ability to conduct complex strikes utilizing land-attack missiles and UAVs. The regular navy has limited power-projection capabilities, while the IRGC navy is responsible for maritime security close to home. The armed forces struggle with an ageing inventory of primary combat equipment that ingenuity and asymmetric warfare techniques can only partially offset.[115]

This *Index* therefore assesses the overall threat from Iran, considering the range of contingencies, as "aggressive." Iran's capability score holds at "gathering."[116]

Threats: Iran

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✔			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✔			

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116. This *Index* scores threat capability as it relates to the vital national interests of the U.S. and the role and utility of U.S. military forces. Terrorist groups clearly have the ability to conduct attacks using improvised explosive devices (IEDs), firearms, and even hijacked airplanes. The bombing of the Boston Marathon in April 2013, an attempted car bomb attack in New York City's Times Square in May 2010, and al-Qaeda's attacks on September 11, 2001, are stark examples. Often, the U.S. has handled terrorism as a law enforcement and intelligence collection matter, especially within the United States and when it presents a threat to particular U.S. interests in other countries. Compared to the types of threats posed by states such as China or Russia, terrorism is a lesser sort of threat to the security and viability of the U.S. as a global power. This *Index* does not dismiss the deaths, injuries, and damage that terrorists can inflict on Americans at home and abroad; it places the threat posed by terrorism in context with substantial threats to the U.S. homeland, the potential for major regional conflict, and the potential to deny U.S. access to the global commons. With this in mind, terrorist groups seldom have the physical ability either to accomplish their extreme stated objectives or to present a physical threat that rises to a level that threatens U.S. vital security interests. Of course, terrorist organizations can commit acts of war on a continuing basis, as reflected in their conduct in the war against al-Qaeda and its associates in which the United States has been engaged for nearly two decades.

North Korea

Bruce Klingner

With its active and growing ballistic missile capability, North Korea poses definite threats to the U.S. homeland in addition to contributing to the general threat of regional war in Asia and threatening U.S. bases in South Korea, Japan, and Guam. North Korean belligerence toward the United States has included military and diplomatic threats. Pyongyang's provocative behavior also includes nuclear and missile tests and tactical-level attacks on South Korea, a critical American ally that remains under active threat of attack and invasion from the North. Japan faces both intimidation attacks intended to deny the U.S. its base access to Japan and nuclear attacks on U.S. bases in the case of conflict on the Korean Peninsula.

Threats to the Homeland

North Korea has developed a spectrum of missile systems that threaten the continental United States as well as U.S. forces and allies in Asia with nuclear weapons. In March 2020, General Terrence O'Shaughnessy, Commander, U.S. Northern Command and North American Aerospace Defense Command (NORAD), testified that "[i]n 2017, North Korea successfully tested an apparent thermonuclear weapon as well as two ICBM designs capable of ranging most or all of North America—feats only the five permanent members of the UN Security Council had previously achieved."[1]

In July 2019, U.S. Forces Korea assessed that North Korea's Hwasong-15 ICBM has a range of 8,000 miles and is capable of reaching anywhere in the U.S. mainland.[2] Although North Korea has not yet conducted an ICBM flight test that successfully demonstrated a reentry vehicle capability, the CIA has assessed that Pyongyang's ICBM reentry vehicles would likely perform adequately if flown on a normal trajectory to continental U.S. targets.[3]

North Korea has conducted six nuclear tests, including a 2017 test of a much more powerful hydrogen bomb with an explosive yield approximately 10 times the yields of the Hiroshima and Nagasaki atomic bombs of World War II. Pyongyang also has done nothing to indicate that it intends to abide by U.N. resolutions that require the abandonment of its nuclear and missile programs. North Korea has declared that it already has a full nuclear strike capability, even altering its constitution to enshrine itself as a nuclear-armed state.[4] In April 2018, Kim Jong-un announced that North Korea had successfully completed its program to mount nuclear weapons on ballistic missiles and that it was no longer necessary to conduct nuclear or ICBM tests.[5]

In 2016 and 2017, North Korea had breakthrough successes with many missiles in development. It successfully test-launched the Hwasong 12 intermediate-range ballistic missile, which can target critical U.S. bases in Guam, and both the Pukguksong-2 road-mobile medium-range ballistic missile and the Pukguksong-1 submarine-launched ballistic missile (SLBM).[6] In 2019, North Korea conducted 26 missile launches and unveiled five new short-range missile systems that threaten South Korea. That was the highest-ever annual

number of North Korea's violations of U.N. resolutions. In March 2020, Pyongyang conducted another nine short-range missile launches, all violations of U.N. resolutions.

In June 2018, President Donald Trump met with Kim Jong-un in Singapore and subsequently declared that "there is no longer a nuclear threat from North Korea" and that "total denuclearization...has already started taking place."[7] Secretary of State Michael Pompeo repeatedly claimed that North Korean leader Kim Jong-un had accepted U.N.-mandated complete, verifiable, and irreversible dismantling of his nuclear, missile, and biological and chemical weapons (BCW) programs. However, during the February 2019 Trump–Kim summit, it became clear that Kim has not agreed to do so and that the two sides still do not even have a common definition of "denuclearization" or what constitutes the Korean Peninsula.

Despite three U.S.–North Korea summit meetings, there has been no decrease in North Korea's weapons of mass destruction (WMD) arsenal or production capabilities. The U.S. Intelligence Community subsequently assessed that Pyongyang had increased its production of fissile material for nuclear weapons, and satellite imagery showed upgrades to missile, reentry vehicle, missile launcher, and nuclear weapon production facilities.[8] The Intelligence Community continues to assess that North Korea "is unlikely to give up all of its WMD stockpiles, delivery systems, and production capabilities."[9]

Threat of Regional War

North Korea's conventional and nuclear missile forces threaten U.S. bases in South Korea, Japan, and Guam. North Korea has an extensive ballistic missile force and has deployed approximately 800 Scud short-range tactical ballistic missiles, 300 No-dong medium-range missiles, and 50 Musudan intermediate-range ballistic missiles. The Scud missiles threaten South Korea, the No-dong can target all of Japan and South Korea, and the Musudan and Hwasong-12 intermediate-range ballistic missiles can hit U.S. bases on Okinawa and Guam.[10]

North Korea has "more than 1 million soldiers, making it the world's fourth-largest military," with reserves numbering several million more. In addition, "[a]bout 70 percent of [its] ground forces and 50 percent of its air and naval forces are deployed within approximately 60 miles of the Demilitarized Zone (DMZ)," making it possible to attack "with little to no warning," which is of particular concern because South Korea's capital, Seoul, is only 30 miles south of the DMZ.[11] In addition to three conventional corps along the DMZ, Pyongyang has deployed two mechanized corps, an armor corps, and an artillery corps.

The April 2018 inter-Korean summit led to bilateral pledges of nonaggression and mutual force reduction. Similar pledges were also contained in the 1972, 1992, 2000, and 2007 joint statements, all of which Pyongyang subsequently violated or abrogated. None of those pledges prevented North Korea from conducting provocations, attempted assassinations of South Korea's president, terrorist acts, military and cyberattacks, and acts of war.

In September 2018, the two Koreas signed a Comprehensive Military Agreement to ease military tension and build confidence. The agreement seeks to reduce the danger that inadvertent tactical military clashes along the DMZ might escalate to larger strategic conflicts. However, static defensive positions like fixed concrete bunkers and minefields are not threatening and have never been the source of military clashes on the peninsula. Rather, the greatest danger arises from the forward, offensively oriented disposition of North Korea's forces and the regime's history of making threats and initiating hostilities. The confidence-building measures implemented to date have not reduced North Korea's tactical or strategic conventional military threat to South Korea, nor do they represent progress in denuclearization.

Due to a predicted shortfall of 18-year-old conscripts by 2025, South Korea has initiated a comprehensive defense reform strategy to transform its military into a smaller but more capable force to deal with the North Korean

MAP 7

North Korean Missiles

North Korean missiles can target South Korea, Japan, and U.S. bases in Guam and can now reach the United States

Hwasong–12
4,500 km*

INTERMEDIATE-RANGE

Musudan
4,000 km

MEDIUM-RANGE

Scud-ER and **Pukguksong-1**
1,000 km

No Dong and **Pukguksong-2**
1,300 km

Alaska

CANADA

N. KOREA

JAPAN

S. KOREA

Pacific Ocean

U.S.

Atlantic Ocean

Arctic Ocean

U.K.

RUSSIA

EUROPE

CHINA

AFRICA

Indian Ocean

Guam

AUSTRALIA

Hwasong–14
10,000 km**

ICBM

SOUTH AMERICA

Hwasong–15
13,000 km

* First tested May 2017.   ** First tested July 2017.
SOURCE: Heritage Foundation research and media reports.

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threat. Overall, South Korean military manpower will be reduced by approximately 25 percent, from 681,000 to 500,000. The army would face the largest cuts, disbanding four corps and 23 divisions and cutting troops from 560,000 in 2004 to 370,000 in 2020. Seoul planned to compensate for decreased troop levels by procuring advanced fighter and surveillance aircraft, naval platforms, and ground combat vehicles.[12]

That North Korea's conventional forces are a very real threat to South Korea was vividly demonstrated by two deadly attacks on South Korea in 2010. In March, a North Korean submarine sank the South Korean naval corvette *Cheonan* in South Korean waters, killing 46 sailors. In November, North Korean artillery shelled Yeonpyeong Island, killing four South Koreans.

Because the North Korean military is equipped predominantly with older ground force equipment, Pyongyang has prioritized deployment of strong asymmetric capabilities that include special operations forces,

long-range artillery, and missiles. As noted, North Korea has deployed hundreds of Scud short-range ballistic missiles that can target all of South Korea with explosive, chemical, and biological warheads. The land and sea borders between North and South Korea remain unsettled, heavily armed, and subject to occasional, limited armed conflict.

North Korean forces arrayed against American allies in South Korea and Japan are substantial, and North Korea's history of provocation is a consistent indicator of its intent to achieve its political objectives by at least the threat of force. After assuming power, Kim Jong-un directed the North Korean military to develop a new war plan to invade and occupy South Korea within a week using asymmetric capabilities that include nuclear weapons.[13] Since then, North Korea has conducted several missile exercises and subsequently announced that they were practice drills for preemptive nuclear attacks on South Korea and Japan.[14]

Conclusion

The North Korean military poses a security challenge for American allies South Korea and Japan, as well as for U.S. bases in those countries and Guam. North Korean officials are belligerent toward the United States, often issuing military and diplomatic threats. Pyongyang also has engaged in a range of provocative behavior, including nuclear and missile tests and tactical-level attacks on South Korea.

North Korea has used its missile and nuclear tests to enhance its prestige and importance domestically, regionally, and globally and to extract various concessions from the United States in negotiations over its nuclear program and various aid packages. Such developments also improve North Korea's military posture. U.S. and allied intelligence agencies assess that Pyongyang has already achieved warhead miniaturization, the ability to place nuclear weapons on its medium-range missiles, and an ability to reach the continental United States with a missile.

This *Index* therefore assesses the overall threat from North Korea, considering the range of contingencies, as "testing" for level of provocation of behavior and "gathering" for level of capability.

Threats: North Korea

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior			✔		

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✔			

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Afghanistan/Pakistan

James Phillips

The threat to the American homeland emanating from Afghanistan and Pakistan is diverse, complex, and mostly indirect, largely involving non-state actors. The intentions of non-state terrorist groups like the TTP (Pakistani Taliban), al-Qaeda, and ISIS toward the U.S. are demonstrably hostile. Despite the broad and deep U.S. relationships with Pakistan's governing elites and military, it is likely that the political–military interplay in Pakistan and instability in Afghanistan will continue to result in an active threat to the American homeland.

In addition, ongoing tensions between nuclear-armed rivals India and Pakistan could lead eventually to broader military conflict with some prospect of escalating to a nuclear exchange. Because neither side desires another general war, both countries have limited objectives and have demonstrated a desire to avoid escalation. However, the likelihood of miscalculation and escalation has grown considerably since 2016 when India ended its policy of not responding with force to Pakistani-backed terrorist attacks.

Afghanistan War. On October 7, 2001, U.S. forces invaded Afghanistan in response to the September 11, 2001, terrorist attacks on the United States. This marked the beginning of Operation Enduring Freedom to eliminate the threat from al-Qaeda and topple the Taliban government that harbored the terrorist group. The U.S., in alliance with the United Kingdom and the anti-Taliban Afghan Northern Alliance forces, ousted the Taliban from power in December 2001. Many Taliban and al-Qaeda leaders fled across the border into Pakistan's Federally Administered Tribal Areas, where they regrouped and initiated an insurgency in Afghanistan in 2003.

In August 2003, NATO joined the war in Afghanistan and assumed control of the International Security Assistance Force (ISAF). At the height of the war in 2011, there were 50 troop-contributing nations, and nearly 150,000 NATO and U.S. forces were on the ground in Afghanistan.

On December 28, 2014, NATO formally ended combat operations and relinquished responsibility to the Afghan security forces, which numbered around 352,000 (including army and police).[1] After Afghan President Ashraf Ghani signed a bilateral security agreement with the U.S. and a Status of Forces Agreement with NATO, the international coalition launched Operation Resolute Support to train and support Afghan security forces.

In August 2017, while declining to announce specific troop levels, President Donald Trump recommitted America to the effort in Afghanistan and announced that "[c]onditions on the ground—not arbitrary timetables—will guide our strategy from now on."[2] He also suggested that his Administration would pursue a negotiated settlement with the Taliban. This was followed in 2018 by the initiation of direct talks with the Taliban in Doha, Qatar, in an attempt to find a political solution to the fighting.

In February 2020, after nearly two years of on-again, off-again negotiations, U.S.

Special Envoy Zalmay Khalilzad and Taliban co-founder and chief negotiator Abdul Ghani Baradar signed a phase-one peace agreement in Doha. Among other things, the deal (the details of which can be found in the chapter in the Asia operating environment) is designed to bring the Taliban and the Afghan government to the negotiating table while allowing all U.S. and international troops to leave Afghanistan by the spring of 2021. As part of the agreement, the Taliban pledged to break ties with al-Qaeda and other transnational terrorist groups.

The agreement still faces many obstacles. Levels of violence and the number of attacks between U.S. forces and the Taliban have declined significantly since the signing of the agreement in February 2020. However, the Taliban has continued to engage in attacks on Afghan security forces, and that is likely to remain the case until intra-Afghan negotiations produce some form of peace agreement. The COVID-19 global pandemic has temporarily halted intra-Afghan talks, and there are no publicly available details on how the international community intends to enforce the Taliban's commitment to renounce transnational terrorism.

Threats to the Homeland

Terrorist Groups Operating in Afghanistan and Pakistan (AfPak). This is a deadly region. In 2017, General John Nicholson, commander of the NATO-led Resolute Support Mission and of U.S. Forces Afghanistan, stated that the AfPak region harbors 20 of the "98 U.S.-designated terrorist groups globally," the "highest concentration of terrorist groups anywhere in the world."[3]

A wide variety of Islamist fundamentalist terrorist groups continue to operate from Pakistani territory, many with the support or sanction of the Pakistani state. Some continue to pose a direct threat to the U.S. homeland. Many are focused on launching attacks in Afghanistan, Kashmir, or other parts of India. Some target non-Muslims and Muslim minorities deemed un-Islamic inside Pakistan; others have targeted the Pakistani state and

security forces. The threat posed by al-Qaeda in Pakistan has been gradually degraded by the killing of Osama bin Laden at his hideout in Abbottabad, Pakistan, in May 2011; by an intensive drone campaign in Pakistan's tribal areas; and by Pakistani security forces. Nevertheless, al-Qaeda's residual presence and the emergence of ISIS in neighboring Afghanistan remain serious concerns.

Efforts by ISIS to make inroads into Pakistan and Afghanistan, known as the so-called Islamic State-Khorasan (IS-K) have met with only limited success, most likely because of other terrorist groups' well-established roots in the region. The Afghan Taliban views IS-K as a direct competitor for financial resources, recruits, and ideological influence. This competition was evident in a June 16, 2015, letter sent by the Taliban to then-ISIS leader Abu Bakr al-Baghdadi, urging his group not to take actions that could lead to "division of the Mujahideen's command."[4] The Taliban has attacked IS-K on numerous occasions. For example, U.S. officials acknowledge that even though they were not coordinating directly, it was U.S. air strikes and Taliban ground attacks that caused IS-K to lose its stronghold in Afghanistan's Nangarhar province.[5]

Reports of an ISIS presence in Afghanistan first began to surface in 2014, and the group has slowly gained a small foothold in the country. Though its actual numbers remain modest, its high-profile, high-casualty terrorist attacks have helped it to attract followers. In March 2019, General Joseph Votel, then commander of U.S. Central Command, said that he believed "ISIS Khorasan does have ideations focused on external operations toward our homeland."[6]

The lack of publicly available information and the willingness of local fighters in the region to change allegiances with little thought make it next to impossible to determine the exact number of IS-K fighters in Afghanistan at any given time. A report issued by the United Nations Security Council in February 2019 claimed that ISIS had between 2,500 and 4,000 fighters in Afghanistan.[7] In September 2019, U.S. officials estimated that there were between

2,000 and 5,000 ISIS fighters in Afghanistan.[8] IS-K suffered a series of major defeats in 2019 that led to its "collapse" in eastern Afghanistan according to U.S. officials.[9] Strikes by U.S. and Taliban forces appear to have diminished the Islamic State's capabilities in late 2019, and in November, Afghan President Ghani claimed that ISIS had been "obliterated."[10]

Experts believe that there is little coordination between the IS branch operating in Afghanistan and the central command structure of the group located in the Middle East. Instead, it draws recruits from disaffected members of the Pakistani Taliban and other radicalized Afghans and has frequently found itself at odds with the Afghan Taliban, with which it competes for resources, territory, and recruits. IS-K could benefit from Taliban fighters disgruntled by the peace deal with the U.S. and commitment to intra-Afghan talks. Also, IS-K is trying to be a spoiler in the peace process by conducting very high-profile and lethal attacks in Afghanistan, hoping that the international community will blame the Taliban.

Pakistan's continued support for terrorist groups that have links to al-Qaeda, the Taliban, and the Haqqani Network undermines U.S. counterterrorism goals in the region. Pakistan's military and intelligence leaders maintain a short-term tactical approach that involves fighting some terrorist groups that are deemed to be a threat to the state while supporting others that are aligned with Pakistan's goal of extending its influence and curbing India's.

In 2015, after a series of terrorist attacks against the Pakistani state and security services, the Pakistani government introduced a National Action Plan (NAP) to reinvigorate the country's fight against terrorism. Implementation of the NAP and the Pakistani military's operations against TTP (Pakistani Taliban) hideouts in North Waziristan helped to reduce Pakistan's internal terrorist threat to some degree. According to the India-based South Asia Terrorism Portal, total fatalities in Pakistan (including terrorists/insurgents) have been declining steadily since 2009, when they peaked at 11,704. Since then, they have fallen to 5,496 in 2014, 1,803 in 2016, 1,260 in 2017, 691 in 2018, and 228 as of June 23, 2019.[11]

However, there are few signs that Pakistan's crackdown on terrorism extends to groups that target India, such as the Lashkar-e-Taiba (LeT), which was responsible for the 2008 Mumbai attacks, and the Jaish-e-Mohammed (JeM), which carried out an attack on the Indian parliament in 2001, another on the airbase at Pathankot in 2016, and the deadliest attack on Indian security forces in Kashmir in February 2019.[12]

Threat of Regional War

Pakistan's Nuclear Weapons Stockpile. In its most recent report on the topic, published in September 2018, the *Bulletin of the Atomic Scientists* estimated that Pakistan "has a nuclear weapons stockpile of 140 to 150 warheads" that could "realistically grow to 220 to 250 warheads by 2025, if the current trend continues."[13] As of July 2019, the Arms Control Association estimated that Pakistan had "150–160 nuclear warheads."[14] The possibility that terrorists could gain effective access to Pakistani nuclear weapons is contingent on a complex chain of circumstances, but its possible consequences make this the most dangerous regional threat scenario. Concern about the safety and security of Pakistan's nuclear weapons increases when India–Pakistan tensions increase. During the 1999 Kargil crisis, for example, U.S. intelligence indicated that Pakistan had made "nuclear preparations," and this spurred greater U.S. diplomatic involvement in defusing the crisis.[15]

If Pakistan were to move its nuclear assets or, worse, take steps to mate weapons with delivery systems, the likelihood of theft or infiltration by terrorists would increase. Increased reliance on tactical nuclear weapons (TNWs) is of particular concern because launch authorities for TNWs are typically delegated to lower-tier field commanders far from the central authority in Islamabad. Another concern is the possibility that miscalculations could lead to regional nuclear war if India's leaders

were to lose confidence that nuclear weapons in Pakistan are under government control or, conversely, were to assume that they were under Pakistani government control after they ceased to be so.

There are additional concerns that Islamist extremist groups with links to the Pakistan security establishment could exploit those links to gain access to nuclear weapons technology, facilities, and/or materials. The realization that Osama bin Laden stayed for six years within a half-mile of Pakistan's premier defense academy has fueled concern that al-Qaeda can operate relatively freely in parts of Pakistan and eventually might gain access to Pakistan's nuclear arsenal. The Nuclear Threat Initiative's *Nuclear Security Index* ranks 22 countries that possess "weapons-usable nuclear materials" for their susceptibility to theft. Pakistan's weapons-grade materials were ranked the 20th least secure in 2018, with only Iran (21st) and North Korea (22nd) ranking lower.[16]

There is the additional (though less likely) scenario of extremists gaining access through a collapse of the state. While Pakistan remains unstable because of its weak economy, regular terrorist attacks, sectarian violence, civil–military tensions, and the growing influence of religious extremist groups, it is unlikely that the Pakistani state will collapse altogether. The country's most powerful institution, the 550,000-strong army that has ruled Pakistan for almost half of its existence, would almost certainly intervene and assume control once again if the political situation began to unravel. The potential breakup of the Pakistani state would have to be preceded by the disintegration of the army, which currently is not plausible.[17]

Pakistan–India Conflict. India and Pakistan have fought four wars since partition in 1947, including conflicts in 1947, 1965, 1971, and 1999. Deadly border skirmishes across the Line of Control in Kashmir, a disputed territory claimed in full by both India and Pakistan, are commonplace.

Another India–Pakistan conflict would jeopardize multiple U.S. interests in the region and could increase the threat of global terrorism if Pakistan were destabilized. Pakistan would rely on militant non-state actors to help it fight India, thereby creating a more permissive environment in which various terrorist groups could operate freely. The potential for a nuclear conflict would threaten U.S. businesses in the region and disrupt investment and trade flows, mainly between the U.S. and India, whose bilateral trade in goods and services reached roughly $150 billion in 2019. A conflict would also strain America's ties with one or both of the combatants at a time when Pakistan–U.S. ties are already under severe stress and America is trying to build a stronger partnership with India. The effects of an actual nuclear exchange—both the human lives lost and the long-term economic damage—would be devastating.

India and Pakistan are engaged in a nuclear competition that threatens stability throughout the subcontinent. Both countries tested nuclear weapons in 1998, establishing themselves as overtly nuclear weapons states, although India first conducted a "peaceful" nuclear weapons test in 1974. Both countries also are developing naval nuclear weapons and already possess ballistic missile and aircraft-delivery platforms.[18]

As noted, it is estimated that Pakistan has a stockpile of 150–160 nuclear warheads. It also "has lowered the threshold for nuclear weapons use by developing tactical nuclear weapons capabilities to counter perceived Indian conventional military threats."[19] This in turn affects India's nuclear use threshold and could affect those of China and other countries as well.

The broader military and strategic dynamic between India and Pakistan has grown more volatile since the May 2014 election of Bharatiya Janata Party (BJP) leader Narendra Modi as India's prime minister. Modi invited Pakistani Prime Minister Nawaz Sharif to his swearing-in ceremony but then, to express anger over a Pakistani official's meeting with Kashmiri separatist leaders, later called off foreign secretary–level talks that were scheduled for August 2014. During the same month, the two sides engaged in intense firing and shelling

along their international border (called the working boundary) and across the Line of Control that divides Kashmir. A similar escalation in border tensions occurred again in October 2014 when a series of firing incidents claimed more than a dozen casualties with several dozen more injured.[20]

A meeting finally occurred on December 25, 2015, when Modi made an impromptu visit to Lahore—the first visit to Pakistan by an Indian leader in 12 years—to meet with Sharif. The visit created enormous goodwill between the two countries and raised hope that official dialogue would soon resume. Again, however, violence marred the new opening. Six days after the meeting, militants attacked an Indian airbase at Pathankot, killing seven Indian security personnel.[21]

As a result, official India–Pakistan dialogue remains deadlocked even though the two sides are reportedly communicating quietly through their foreign secretaries and national security advisers. With Prime Minister Modi's BJP sweeping national elections in May 2019 and earning him a second term in office, few expect any major breakthroughs in the near term. As noted, Pakistan continues to harbor terrorist groups like Lashkar-e-Taiba and Jaish-e-Mohammed. The latter was responsible for a January 2, 2016, attack on the Indian airbase at Pathankot, a February 2018 attack on an Indian army camp in Kashmir, and a February 2019 attack on Indian security forces in Kashmir, the deadliest single terrorist attack in the disputed region since the eruption of an insurgency in 1989.[22]

Hafez Muhammed Saeed, LeT's founder and the leader of its front organization Jamaat-ud-Dawa (JuD), has periodically been placed under arrest, only later to be released. He was arrested most recently in July 2019 and remains under house arrest, his trial on charges of financing terrorism having been delayed as a result of the COVID-19 pandemic.[23] Previously, he had operated freely in Pakistan, often holding press conferences and inciting violence against India during large public rallies.

Some observers remain concerned about the possible impact of an international troop drawdown in Afghanistan. Such a drawdown could enable the Taliban and other extremist groups to strengthen their grip in the region, further undermining stability in Kashmir and raising the chances of another major terrorist attack against India. A successful future attack on Indian interests in Afghanistan along the lines of the bombing of the Indian embassy in Kabul in 2008 would sharpen tensions between New Delhi and Islamabad.

With terrorist groups operating relatively freely in Pakistan and maintaining links to the country's military and intelligence services, there is a moderate risk that the two countries might eventually engage in all-out conflict. Pakistan's recent focus on incorporating tactical nuclear weapons into its warfighting doctrine has also raised concern that conflict now involves a higher risk of nuclear exchange. In early 2019, Pakistan conducted several tests of its nuclear-capable, short-range NASR ballistic missiles.[24]

Pakistan's nuclear weapons capability appears to have acted as a deterrent against Indian military escalation, both during the 2001–2002 military crisis and following the 2008 Mumbai attacks, but the Indian government has been under growing pressure to react strongly to terrorist provocations. In 2016, following an attack on an Indian army base in Uri, Kashmir, that killed 19 Indian soldiers, the Indian military reportedly launched surgical strikes on terrorist targets across the Line of Control in Pakistan-administered Kashmir. The Indian press indicated that up to 80 Indian commandos crossed the Line of Control on foot and destroyed seven "terror launch pads," with attack helicopters on standby.[25]

Following a deadly attack on Indian security forces in Pulwama, Kashmir, in February 2019, India launched an even more daring cross-border raid. For the first time since the Third India–Pakistan War of 1971, the Indian air force crossed the Line of Control and dropped ordnance inside Pakistan proper (as opposed to disputed Kashmir), targeting several JeM

training camps in Khyuber Pakhtunkhwa province.[26] Delhi stressed that the "non-military" operation was designed to avoid civilian casualties and was preemptive in nature because India had credible intelligence that JeM was attempting other suicide attacks in the country.

In response, Pakistan launched fighter jets to conduct their own strike on targets located on India's side of the Line of Control in Kashmir, prompting a dogfight that resulted in the downing of an Indian MiG-21. Pakistan released the captured MiG-21 pilot days later, ending the brief but dangerous crisis. Nevertheless, both militaries continued to engage in artillery attacks along the disputed border throughout 2019. Pakistan reported more than 45 casualties, including 14 soldiers, from Indian shelling between January 2019 and October 2019. India reported 21 casualties and over 2,000 cease-fire violations in the same period.[27]

Conclusion

In the AfPak region, non-state terrorist groups pose the greatest threat to the U.S. homeland. Pakistan represents a paradox: It is both a security partner and a security challenge. Islamabad provides a home and support to terrorist groups that are hostile to the U.S., to other U.S. partners in South Asia like India, and to the government in Afghanistan, which is particularly vulnerable to destabilization efforts. Both Pakistan and Afghanistan are already among the world's most unstable states, and the instability of the former, given its nuclear arsenal, has a direct bearing on U.S. security.

This *Index* therefore assesses the overall threat from AfPak-based actors to the U.S. homeland as "testing" for level of provocation of behavior and "capable" for level of capability.

Threats: Af-Pak Terrorism

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior			✔		

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability			✔		

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Non-State Actors

James Phillips

Terrorist groups come in many forms but have one thing in common: the use of violence to achieve their political objectives, whether they be religious, ethnic, or ideological. In general, terrorist groups operate in a very local context, usually within a specific country or sub-region. Sometimes a terrorist group's objectives extend beyond the internationally recognized borders of a state because their identity as a group transcends such legal or geographic boundaries.

Terrorist groups rarely pose a threat to the United States that rises to the threshold used by this *Index*: a substantial threat to the U.S. homeland; the ability to precipitate a war in a region of critical interest to the U.S.; and/or the ability to threaten the free movement of people, goods, or services through the global commons. Those that do meet these criteria are assessed in this section, with the exception of Hezbollah and other Iran-backed groups, which are covered in the assessment of Iran within this chapter.

Terrorist Threats to the Homeland from the Middle East and North Africa

Radical Islamist terrorism in its various forms remains a global threat to the safety of U.S. citizens. Many terrorist groups operate in the Middle East, but those that are inspired by Islamist ideology also operate in Europe, Asia, and Africa.

The primary terrorist groups of concern to the U.S. homeland and to Americans abroad are the Islamic State of Iraq and al-Sham (ISIS) and al-Qaeda. Their threat is amplified when they can exploit areas with weak or nonexistent governance that allows them to plan, train, equip, and launch attacks.

Al-Qaeda and Its Affiliates. Al-Qaeda was founded in 1988 by foreign veterans from among those who flocked to Afghanistan to join the war against Soviet occupation of the country in the 1980s. With Osama bin Laden appointed emir, al-Qaeda was envisaged as a fighting force that could defend Sunni Muslims across the world and expand the Islamist struggle into a global revolutionary campaign.[1]

After 9/11, al-Qaeda's leadership fled Afghanistan. Much of the original cadre has now been killed or captured, including Osama bin Laden, and other key al-Qaeda leaders have been killed by targeted strikes in Afghanistan, Pakistan, Syria, Yemen, and Somalia. However, segments of al-Qaeda's leadership, including its current emir, Ayman al-Zawahiri, have survived. Some al-Qaeda lieutenants are believed to remain in the Afghanistan–Pakistan (AfPak) region; others have taken refuge in Iran.[2] Al-Qaeda's central leadership therefore continues to pose a potential threat to the U.S. homeland.

Al-Qaeda also dispersed its fighters further afield, allowing for the development of regional affiliates that shared the long-term goals of al-Qaeda's general command and largely remained loyal to it. These affiliates have engaged with some success in local conflict environments. In particular, the Arab Spring uprisings that began in 2011 enabled al-Qaeda

to advance its revolutionary agenda, taking advantage of failed or failing states in Iraq, Libya, Mali, Syria, and Yemen. It is through these affiliates that al-Qaeda is able to project regional strength most effectively.

Yemen. Yemen has long been a bastion of support for militant Islamism. Yemenis made up a disproportionate number of the estimated 25,000 foreign Muslims that fought in the Afghan jihad against the Soviet Union in the 1980s. After that conflict ended, Yemen also attracted Westerners into the country to carry out terrorist operations there. In 1998, several British citizens were jailed for planning to bomb Western targets, including hotels and a church.[3]

Al-Qaeda's first terrorist attack against Americans occurred in Yemen in December 1992 when a bomb was detonated in a hotel used by U.S. military personnel. In October 2000, in a much deadlier operation, it used a boat filled with explosives to attack the USS *Cole* in the port of Aden, killing 17 American sailors.[4] The first U.S. drone strike outside Afghanistan after 9/11 also took place in Yemen, targeting those connected to the attack on the *Cole*.[5]

After 9/11 and following crackdowns in other countries, Yemen became increasingly important as a base of operations for al-Qaeda. In September 2008, it launched an attack on the U.S. embassy in Yemen that killed 19 people, including an American woman. Yemen's importance to al-Qaeda increased further in January 2009 when al-Qaeda members who had been pushed out of Saudi Arabia merged with the Yemeni branch to form Al-Qaeda in the Arabian Peninsula (AQAP). This affiliate quickly emerged as one of the leading terrorist threats to the U.S.

Much of this threat centered initially on AQAP's Anwar al-Awlaki, a charismatic American-born Yemeni cleric who directed several terrorist attacks on U.S. targets before being killed in a drone air strike in September 2011. He had an operational role in the plot executed by Umar Farouk Abdulmutallab, the failed suicide bomber who sought to destroy an airliner bound for Detroit on Christmas Day 2009.[6] Awlaki was also tied to plots to poison food and water supplies, as well as to launch ricin and cyanide attacks,[7] and is suspected of playing a role in the November 2010 plot to dispatch parcel bombs to the U.S. in cargo planes. Additionally, Awlaki was in contact with Major Nidal Hassan, who perpetrated the 2009 Fort Hood shootings that killed 13 soldiers.[8]

Since Awlaki's death, the number of AQAP-sanctioned external operations in the West has diminished.[9] However, his videos on the Internet have continued to radicalize and recruit young Muslims, including the perpetrators of the April 2013 bombing of the Boston Marathon that killed three people.[10]

AQAP's threat to Western security, while seemingly slightly reduced by Awlaki's death, is still pronounced. Another attempt to carry out a bombing of Western aviation using explosives concealed in an operative's underwear was thwarted by a U.S.–Saudi intelligence operation in May 2012.[11] In August 2013, U.S. interception of al-Qaeda communications led to the closure of 19 U.S. embassies and consulates across the Middle East and Africa because of fears that AQAP was planning a massive attack.[12] In January 2015, two AQAP-trained terrorists murdered staff members and nearby police at *Charlie Hebdo* magazine in Paris.[13] In 2017, aviation was targeted once again by a plan to conceal bombs in laptop batteries.[14]

AQAP launched another successful attack inside the United States on December 6, 2019, when a radicalized Saudi Royal Air Force officer being trained at Naval Air Station Pensacola killed three U.S. Navy sailors and wounded eight other Americans in a shooting attack. The FBI later assessed that Mohammed Saeed Al-Shamrani, the shooter, had been radicalized by 2015 and was influenced by Awlaki's propaganda.[15]

Much of AQAP's activity has focused on exploiting the chaos of the Arab Spring in Yemen. AQAP acquired a significant amount of territory in 2011 and established governance in the country's South, finally relinquishing this

territory only after a Yemeni military offensive in the summer of 2012.[16]

AQAP further intensified its domestic activities after the overthrow of Yemen's government by Iran-backed Houthi rebels in 2015, seizing the city of al-Mukalla and expanding its control of rural areas in southern Yemen. AQAP withdrew from al-Mukalla and other parts of the South in the spring of 2016, reportedly after the U.S.-backed Saudi–United Arab Emirates coalition had cut deals with AQAP, paying it to leave certain territory and even integrating some of its fighters into its own forces targeting the Houthis.[17]

More substantive progress has been achieved in the targeting of AQAP's leadership. Said al-Shehri, a top AQAP operative, was killed in a drone strike in 2013. The group's leader at the time, Nasir al-Wuhayshi, was killed in a drone strike in June 2015. Perhaps most significantly, Ibrahim al-Asiri, AQAP's most notorious bomb maker, was killed in a U.S. strike in 2017. Since then, the tempo of U.S. drone strikes against AQAP has slowed.[18]

Despite U.S. drone activity, it is estimated that AQAP still has between 6,000 and 7,000 fighters.[19] It therefore remains a potent force that could capitalize on the anarchy of Yemen's multi-sided civil war to seize new territory and plan more attacks on the West.

Syria. Al-Qaeda's Syrian affiliate, the al-Nusra Front (ANF), was established as an offshoot of the Islamic State of Iraq (ISI), al-Qaeda's Iraq affiliate, in late 2011 by Abu Muhammad al-Julani, a lieutenant of ISI leader Abu Bakr al-Baghdadi.[20] ANF had an estimated 5,000 to 10,000 members and emerged as one of the top rebel groups fighting the Assad dictatorship in Syria.[21] Most ANF cadres are concentrated in rebel strongholds in northwestern Syria, but the group also has small cells operating elsewhere in Syria.

ANF had some success in attracting Americans to its cause. An American Muslim recruited by ANF, Moner Mohammad Abusalha, conducted a suicide truck bombing in northern Syria on May 25, 2014, in the first reported suicide attack by an American in that country.[22]

At least five men have been arrested inside the U.S. for providing material assistance to ANF, including Abdirahman Sheik Mohamud, a naturalized U.S. citizen who was arrested in April 2015 after returning from training in Syria and was planning to launch a terrorist attack on U.S. soldiers based in Texas.[23]

In recent years, the al-Qaeda movement in Syria has undergone several name changes, allying itself with various Islamist rebel groups. This has made the degree of direct threat posed outside of Syria's borders harder to assess.

In a May 2015 interview, al-Julani stated that al-Nusra's intentions were purely local and that, "so as not to muddy the current war" in Syria, ANF was not planning to target the West.[24] In July 2016, al-Nusra rebranded itself as Jabhat Fatah Al Sham (JFS), and al-Julani stated that it would have "no affiliation to any external entity," a move that some experts regarded as a break from al-Qaeda and others regarded as a move to obscure its ties to al-Qaeda and reduce U.S. military pressure on the group.[25]

In January 2017, JFS merged as part of an alliance with other Islamist extremist movements into a new anti-Assad coalition: Hayat Tahrir al-Sham (HTS, Organization for the Liberation of the Levant). It was estimated that HTS had 12,000 to 14,000 fighters in March 2017.[26] Further complicating matters surrounding al-Qaeda's presence, another group in Syria connected to al-Qaeda, Hurras al-Din (Guardians of the Religion), was formed in March 2018.[27] Among its ranks were those who defected from HTS, and its suspected emir is an Ayman al-Zawahiri acolyte.[28]

HTS is more pragmatic than its ultra-extremist parent organization and has cooperated with moderate Syrian rebel groups against the Assad regime, as well as against ISIS. However, the leadership of Abu Muhammad al-Julani and his tactical approach to the conflict, as well as the clear divisions within the Syrian jihad, have led to rebukes from Ayman al-Zawahiri and those loyal to him.[29] Zawahiri has stressed the need for unity while lambasting the jihadist movement in Syria and

its emphasis on holding territory in northwest Syria at the expense of intensifying the struggle against Assad.[30]

One entity that did pose a direct threat to the West was the Khorasan group, which was thought to comprise dozens of veterans of al-Qaeda's operations in Afghanistan and Pakistan.[31] Al-Zawahiri had dispatched this cadre of operatives to Syria, where they were embedded with ANF and—despite al-Julani's statement that ANF was not targeting the West—charged with organizing terrorist attacks against Western targets. A series of U.S. air strikes in 2014–2015 degraded Khorasan's capacity to organize terrorist attacks.

Al-Qaeda's presence and activities in Syria, as well as the intent of those once aligned with it, are sometimes opaque, most likely on purpose. Even if offshoots of al-Qaeda are not currently emphasizing their hostility to the U.S., however, that will likely change if they succeed in further consolidating power in Syria.

The Sahel. Al-Qaeda in the Islamic Maghreb (AQIM) "has an estimated 1,000 fighters operating in the Sahel, including Algeria, northern Mali, southwest Libya, and Nigeria," and "is based in southern and eastern Algeria (including isolated parts of the Kabylie region), Burkina Faso, Cote D'Ivoire, Libya, northern Mali, Niger, and Tunisia."[32]

AQIM's roots lie in the Algerian civil war of the 1990s, when the Algerian government cancelled the second round of elections following the victory of the Islamic Salvation Front (FIS) in the first round. The armed wing of the FIS, the Armed Islamic Group (GIA), responded by launching a series of attacks, executing those who were even suspected of working with the state. The group also attempted to implement sharia law in Algeria.

The GIA rapidly alienated Algerian civilians, and by the late 1990s, an offshoot, the Salafist Group for Preaching and Combat (GSPC), emerged. Its violence, somewhat less indiscriminate than the GIA's, was focused on security and military targets. Having failed to overthrow the Algerian state, the GSPC began to align itself with al-Qaeda, and Ayman al-Zawahiri announced its integration into the al-Qaeda network in a September 2006 video. The GSPC subsequently took the AQIM name.

AQIM has carried out a series of regional attacks and has focused on kidnapping Westerners. Some of these hostages have been killed, but more have been used to extort ransoms from Western governments.[33] Like other al-Qaeda affiliates, AQIM also took advantage of the power vacuums that emerged from the Arab Spring, particularly in Libya where Islamist militias flourished. The weak central government was unable to tame fractious militias, curb tribal and political clashes, or dampen rising tensions between Arabs and Berbers in the West and Arabs and the Toubou tribe in the South.

The September 11, 2012, attack on the U.S. diplomatic mission in Benghazi underscored the extent to which Islamist extremism had flourished in the region. The radical Islamist group that launched the attack, Ansar al-Sharia, had links to AQIM and shared its violent ideology. AQIM and like-minded Islamist allies also grabbed significant amounts of territory in northern Mali in late 2012, implementing a brutal version of sharia law, until a French military intervention helped to push them back.

AQIM continues to support and works alongside various jihadist groups in the region. In March 2017, the Sahara branch of AQIM merged with three other al-Qaeda or al-Qaeda–linked organizations based in the Sahel to form the Group for Support of Islam and Muslims (JNIM), an organization that has pledged allegiance to al-Qaeda emir Ayman al-Zawahiri.[34]

AQIM is not known to have explicitly targeted the U.S. homeland in recent years, but it does threaten regional stability and U.S. allies in North Africa and Europe, where it has gained supporters and operates extensive networks for the smuggling of arms, drugs, and people.

The Islamic State of Iraq and al-Sham and Its Affiliates. The Islamic State of Iraq and al-Sham (ISIS) is an al-Qaeda splinter group that has outstripped its parent organization in terms of its immediate threats to U.S. national interests.

The Islamic State of Iraq (ISI), the precursor to ISIS and an al-Qaeda offshoot, was perceived by some Western policymakers as having been strategically defeated following the U.S. "surge" of 2006–2007 in Iraq. However, the group benefited from America's political and military withdrawal from Iraq in the 2010–2011 period, as well as from the chaos in Syria where the Arab Spring protests were met with bloody persecution from Bashar al-Assad.

In both Iraq and Syria, ISI had space in which to operate and a large disaffected pool of individuals from which to recruit. In April 2013, ISI emir Abu Bakr al-Baghdadi declared that the al-Nusra Front, the al-Qaeda affiliate operating in Syria, was merely a front for his operation and that a new organization was being formed: the Islamic State of Iraq and al-Sham. ISIS sought to establish an Islamic state governed by its harsh interpretation of sharia law, posing an existential threat to Christians, Shiite Muslims, Yazidis, and other religious minorities. Its long-term goals include leading a jihad to drive Western influence out of the Middle East; diminish and discredit Shia Islam, which it considers apostasy; and to become the nucleus of a global Sunni Islamic empire.

With both al-Qaeda leader Ayman al-Zawahiri and ANF emir Abu Mohammed al-Julani unable to rein in al-Baghdadi, ISIS was expelled from the al-Qaeda network in February 2014. Despite this, ISIS swept through parts of northern and western Iraq and in June 2014 declared the return of the Caliphate, with its capital in the northern Syrian city of Raqqa. It subsequently kidnapped and then murdered Westerners working in Syria, including American citizens.

A U.S.-led international coalition was assembled to chip away at ISIS's control of territory. The Iraqi Army and Iranian-backed militias broke its control of Mosul in July 2017, and the U.S.-backed Syrian Democratic Forces militia liberated Raqqa in October 2017, with ISIS's last town (Baghouz) falling in March 2019. ISIS fighters have retreated, have adopted insurgent tactics, and will continue to pose a regional terrorist threat with direct implications for the U.S. In January 2019, for example, U.S. troops were killed in a suicide bombing at a market in Manbij in northern Syria.[35]

On October 26, 2019, U.S. special operations forces killed ISIS leader al-Baghdadi in a raid in northwestern Syria's Idlib governate near the Turkish border.[36] ISIS soon named a successor, Abdullah Qardash, the nom de guerre of Mohammad Abdul Rahman al-Mawli al-Salbi. An Iraqi Turkman from Tal Afar near Mosul, Salbi is said to have met Baghdadi in Camp Bucca, a U.S. military detention center.[37] ISIS attacks in Iraq and Syria fell from 776 during the first four months of 2019 to 330 during the same period in 2020.[38] Nevertheless, ISIS remains a significant regional threat. U.S. officials estimate that ISIS retains 14,000 to 18,000 militants in Syria and Iraq, where it is rebuilding in remote desert and mountain regions.[39]

Although ISIS's territorial control has been broken in Iraq and Syria, its presence has spread far beyond that territory. Terrorist groups around the world have pledged allegiance to Abu Bakr al-Baghdadi, and ISIS now has affiliates in the Middle East, in South and Southeast Asia, and throughout Africa.

ISIS poses a threat to stability in all of these regions, seeking to overthrow their governments and impose Islamic law. In pursuit of this cause, ISIS has shown itself willing to kill Christians and other non-Muslims while carrying out attacks on the police and soldiers. An Islamic State in the Greater Sahara ambush in Niger in October 2017, for example, resulted in the death of four U.S. special operations troops.[40] In addition, ISIS has made threats against government embassies, including those of the U.S., in its areas of influence.[41]

ISIS poses an ongoing threat to life in the West. In the U.S., on May 3, 2015, two American extremists in contact with an ISIS operative in Syria were fatally shot by police before they could commit mass murder in Garland, Texas.[42]

More commonly, however, the ISIS ideology has inspired individuals and small groups to plan attacks in the U.S. Between 2014 and January 2020, 204 individuals were charged

in the U.S. with offenses related to the Islamic State.[43] Tashfeen Malik, one of the perpetrators of the December 2, 2015, shootings that killed 14 people in San Bernardino, California, pledged allegiance to al-Baghdadi.[44] ISIS also claimed responsibility for the June 12, 2016, shootings at a nightclub in Orlando, Florida, that killed 49 people. Omar Mateen, the perpetrator, had pledged allegiance to al-Baghdadi, although there is no evidence to show that the attacks were directed by ISIS.[45] The group also claimed responsibility for the October 31, 2017, vehicular attack by Sayfullo Saipov in New York that killed eight.[46] Saipov, too, had pledged allegiance to ISIS's emir but did not appear to be operationally guided by ISIS.[47] Such terrorist attacks, incited but not directed by ISIS, are likely to continue for the foreseeable future.

ISIS has also attempted complex attacks on aviation. It claimed responsibility for the October 31, 2015, downing of a Russian passenger jet over Egypt's Sinai Peninsula that killed 224 people and also tried to bring down a flight heading from Sydney, Australia, to Abu Dhabi by concealing an explosive device inside a meat grinder.[48]

ISIS had well-publicized success in attracting the support of foreign fighters. Approximately 250 from the U.S. traveled or attempted to travel to Syria.[49] There is the potential for an ongoing threat from these individuals, who are likely to have received military training, upon return to the U.S. either in terms of attack planning or in recruiting future generations of jihadists.

ISIS had greater success attracting recruits from Europe, with approximately 6,000 departing from European countries.[50] The return of foreign fighters to Europe has led to several attacks. Mehdi Nemmouche, a French citizen of Algerian origin who shot and killed four civilians at the Jewish Museum in Brussels in May 2014, for example, was an ISIS-aligned terrorist who had fought in Syria.[51] In August 2015, Ayoub el-Khazzani, a Moroccan, attempted to gun down passengers in a train travelling between Amsterdam and Paris.

Passengers, including two members of the U.S. Army, foiled the attack and restrained him.[52]

Similarly, a group of ISIS foreign fighters teamed with local Islamist terrorists to launch a series of suicide and gun attacks on a music venue, restaurants, cafes, and a football stadium, killing 130 and injuring 368 people in Paris, France, in November 2015.[53] Recruits from within the same network then killed 32 people and injured around 300 more in shootings and suicide bombings across Brussels, Belgium, in March 2016.[54]

ISIS ideology has also inspired a wave of attacks in Europe, including one carried out by a Tunisian who used a truck to kill 86 people and injure 434 more at a Bastille Day celebration in Nice, France, in July 2016.[55] In another such attack, in June 2017, three men killed eight people and injured 47 on or near London Bridge in London, England, by running over them or stabbing them.[56] London Bridge also was the site of a November 29, 2019, knife attack by an ISIS supporter who killed two people and wounded three more before being killed by police.[57]

ISIS has demonstrated an interest in carrying out biological attacks. Sief Allah H., a Tunisian asylum seeker who was in contact with ISIS, and his German wife Yasmin H. were arrested in Cologne in June 2018 after they successfully produced ricin as part of a suspected attack.[58] This was the first time that ricin was successfully produced in the West as part of an alleged Islamist plot.

Overall, as of May 2019, ISIS had had some involvement—ranging from merely inspirational to hands-on and operational—in over 150 plots and attacks in Europe since January 2014 that had led to 371 deaths and over 1,700 injuries.[59] This includes the loss of American lives abroad. An American college student was killed in Paris in November 2015, four Americans were killed in the Brussels attack of March 2016, and another three were killed in the Nice attack of July 2016.[60] Moreover, the threat is by no means confined to Europe: Americans were also killed in ISIS-claimed attacks in Tajikistan in July 2018 and Sri Lanka in April 2019.[61]

Conclusion

ISIS has lost its so-called Caliphate, but it remains a highly dangerous adversary capable of planning and executing attacks regionally and—at the very least—inspiring them in the West. It appears to be transitioning from a quasi-state to an insurgency, relying on its affiliates to project strength far beyond its former Syrian and Iraqi strongholds.

Meanwhile, despite sustained losses in leadership, al-Qaeda remains resilient. It has curried favor with other Sunnis in particular areas of strategic importance to it, has focused its resources on local conflicts, has occasionally controlled territory, and has deemphasized (but not eschewed) focus on the global jihad. This approach has been particularly noticeable since the Arab Spring.

Regardless of any short-term tactical considerations, both groups ultimately aspire to attack the U.S. at home and U.S. interests abroad. While the U.S. has hardened its domestic defenses, making this a tricky prospect for both groups, they can rely on radicalized individuals living within the U.S. to take up the slack. Furthermore, as has been demonstrated time and again, there are ample opportunities to target Americans overseas in countries that are more vulnerable to terrorist attack. If it wishes to contain and ultimately end Islamist violence, the U.S. must continue to bring effective pressure to bear on these groups and those that support them.

This *Index* assesses the threat from ISIS, al-Qaeda, and their affiliated organizations as "aggressive" for level of provocation of behavior and "capable" for level of capability.

Threats: Middle East Terrorism

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✔			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability			✔		

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Conclusion: Global Threat Level

America faces challenges to its security at home and interests abroad from countries and organizations that have:

- Interests that conflict with those of the United States;

- Sometimes hostile intentions toward the U.S.; and

- In some cases, growing military capabilities that are leveraged to impose an adversary's will by coercion or intimidation of neighboring countries, thereby creating regional instabilities.

The government of the United States constantly faces the challenge of employing—sometimes alone but more often in concert with allies—the right mix of diplomatic, economic, public information, intelligence, and military capabilities to protect and advance U.S. interests. Because this *Index* focuses on the military component of national power, its assessment of threats is correspondingly an assessment of the military or physical threat posed by each entity addressed in this section.

Russia remains the primary threat to American interests in Europe as well as the most pressing threat to the United States. Moscow remains committed to massive pro-Russia propaganda campaigns in Ukraine and other Eastern European countries, has continued its active support of separatist forces in Ukraine, regularly performs provocative military exercises and training missions, and continues to sell and export arms to countries that are hostile to U.S.

interests (its sale of the S-400 air defense system to Turkey is a prime example). It also has increased its investment in the modernization of its military and has gained significant combat experience while continuing to sabotage U.S. and Western policy in Syria and Ukraine. The *2021 Index* again assesses the threat emanating from Russia as "aggressive" in its behavior and "formidable" (the highest category on the scale) in its growing capabilities.

China, the most comprehensive threat the U.S. faces, remained "aggressive" in the scope of its provocative behavior and earns the score of "formidable" for its capability because of its continued investment in the modernization and expansion of its military and the particular attention it has paid to its space, cyber, and artificial intelligence capabilities. The People's Liberation Army continues to extend its reach and military activity beyond its immediate region and engages in larger and more comprehensive exercises, including live-fire exercises in the East China Sea near Taiwan and aggressive naval and air patrols in the South China Sea. It has continued to conduct probes of the South Korean and Japanese air defense identification zones, drawing rebukes from both Seoul and Tokyo, and its statements about Taiwan and exercise of military capabilities in the air and sea around the island have been increasingly belligerent.

Iran represents by far the most significant security challenge to the United States, its allies, and its interests in the greater Middle East. Its open hostility to the United States and Israel, sponsorship of terrorist groups like Hezbollah, and history of threatening the commons

underscore the problem it could pose. Today, Iran's provocations are of primary concern to the region and America's allies, friends, and assets there. Iran relies heavily on irregular (to include political) warfare against others in the region and fields more ballistic missiles than any of its neighbors. Its development of ballistic missiles and its potential nuclear capability also make it a long-term threat to the security of the U.S. homeland. In addition, Iran has continued its aggressive efforts to shape the domestic political landscape in Iraq, adding to the general instability of the region. The *2021 Index* extends the *2020 Index*'s assessment of Iran's behavior as "aggressive" and its capability as "gathering."

North Korea's military poses a security challenge for American allies South Korea and Japan, as well as for U.S. bases in those countries and on Guam. North Korean officials are belligerent toward the United States, often issuing military and diplomatic threats. Pyongyang also has engaged in a range of provocative behavior that includes nuclear and missile tests and tactical-level attacks on South Korea.

North Korea has used its missile and nuclear tests to enhance its prestige and importance domestically, regionally, and globally and to extract various concessions from the United States in negotiations on its nuclear program and various aid packages. Such developments also improve North Korea's military posture. U.S. and allied intelligence agencies assess that Pyongyang has already achieved nuclear warhead miniaturization, the ability to place nuclear weapons on its medium-range missiles, and an ability to reach the continental United States with a missile. This *Index* therefore assesses the overall threat from North Korea, considering the range of contingencies, as "testing" for level of provocation of behavior and "gathering" for level of capability.

In the Afghanistan–Pakistan (AfPak) region, non-state terrorist groups pose the greatest threat to the U.S. homeland and the overall stability of the South/Southwest Asia region. Pakistan represents a paradox: It is both a security partner and a security challenge. Islamabad provides a home and support to terrorist groups that are hostile to the U.S., to other U.S. partners in South Asia like India, and to the government in Afghanistan, which is particularly vulnerable to destabilization efforts. Both Pakistan and Afghanistan are already among the world's most unstable states, and the instability of the former, given its nuclear arsenal, has a direct bearing on U.S. security. Afghanistan's inability to control many parts of its territory and Pakistan's willingness to host and support terrorist groups help to facilitate the operations of such entities as al-Qaeda, the Haqqani Network, the Taliban, and affiliates of the Islamic State. This *Index* therefore assesses the overall threat from AfPak-based actors to the U.S. and its interests as "testing" for level of provocation of behavior and "capable" for level of capability.

A broad array of terrorist groups remain the most hostile of any of the threats to America examined in the *Index*. The primary terrorist groups of concern to the U.S. homeland and to Americans abroad are the Islamic State of Iraq and al-Sham (ISIS) and al-Qaeda. Al-Qaeda and its branches remain active and effective in Syria, Yemen, Iraq, and the Sahel of Northern Africa. Though no longer a territory-holding entity, ISIS also remains a serious presence in the Middle East, in South and Southeast Asia, and throughout Africa, posing threats to stability as it seeks to overthrow governments and impose an extreme form of Islamic law. Its ideology continues to inspire attacks against Americans and U.S. interests. Fortunately, Middle East terrorist groups remain the least capable threats facing the U.S., but they cannot be dismissed.

Just as there are American interests that are not covered by this *Index*, there may be additional threats to American interests that are not identified here. This *Index* focuses on the more apparent sources of risk and those that appear to pose the greatest threat.

Compiling the assessments of these threat sources, the *2021 Index* again rates the overall global threat environment as "aggressive" and "gathering" in the areas of threat actor behavior and material ability to harm U.S. security interests, respectively, leading to an aggregated threat score of "high."

Behavior of Threats

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Russia		✔			
Iran		✔			
Middle East Terrorism		✔			
Af-Pak Terrorism			✔		
China		✔			
North Korea			✔		
OVERALL		**✔**			

Capability of Threats

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Russia	✔				
Iran		✔			
Middle East Terrorism			✔		
Af-Pak Terrorism			✔		
China	✔				
North Korea		✔			
OVERALL		**✔**			

Threats to U.S. Vital Interests

	SEVERE	HIGH	ELEVATED	GUARDED	LOW
Russia		✔			
Iran		✔			
Middle East Terrorism		✔			
Af-Pak Terrorism			✔		
China		✔			
North Korea		✔			
OVERALL		**✔**			

Our combined score for threats to U.S. vital interests can be summarized as:

Threats to U.S. Vital Interests: Summary

SEVERE	HIGH	ELEVATED	GUARDED	LOW
	HIGH			

U.S. Military Power

An Assessment of U.S. Military Power

Because America is a global power with global interests, its military is tasked first and foremost with defending the country from attack. Beyond that, it must be capable of protecting Americans abroad, America's allies, and the freedom to use international sea, air, space, and cyberspace while retaining the ability to engage in more than one major contingency at a time. America must be able not only to defend itself and its interests, but also to deter enemies and opportunists from taking action that would challenge U.S. interests, a capability that includes both preventing the destabilization of a region and guarding against threats to the peace and security of America's friends.

As noted in all preceding editions of the *Index*, however, the U.S. does not have the necessary force to meet a two–major regional contingency (two-MRC) requirement and is not ready to carry out its duties effectively. Consequently, as we have seen during the past few years, the U.S. finds itself increasingly challenged by major competitors such as China and Russia and the destabilizing effects of terrorist and insurgent elements operating in regions that are of substantial interest to the U.S.

For 2020, the extent to which SARS-CoV-2, the virus that causes the COVID-19 disease, will affect the broad, complex fabric of security issues—not only those of direct interest to the U.S., but also those that involve the societal, economic, political, and military pillars of allies, partners, and competitors—cannot be known. For the U.S. military, the COVID-19 pandemic has created challenges for recruiting and basic training, for standard individual and small unit training, and for large exercises, especially those that had been planned with allies and partners in 2020.[1]

Requirements to observe distancing (maintaining separation between individuals) have been the most direct factor affecting daily activities; instances of large-scale infection as occurred aboard the aircraft carrier USS *Theodore Roosevelt*, although rare, have captured the public's attention.[2] Of the roughly two million soldiers, sailors, airmen, and Marines serving in the Active and Reserve components, slightly more than 8,000 had contracted COVID-19 as of June 15, 2020, and slightly more than 4,800 were listed as recovered.[3] Aware of the need to maintain necessary levels of readiness, the services have balanced measures to protect the force with activities that are essential to keeping it trained and ready for action.

The service-specific sections that follow will address the impact that the COVID-19 pandemic has had on the respective services during 2020. Suffice it to say that, so far and in general, the public health crisis plaguing much of the world has not had a profound impact on the U.S. military.

How to Think About Sizing Military Power

For all of these reasons, military power consists of many things and is the result of how all of its constituent pieces are brought together to create an effective warfighting force. But it begins with the people and equipment used to conduct war: the weapons, tanks, ships, airplanes, and supporting tools such as communications systems that make it possible either for one group to impose its will on another or

to prevent such an outcome from happening, which is the point of deterrence.

However, simply counting the number of people, tanks, or combat aircraft that the U.S. possesses would be insufficient because it would lack context. For example, the U.S. Army might have 100 tanks, but to accomplish a specific military task, 1,000 or more might be needed or none at all. It might be that the terrain on which a battle is fought is especially ill-suited to tanks or that the tanks one has are inferior to the enemy's. The enemy could be quite adept at using tanks, or his tank operations might be integrated into a larger employment concept that leverages the supporting fires of infantry and airpower, whereas one's own tanks are poorly maintained, the crews are not well-prepared, or one's doctrine is irrelevant.

Success in war is partly a function of matching the tools of warfare to a specific task and employing those tools effectively in battle. Get these wrong—tools, objective, competence, or context—and you lose.

Another key element is the military's capacity to conduct operations: how many of the right tools—people, tanks, planes, or ships—it has. One might have the right tools and know how to use them effectively but not have enough to win. Because one cannot know with certainty beforehand just when, where, against whom, and for what reason a battle might be fought, determining how much capability is needed is an exercise that requires informed but not certain judgment.

Further, two different combatants can use the same set of tools in radically different ways to quite different effects. The concept of employment matters. Concepts are developed to account for numbers, capabilities, material readiness, and all sorts of other factors that enable or constrain one's actions, such as whether one fights alone or alongside allies, on familiar or strange terrain, or with a large, well-equipped force or a small, poorly equipped force. A thinking adversary will analyze his opponent for weaknesses or patterns of behavior and seek to develop techniques,

approaches, and tools that exploit such shortfalls or predictable patterns—the asymmetries of war. One need not try to match an enemy tank for tank, and in many cases, not trying is more effective.

All of these factors and a multitude of others affect the outcome of any military contest. Military planners attempt to account for them when devising requirements, developing training and exercise plans, formulating war plans, and providing advice to the President in his role as Commander in Chief of U.S. military forces.

Measuring hard combat power in terms of its capability, capacity, and readiness to defend U.S. vital interests is difficult, especially in such a limited space as this *Index*, but it is not impossible. However difficult determining the adequacy of one's military forces may be, the Secretary of Defense and the military services have to make such decisions every year when the annual defense budget request is submitted to Congress.

The adequacy of hard power is affected most directly by the resources the nation is willing to apply. Although that decision is informed to a significant degree by an appreciation of threats to U.S. interests and the ability of a given defense portfolio to protect U.S. interests against such threats, it is not informed solely by such considerations; hence the importance of clarity and honesty in determining just what is needed in terms of hard power and the status of such power from year to year.

Administrations take various approaches in determining the type and amount of military power needed and, by extension, the amount of money and other resources that will be necessary to support that power. After defining the national interests to be protected, the Department of Defense (DOD) can use worst-case scenarios to determine the maximum challenges the U.S. military might have to overcome. Another way is to redefine what constitutes a threat. By taking a different view of whether major actors pose a meaningful threat and of the extent to which friends and allies have the ability to assist the U.S. in

meeting security objectives, one can arrive at different conclusions about the necessary level of military strength.

For example, one Administration might view China as a rising belligerent power bent on dominating the Asia–Pacific region. Another Administration might view China as an inherently peaceful rising economic power and the expansion of its military capabilities a natural occurrence commensurate with its strengthening status. The difference between these views can have a dramatic impact on how one thinks about U.S. defense requirements. So, too, can policymakers amplify or downplay risk to justify defense budget decisions.

There also can be strongly differing views on requirements for operational capacity.

- Does the country need enough for two major combat operations (MCOs) at roughly the same time or just enough for a single major operation and some number of lesser cases?

- To what extent should "presence" tasks—the use of forces for routine engagement with partner countries or simply to be on hand in a region for crisis response—be in addition to or a subset of a military force sized to handle two major regional conflicts?

- How much value should be assigned to advanced technologies as they are incorporated into the force?

- What is the likelihood of war and, if one thinks it unlikely, what is the risk one is willing to accept that sufficient warning will allow for rearming?

Where to Start

There are two major references that one can use to help sort through the variables and arrive at a starting point for assessing the adequacy of today's military posture: government studies and historical experience. The government occasionally conducts formal reviews that are meant to inform decisions on capabilities and capacities across the Joint Force relative to the threat environment (current and projected) and evolutions in operating conditions, the advancement of technologies, and aspects of U.S. interests that may call for one type of military response over another.

The 1993 Bottom-Up Review (BUR) conducted by then-Secretary of Defense Les Aspin has been one such frequently cited example. Secretary Aspin recognized that "the dramatic changes that [had] occurred in the world as a result of the end of the Cold War and the dissolution of the Soviet Union" had "fundamentally altered America's security needs" and were driving an imperative "to reassess all of our defense concepts, plans, and programs from the ground up."[4]

The BUR formally established the requirement that U.S. forces should be able "to achieve decisive victory in two nearly simultaneous major regional conflicts and to conduct combat operations characterized by rapid response and a high probability of success, while minimizing the risk of significant American casualties."[5] Thus was formalized the two-MRC standard.

Since that study, the government has undertaken others as Administrations, national conditions, and world events have changed the context of national security. Quadrennial Defense Reviews (QDRs) were conducted in 1997, 2010, and 2014, accompanied by independent National Defense Panel (NDP) reports that reviewed and commented on them. Both sets of documents purported to serve as key assessments, but analysts came to minimize their value, regarding them as justifications for executive branch policy preferences (the QDR reports) or overly broad generalized commentaries (the NDP reports) that lack substantive discussion about threats to U.S. interests, a credible strategy for dealing with them, and the actual ability of the U.S. military to meet national security requirements.

The QDR was replaced by the National Defense Strategy (NDS), released in 2018, and the independent perspectives of the formal DOD

review by the National Defense Strategy Commission, which released its view of the NDS in November 2018. Departing from their predecessors, neither document proposed specific force structures or end strength goals for the services,[6] but both were very clear in arguing the need to be able to address more than one major security challenge at a time. The commission's report went so far as to criticize the NDS for not making a stronger case for a larger military that would be capable of meeting the challenges posed by four named competitors—China, Russia, Iran, and North Korea—while also possessing the capacity to address lesser, though still important, military tasks that included presence, crisis response, and assistance missions.

Correlation of Forces as a Factor in Force Sizing

During the Cold War, the U.S. used the Soviet threat as its primary reference in determining its hard-power needs. At that time, the correlation of forces—a comparison of one force against another to determine strengths and weaknesses—was highly symmetrical. U.S. planners compared tanks, aircraft, and ships against their direct counterparts in the opposing force. These comparative assessments drove the sizing, characteristics, and capabilities of fleets, armies, and air forces.

The evolution of guided, precision munitions and the rapid technological advancements in surveillance and targeting systems since the late 1980s, however, have made comparing combat power more difficult. What was largely a platform-versus-platform model has shifted somewhat to a munitions-versus-target model.

The proliferation of precise weaponry means increasingly that each round, bomb, rocket, missile, and even (in some instances) individual bullet can hit its intended target, thus decreasing the number of munitions needed to prosecute an operation. It also means that the lethality of an operating environment increases significantly for the people and platforms involved. We have now reached the point at which, instead of focusing primarily on how many ships or airplanes the enemy can bring to bear against one's own force, one must consider how many "smart munitions" the enemy has when thinking about how many platforms and people are needed to win a combat engagement.[7]

In one sense, increased precision and the technological advances now being incorporated into U.S. weapons, platforms, and operating concepts make it possible to do far more than ever before with fewer assets.

- Platform signature reduction (stealth) makes it harder for the enemy to find and target them, and the increased precision of weapons makes it possible for fewer platforms to hit many more targets.

- The ability of the U.S. Joint Force to harness computers, modern telecommunications, space-based platforms—such as for surveillance, communications, and positioning-navigation-timing (PNT) support from GPS satellites—and networked operations potentially means that in certain situations, smaller forces can have far greater effect in battle than at any other time in history (although these same advances also enable enemy forces).

- Certain military functions—such as seizing, holding, and occupying territory—may require a certain number of soldiers no matter how state-of-the-art their equipment may be. For example, securing an urban area where line of sight is constrained and precision weapons have limited utility requires the same number of squads of infantry as were needed in World War II.

Regardless of the improved capability of smaller forces, there is a downside to fewer numbers. With smaller forces, each individual element of the force represents a greater percentage of its combat power. Each casualty or equipment loss therefore takes a larger toll

on the ability of the force to sustain high-tempo, high-intensity combat operations over time, especially if the force is dispersed across a wide theater or across multiple theaters of operation.

As advanced technology has become more affordable, it has become more accessible for nearly any actor, whether state or non-state. Consequently, it may well be that the outcomes of future wars will depend far more on the skill of the forces and their capacity to sustain operations over time than they will on some great disparity in technology. If so, readiness and capacity will take on greater importance than absolute advances in capability.

All of this illustrates the difficulties of and need for exercising judgment in assessing the adequacy of America's military power. Yet without such an assessment, all that remains are the defense strategy reviews, which are subject to filtering and manipulation to suit policy interests; annual budget submissions, which typically favor desired military programs at presumed levels of affordability and are therefore necessarily budget-constrained; and leadership posture statements, which often simply align with executive branch policy priorities.

The U.S. Joint Force and the Art of War

This section of the *Index* assesses the adequacy of America's defense posture as it pertains to a conventional understanding of "hard power," defined as the ability of American military forces to engage and defeat an enemy's forces in battle at a scale commensurate with the vital national interests of the U.S. While some hard truths in military affairs are appropriately addressed by mathematics and science, others are not. Speed, range, probability of detection, and radar cross-section are examples of quantifiable characteristics that can be measured. Specific future instances in which U.S. military power will be needed, the competence of the enemy, the political will to sustain operations in the face of mounting deaths and destruction, and the absolute amount of strength needed to win are matters of judgment and

experience, but they nevertheless affect how large and capable a force one might need.

In conducting the assessment, we accounted for both quantitative and qualitative aspects of military forces, informed by an experience-based understanding of military operations and the expertise of external reviewers. The authors of these military sections bring a combined total of more than a hundred years of uniformed military experience to their analysis.

Military effectiveness is as much an art as it is a science. Specific military capabilities represented in weapons, platforms, and military units can be used individually to some effect. Practitioners of war, however, have learned that combining the tools of war in various ways and orchestrating their tactical employment in series or simultaneously can dramatically amplify the effectiveness of the force that is committed to battle.

Employment concepts are exceedingly hard to measure in any quantitative way, but their value as critical contributors in the conduct of war is undeniable. How they are used is very much an art-of-war matter that is learned through experience over time.

What Is Not Being Assessed

In assessing the current status of the military forces, this *Index* uses the primary measures used by the military services themselves when they discuss their ability to employ hard combat power.

- The Army's unit of measure is the brigade combat team (BCT);

- The Marine Corps structures itself by battalions;

- For the Navy, it is the number of ships in its combat fleet; and

- The most consistent measure for the Air Force is total number of aircraft, sometimes broken down into the two primary subtypes of fighters and bombers.

Obviously, this is not the totality of service capabilities, and it certainly is not everything needed for war, but these measures can be viewed as surrogates that subsume or represent the vast number of other things that make these units of measure possible and effective in battle. For example, combat forces depend on a vast logistics system that supplies everything from food and water to fuel, ammunition, and repair parts. Military operations require engineer support, and the force needs medical, dental, and administrative capabilities. The military also fields units that transport combat power and its sustainment wherever they may be needed around the world.

The point is that the military spear has a great deal of shaft that makes it possible for the tip to locate, close with, and destroy its target, and there is a rough proportionality between shaft and tip. Thus, in assessing the basic units of measure for combat power, one can get a sense of what is probably needed in the combat support, combat service support, and supporting establishment echelons.

The scope of this *Index* does not extend to analysis of everything that makes hard power possible; it focuses on the status of the hard power itself. It also does not assess the services' Reserve and National Guard components, although they account for roughly one-third of the U.S. military force and have been essential to the conduct of operations since September 2001.[8] Consistent assessment of their capability, readiness, and operational role is a challenge because each service determines the balance among its Active, Reserve, and National Guard elements differently (only the Army and Air Force have Guard elements; the Navy and Marine Corps do not). This balance can change from year to year and is based on factors that include cost of the respective elements, availability for operational employment, time needed to respond to an emergent crisis, allocation of roles among the elements, and political considerations.[9]

As with other elements essential to the effective employment of combat power—logistics, medical support, strategic lift, training,

etc.—the U.S. military could not handle a major conflict without the Reserve and Guard forces. Nevertheless, to make the challenge of annually assessing the status of U.S. military strength using consistent metrics over time more manageable, this *Index* looks at something that is usually associated with the Active component of each service: the baseline requirement for a given amount of combat power that is readily available for use in a major combat operation. There are exceptions, however. For example, in this edition of the *Index,* four Army National Guard BCTs are counted as "available" for use because of the significant amounts of additional resources that have been dedicated specifically to these formations to raise their readiness levels.[10]

The *Index* also does not assess the U.S. Space Force, the newest of the military services within the Department of Defense and governed by Title 10 of the U.S. Code, although a section describing the origin, configuration, and functions of the service is included.[11] The Space Force describes itself as having been "established on December 20, 2019 with enactment of the Fiscal Year 2020 National Defense Authorization Act."[12] There are no viable metrics at this point by which to measure the service's capacity, capability, or readiness, and it is not yet clear how one would assess the Space Force's role in measuring "hard combat power," which is the focus of this publication.

The Defense Budget and Strategic Guidance

When it comes to the defense budget, how much we spend does not automatically determine the U.S. military's posture or capacity. As a matter of fact, simply looking at how much is allocated to defense does not tell us much about the capacity, modernity, or readiness of the forces. Proper funding is a necessary condition for a capable, modern, and ready force, but it is not sufficient by itself. It is possible that a larger defense budget could be associated with less military capability if the money were allocated inappropriately or spent wastefully. Nevertheless, the budget does

reflect the importance assigned to defending the nation and its interests in prioritizing federal spending.

Absent a significant threat to the country's survival, the U.S. government will always balance spending on defense against spending in all of the other areas of government activity that are deemed necessary or desirable. Ideally, defense requirements are determined by identifying national interests that might need to be protected with military power; assessing the nature of threats to those interests, what would be needed to defeat those threats, and the costs associated with that capability; and then determining what the country can afford or is willing to spend. *Any difference between assessed requirements and affordable levels of spending on defense would constitute a risk to U.S. security interests.*

This *Index* enthusiastically adopts this approach: interests, threats, requirements, resulting force, and associated budget. Spending less than the amount needed to maintain a two-MRC force results in policy debates about where to accept risk: force modernization, the capacity to conduct large-scale or multiple simultaneous operations, or force readiness.

The National Defense Strategy released in January 2018 by the Department of Defense is the DOD's current effort to establish the connection among interests, threats, requirements, and resources.[13] It serves to orient how the DOD intends to prepare the country's defense and establishes a public baseline of mission and associated requirements against which the country can measure its defense efforts. When discussing resources, the strategy calls for an increased, sustained, and predictable budget as the necessary precondition for its execution—something that proved elusive during the budgetary climate of two-year deals designed to circumvent the Budget Control Act of 2011 (BCA)[14] and now potentially affected by federal spending to offset the economic damage wrought by the COVID-19 pandemic.

The decision to fund national defense commensurate with interests and prevailing threats reflects our national priorities and risk tolerance. This *Index* assesses the ability of the nation's military forces to protect vital national security interests within the world *as it is* so that the debate about the level of funding for hard power is better informed.

The fiscal year (FY) 2020 base discretionary budget for the Department of Defense was $633.3 billion.[15] This represents the resources allocated to pay for the forces (manpower, equipment, and training); enabling capabilities (things like transportation, satellites, defense intelligence, and research and development); and institutional support (bases and stations, facilities, recruiting, and the like). The base budget does not pay for the cost of major ongoing overseas operations, which is captured in supplemental funding known as OCO (overseas contingency operations).

The debate about how much funding should be allocated to defense has been framed by the current Administration's 2016 campaign promise to rebuild the military,[16] an objective that is generally supported by Congress. Despite repeated emphasis on the importance of investing more to fix obvious readiness, capacity, and modernization problems, the debate has been determined by larger political dynamics that pitted those who want to see an overall reduction in federal spending against those who advocate higher levels of defense spending and those who want to see any increase in defense spending matched by commensurate increases in domestic spending.

The passage of the Bipartisan Budget Act of 2019 on August 2, 2019, altered the final two years of the BCA caps.[17] It set the cap for FY 2020 at $666.5 billion with $71.5 billion in OCO for a total of $738 billion. For FY 2021, the cap is at $671.5 billion with $69 billion in OCO for a total of $740.5 billion. These two years will bring an end to the BCA and the budgetary politics of the past 10 years, which largely failed to achieve its objective of decreasing the national debt.[18]

These changes in the BCA caps allowed the DOD to have more resources than it would under the full weight of the Budget Control Act. This in turn enabled the military services to

advance some of their priorities and achieve the improvements in readiness that these pages have shown in the past few years. However, to meet the challenges outlined in the National Defense Strategy, the Department will require more resources. Its senior leaders have expressed this need since before the strategy was released in January 2018.

Testifying before the House Armed Services Committee in 2017, both then-Secretary of Defense James N. Mattis and then-Chairman of the Joint Chiefs of Staff General Joseph Dunford emphasized the need for sustained budget growth so that U.S. forces can maintain a competitive advantage over likely adversaries. Mattis said that "he expects to ask for base budget growth 'along the lines of close to 5 percent growth, 3 to 5 percent growth for 2019 to '23," and Dunford stated that "[w]e know now that continued growth in the base budget of at least 3 percent *above inflation* is the floor necessary to preserve just the competitive advantage we have today, and we can't assume our adversaries will remain still."[19] The bipartisan commission that assessed the National Defense Strategy also assessed the need to have budgetary growth of between 3 percent and 5 percent above inflation.[20] Current Secretary of Defense Mark Esper also has stressed the need for annual budget growth of 3 percent to 5 percent to implement the National Defense Strategy.[21]

Chart 5 illustrates the growth that DOD senior leaders, validated by the NDS commission, have expressed as necessary compared to the trajectory of the defense budget as constrained by the BCA and its renegotiations. Over the past five fiscal years, from FY 2017 to FY 2021, the gap has ranged between $30 billion in the lower end of the projection and $100 billion at the higher end. These gaps illustrate the increased level of risk at which the U.S. military is currently operating.

The federal government's response to the coronavirus pandemic could influence how the defense budget is discussed and appropriated in future fiscal years. As part of the federal government's response, it approved $2 trillion of new emergency spending for FY 2020, which will lead to multitrillion-dollar deficits.[22] The increased debt load will likely demand adjustments in how the federal government allocates taxpayers' dollars, although how this will occur and the extent to which it will affect specific accounts is not yet known.

Purpose as a Driver in Force Sizing

The Joint Force is used for a wide range of purposes, only one of which is major combat operations. Fortunately, such events have been relatively rare, averaging approximately 15 years between occurrences.[23] In between (and even during) such occurrences, the military is used to support regional engagement, crisis response, strategic deterrence, and humanitarian assistance, as well as to support civil authorities and U.S. diplomacy.

All of the U.S. Unified Geographic Combatant Commands, or COCOMS—Northern Command (NORTHCOM); European Command (EUCOM); Central Command (CENTCOM); Indo-Pacific Command (INDOPACOM); Southern Command (SOUTHCOM); and Africa Command (AFRICOM)—have annual and long-term plans through which they engage with countries in their assigned regions. Engagements range from very small unit training events with the forces of a single partner country to larger bilateral and sometimes multilateral military exercises. Such events help to foster working relationships with other countries, acquire a more detailed understanding of regional political–military dynamics and on-the-ground conditions in areas of interest, and signal U.S. security interests to friends and competitors.

To support such COCOM efforts, the services provide forces that are based permanently in their respective regions or that operate in them temporarily on a rotational basis. To make these regional rotations possible, the services must maintain base forces that are large enough to train, deploy, support, receive back, and again make ready a stream of units that ideally is enough to meet validated COCOM demand.

The ratio between time spent at home and time spent away on deployment for any given unit is known as OPTEMPO (operational tempo), and each service attempts to maintain a ratio that both gives units enough time to educate, train, and prepare their forces and allows the individuals in a unit to maintain some semblance of a healthy home and family life. This ensures that units are fully prepared for the next deployment cycle and that service-members do not become "burned out" or suffer adverse consequences in their personal lives because of excessive deployment time.

Experience has shown that a ratio of at least 3:1 (three periods of time at home for every period deployed) is sustainable. If a unit is to be out for six months, for example, it will be home for 18 months before deploying again. Obviously, a service needs enough people, units, ships, and planes to support such a ratio. If peacetime engagement were the primary focus for the Joint Force, the services could size their forces to support these forward-based and forward-deployed demands.

Thus, the size of the total force must necessarily be much larger than any sampling of its use at any point in time.

In contrast, sizing a force for major combat operations is an exercise informed by history—how much force was needed in previous wars—and then shaped and refined by analysis of current threats, a range of plausible scenarios, and expectations about what the U.S. can do given training, equipment, employment concept, and other factors. The defense establishment must then balance "force sizing" between CO-COM requirements for presence and engagement and the amount of military power (typically measured in terms of combat units and major combat platforms, which inform total end strength) that is thought necessary to win in likely war scenarios.

Inevitably, compromises are made that account for how much military the country is willing to buy. Generally speaking:

- **The Army** sizes to major warfighting requirements;

- **The Marine Corps** focuses on crisis response demands and the ability to contribute to one major war;

- **The Air Force** attempts to strike a balance that accounts for historically based demand across the spectrum because air assets are shifted fairly easily from one theater of operations to another ("easily" being a relative term when compared to the challenge of shifting large land forces), and any peacetime engagement typically requires some level of air support; and

- **The Navy** is driven by global presence requirements. To meet COCOM requirements for a continuous fleet presence at sea, the Navy must have three to four ships in order to have one on station. A commander who wants one U.S. warship stationed off the coast of a hostile country, for example, needs the use of four ships from the fleet: one on station, one that left station and is traveling home, one that just left home and is traveling to station, and one that is otherwise unavailable because of major maintenance or modernization work.

This *Index* focuses on the forces required to win two major wars as the baseline force-sizing metric for the Army, Navy, and Air Force and the one-war-plus-crisis-response paradigm for the Marine Corps. The three large services are sized for global action in more than one theater at a time; the Marines, by virtue of overall size and most recently by direction of the Commandant, focus on one major conflict while ensuring that all Fleet Marine Forces are globally deployable for short-notice, smaller-scale actions.[24] The military's effectiveness, both as a deterrent against opportunistic competitor states and as a valued training partner in the eyes of other countries, derives from its effectiveness (proven or presumed) in winning wars.

Our Approach

With this in mind, we assessed the state of America's military forces as it pertains to their

ability to deliver hard power against an enemy in three areas:

- Capability,

- Capacity, and

- Readiness.

Capability. Examining the capability of a military force requires consideration of:

- The proper tools (material and conceptual) with the design, performance characteristics, technological advancement, and suitability that the force needs to perform its function against an enemy successfully;

- The sufficiency of armored vehicles, ships, airplanes, and other equipment and weapons to win against the enemy;

- The appropriate variety of options to preclude strategic vulnerabilities in the force and give flexibilities to battlefield commanders; and

- The degree to which elements of the force reinforce each other in covering potential vulnerabilities, maximizing strengths, and gaining greater effectiveness through synergies that are not possible in narrowly stovepiped, linear approaches to war.

The capability of the U.S. Joint Force was on ample display in its decisive conventional war victory over Iraq in liberating Kuwait in 1991 and later in the conventional military operation in Iraq to depose Saddam Hussein in 2003. Aspects of its capability have also been seen in numerous other operations undertaken since the end of the Cold War. While the conventional combat aspect of power projection has been more moderate in places like Yugoslavia, Somalia, Bosnia and Serbia, and Kosovo, and even against the Taliban in Afghanistan in 2001, the fact that the U.S. military was able to conduct highly complex operations thousands of miles

away in austere, hostile environments and sustain those operations as long as required is testament to the ability of U.S. forces to do things that the armed forces of few if any other countries can do.

A modern "major combat operation"[25] along the lines of those upon which Pentagon planners base their requirements would feature a major opponent possessing modern integrated air defenses; naval power (surface and undersea); advanced combat aircraft (to include bombers); a substantial inventory of short-range, medium-range, and long-range missiles; current-generation ground forces (tanks, armored vehicles, artillery, rockets, and anti-armor weaponry); cruise missiles; and (in some cases) nuclear weapons. Such a situation involving an actor capable of threatening vital national interests would present a challenge that is comprehensively different from the challenges that the U.S. Joint Force has faced in past decades.

Since 2018, the military community has focused on its suitability and readiness for major conventional warfare, given its focus on counterinsurgency, stability, and advise-and-assist operations since 2004 and the NDS directive to prepare for conflict in an era of great-power competition.[26] The Army in particular has noted the need to reengage in training and exercises that feature larger-scale combined arms maneuver operations, especially to ensure that its higher headquarters elements are up to the task.

This *Index* ascertains the relevance and health of military service capabilities by looking at such factors as average age of equipment, generation of equipment relative to the current state of competitor efforts as reported by the services, and the status of replacement programs that are meant to introduce more updated systems as older equipment reaches the end of its programmed service life. While some of the information is quite quantitative, other factors could be considered judgment calls made by acknowledged experts in the relevant areas of interest or as addressed by senior service officials when providing testimony

to Congress or examining specific areas in other official statements.

It must be determined whether the services possess capabilities that are relevant to the modern combat environment.

Capacity. The U.S. military must have a sufficient quantity of the right capability or capabilities. When speaking of platforms such as planes and ships, there is a troubling and fairly consistent trend that characterizes the path from requirement to fielded capability within U.S. military acquisition. Along the way to acquiring the capability, several linked things happen that result in far less of a presumed "critical capability" than supposedly was required.

- The military articulates a requirement that the manufacturing sector attempts to satisfy.

- "Unexpected" technological hurdles arise that take longer and much more money to solve than anyone envisioned.

- Programs are lengthened, and cost overruns are addressed, usually with more money.

- Then the realization sets in that the country either cannot afford or is unwilling to pay the cost of acquiring the total number of platforms originally advocated. The acquisition goal is adjusted downward, if not canceled altogether, and the military finally fields fewer platforms at a higher cost per unit than it originally said it needed to be successful in combat.

As deliberations proceed toward a decision on whether to reduce planned procurement, they rarely focus on and quantify the increase in risk that accompanies the decrease in procurement.

Something similar happens with force structure size: the number of units and total number of personnel the services say they need to meet the objectives established by the Commander in Chief and the Secretary of Defense in their strategic guidance.

- The Marine Corps has stated that it needs 27 infantry battalions to fully satisfy the validated requirements of the regional Combatant Commanders, yet it currently fields only 24 and has stated that it plans to drop further to 21 in order to make resources available for experimentation and modernization.[27]

- In 2012, the Army was building toward 48 brigade combat teams, but incremental budget cuts reduced that number over time to 31—less than two-thirds the number that the Army originally thought was necessary.

- The Navy has produced various assessments of fleet size since the end of the Cold War, from 313 ships to 355 ships, and in 2019 initiated yet another force structure review.

Older equipment can be updated with new components to keep it relevant, and commanders can employ fewer units more expertly for longer periods of time in an operational theater to accomplish an objective. At some point, however, sheer numbers of updated, modern equipment and trained, fully manned units are going to be needed to win in battle against a credible opponent when the crisis is profound enough to threaten a vital interest.

Capacity (numbers) can be viewed in at least three ways: compared to a stated objective for each category by each service, compared to amounts required to complete various types of operations across a wide range of potential missions as measured against a potential adversary, and as measured against a set benchmark for total national capability. This *Index* employs the two-MRC metric as a benchmark for most of the force.

The two-MRC benchmark for force sizing is the *minimum* standard for U.S. hard-power capacity because one will never be able to

TABLE 3

Historical U.S. Force Allocation

Troop figures are in thousands.

	Korean War	Vietnam War	Persian Gulf War	Operation Iraqi Freedom
ARMY				
Total Troop Deployment During Engagement	206.3	219.3	267.0	99.7
Divisions*	6	7	4	1
Reserve Component Divisions Total for Strategic Documents	n/a	n/a	n/a	n/a
Total Army End Strength During Engagement, During Year of Strategy Document Active	1,313.8	1,113.3	738.0	499.0
Total Active End Strength Recommendations	n/a	n/a	n/a	n/a
NAVY				
Total Fleet During Engagement	904	770	529	297
Aircraft Carriers	6	5	6	5
Carrier Air Wings	6	5	6	5
Large Surface Combatants	37	14	30	23
Small Surface Combatants	16	47	16	9
Attack Submarines	4	0	12	12
Amphibious Vessels	34	26	21	7
Combat Logistics and Support Ships	28	29	45	42
Fighter/Attack Squadrons	21	43	22	24
MARINE CORPS				
Total Troop Deployment During Engagement	33.5	44.7	90.0	66.2
Active Divisions*	1	2	2	1
Reserve Divisions	n/a	n/a	n/a	n/a
Marine Expeditionary Force	1	1	1	2
Air Wings Active/Reserve	1	1	1	1
Total Marine Corps End Strength During Engagement by Year of Strategy Document	187.0	289.0	196.3	178.0
Total Recommended End Strength	n/a	n/a	n/a	n/a
AIR FORCE				
Bombers or Bomber Squadrons**	21	23	3	4
Fighter Squadrons	26		30	30
Active Fighter Wings	7	8	10	10
Reserve Fighter Wings				
Airlift/Tankers	239	167	388	293

* Figures for engagements are numbers deployed; figures for documents are totals.

** Figures for Air Force bombers for Korean War, Vietnam War, Persian Gulf War, and Iraq are bomber squadrons.
All other figures are bombers.

*** 2014 QDR prescribed nine heavy bomber squadrons, equaling 96 aircraft.

	1993 BUR	1997 QDR	2001 QDR	2006 QDR	2010 QDR	2010 Indep. Panel	2-MRC Paper	2014 QDR	2014 NDP
ARMY									
Total Troop Deployment During Engagement	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Divisions*	10	10	10	11		11	10	10	n/a
Reserve Component Divisions Total for Strategic Documents	n/a	5	8	8	18	7	8	8	n/a
Total Army End Strength During Engagement, During Year of Strategy Document Active	572.0	492.0	481.0	505.0	566.0	566.0	550.0	490.0	490.0
Total Active End Strength Recommendations	n/a	n/a	n/a	482.4	n/a	1,106.0	600.0	450.0	490.0
NAVY									
Total Fleet During Engagement	346	310	n/a	n/a	n/a	346	350	n/a	346
Aircraft Carriers	12	12	12	11	11	11	11	11	n/a
Carrier Air Wings	12	11	11	n/a	10	10	10	10	n/a
Large Surface Combatants	124	116	116	n/a	84–88	n/a	120	92	n/a
Small Surface Combatants				n/a	14–28	n/a	n/a	43	n/a
Attack Submarines	55	50	55	n/a	53–55	55	50	51	n/a
Amphibious Vessels	41	36	36	n/a	29–31	n/a	38	33	n/a
Combat Logistics and Support Ships	65	n/a	n/a	n/a	58	n/a	75	n/a	n/a
Fighter/Attack Squadrons	33	30	30	n/a	30	30	30	30	n/a
MARINE CORPS									
Total Troop Deployment During Engagement	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Active Divisions*	4	3	3	n/a	3	n/a	n/a	3	n/a
Reserve Divisions	1	1	1	n/a	1	n/a	n/a	1	n/a
Marine Expeditionary Force	3	3	3	n/a	3	3	3	2	n/a
Air Wings Active/Reserve	n/a	4	4	n/a	4	n/a	n/a	4	n/a
Total Marine Corps End Strength During Engagement by Year of Strategy Document	174.0	174.0	173.0	180.0	202.0	202.0	196.0	182.0	182.0
Total Recommended End Strength	n/a	n/a	n/a	175.0	n/a	243.0	202.0	182.0	182.0
AIR FORCE									
Bombers or Bomber Squadrons**	200	187	112	n/a	96	180	200	96***	n/a
Fighter Squadrons	54	54	46	n/a	42	66	54	48	n/a
Active Fighter Wings	13	12+	15	n/a	n/a	20	20	9	n/a
Reserve Fighter Wings	7	8	12	n/a	n/a	n/a		7	n/a
Airlift/Tankers	n/a	n/a	n/a	n/a	1023	1023	1,000	954	n/a

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U.S. Military Power: Five-Grade Scale

VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG

employ 100 percent of the force at any given time. Some percentage of the force will always be unavailable because of long-term maintenance overhaul, especially for Navy ships; unit training cycles; employment in myriad engagement and small-crisis response tasks that continue even during major conflicts; a standing commitment with allies to maintain U.S. forces in a given country or region; and the need to keep some portion of the force uncommitted to serve as a strategic reserve.

The historical record shows that, on average, the U.S. Army commits 21 BCTs to a major conflict; thus, a two-MRC standard would require that 42 BCTs be available for actual use. But an Army built to field only 42 BCTs would also be an Army that could find itself entirely committed to war, leaving nothing back as a strategic reserve, to replace combat losses, or to handle other U.S. security interests. Although new technologies and additional capabilities have made current BCTs more capable than those they replaced, one thing remains the same: Today's BCT, like its predecessors, can only be committed to one place at a time and must be able to account for combat losses, especially if it engages a similarly modernized enemy force. Thus, numbers still matter regardless of modernity.

Again, this *Index* assesses only the Active component of the service, though with full awareness that the Army also has Reserve and National Guard components that together account for half of the total Army. The additional capacity needed to meet these "above two-MRC requirements" could be handled by these other components or mobilized to supplement Active-component commitments. In fact, this is how the Army thinks about meeting operational demands and is at the heart of the long-running debate within the total Army about the roles and contributions of the various Army components. A

similar situation exists with the Air Force and Marine Corps.

The balance among Active, Reserve, and Guard elements is beyond the scope of this study. Our focus here is on establishing a minimum benchmark for the capacity needed to handle a two-MRC requirement.

We conducted a review of the major defense studies (1993 BUR, QDR reports, and independent panel critiques) that are publicly available,[28] as well as modern historical instances of major wars (Korea, Vietnam, Gulf War, Operation Iraqi Freedom), to see whether there was any consistent trend in U.S. force allocation. The results of our review are presented in Table 5. To this we added 20 percent, both to account for forces and platforms that are likely to be unavailable and to provide a strategic reserve to guard against unforeseen demands.

Summarizing the totals, this *Index* concluded that a Joint Force capable of dealing with two MRCs simultaneously or nearly simultaneously would consist of:

- **Army:** 50 BCTs.

- **Navy:** at least 400 ships and 624 strike aircraft.

- **Air Force:** 1,200 fighter/attack aircraft.

- **Marine Corps:** 30 battalions.

America's security interests require that the services have the capacity to handle two major regional conflicts successfully.

Readiness. The consequences of the sharp reductions in funding mandated by sequestration have caused military service officials, senior DOD officials, and even Members of Congress to warn of the dangers of recreating the "hollow force" of the 1970s when units existed on paper but were staffed at reduced levels,

minimally trained, and woefully ill-equipped.[29] To avoid this, the services have traded quantity/capacity and modernization to ensure that what they do have is "ready" for employment.

Supplemental funding in FY 2017, a higher topline in FY 2018, and sustained increases in funding in FY 2019 and through FY 2020 have helped to stop the bleeding and have enabled the services to plan and implement readiness recovery efforts. Massive federal spending in response to the COVID-19 pandemic in calendar year (CY) 2020 could lead to fiscal pressure on defense accounts in future years, but for FY 2020, gains in readiness have been preserved.

It is one thing to have the right capabilities to defeat the enemy in battle. It is another thing to have enough of those capabilities to sustain operations and many battles against an enemy over time, especially when attrition or dispersed operations are significant factors. But sufficient numbers of the right capabilities are rather meaningless if the force is not ready to engage in the task.

Scoring. In our final assessments, we tried very hard not to convey a higher level of precision than we think is achievable using unclassified, open-source, publicly available documents; not to reach conclusions that could be viewed as based solely on assertions or opinion; and not to rely solely on data and information that can be highly quantified. Simple numbers, while important, do not tell the whole story.

We believe that the logic underlying our methodology is sound. This *Index* drew from a wealth of public testimony from senior government officials, from the work of recognized experts in the defense and national security analytic community, and from historical instances of conflict that seemed most appropriate to this project. It then considered several questions, including:

- How does one place a value on the combat effectiveness of such concepts as Air-Sea Battle, Multi-Domain Operations, Littoral Operations in a Contested Environment, Distributed Maritime Operations,

Network-centric Operations, or Joint Operational Access?

- Is it entirely possible to assess accurately (1) how well a small number of newest-generation ships or aircraft will fare against a much larger number of currently modern counterparts when (2) U.S. forces are operating thousands of miles from home, (3) orchestrated with a particular operational concept, and (4) the enemy is leveraging a "home field advantage" that includes strategic depth and much shorter and perhaps better protected lines of communication and (5) might be pursuing much dearer national objectives than the U.S. is pursuing so that the political will to conduct sustained operations in the face of mounting losses might differ dramatically?

- How does one neatly quantify the element of combat experience, the erosion of experience as combat operation events recede in time and those who participated in them leave the force, the health of a supporting workforce, the value of "presence and engagement operations," and the related force structures and patterns of deployment and employment that presumably deter war or mitigate its effects if it does occur?

New capabilities such as unmanned systems, cyber tools, hypervelocity platforms and weapons, and the use of artificial intelligence to better understand and orchestrate operations have the potential to change military force posture calculations in the future, but at the present time, they are not realized in any practical sense.

This *Index* focused on the primary purpose of military power—to defeat an enemy in combat—and the historical record of major U.S. engagements for evidence of what the U.S. defense establishment has thought was necessary to execute a major conventional war successfully. To this we added the two-MRC

benchmark; on-the-record assessments of what the services themselves are saying about their status relative to validated requirements; and the analysis and opinions of various experts, both in and out of government, who have covered these issues for many years.

Taking it all together, we rejected scales that would imply extraordinary precision and settled on a scale that conveys broader characterizations of status that range from very weak to very strong. Ultimately, any such assessment is a judgment call informed by quantifiable data, qualitative assessments, thoughtful deliberation, and experience. We trust that our approach makes sense, is defensible, and is repeatable.

Endnotes

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23. Since World War II, the U.S. has fought four major wars: the Korean War (1950–1953); the Vietnam War (1965–1973); the Gulf War/Operation Desert Shield/Desert Storm (1990–1991); and the Iraq War/Operation Iraqi Freedom (2003–2011).

24. In previous editions of the *Index*, the capacity of the Marine Corps was assessed against a two-war requirement of 36 battalions: a historical average of 15 battalions for a major conflict (twice that for two) and a 20 percent buffer, bringing the total to 36. The Corps has consistently maintained that it is a one-war force and has no intention of growing to the size needed to fight two wars. Its annual budget requests and top-level planning documents reflect this position. Having assessed that the Indo-Pacific region will continue to be of central importance to the U.S., noting that China is a more worrisome "pacing threat" than any other competitor, and that the Joint Force lacks the ability to operate within the range of intensely weaponized, layered defenses featuring large numbers of precision-guided munitions, the Corps is reshaping itself to optimize its capabilities and organizational structures for this challenge. This *Index* concurs with this effort but assesses that the Corps will still need greater capacity to succeed in war in the very circumstances for which the Marines believe they must prepare. For a detailed examination of the current state of the Corps, see Dakota Wood, "The U.S. Marine Corps: A Service in Transition," Heritage Foundation *Backgrounder* No. 3501, June 16, 2020, https://www.heritage.org/sites/default/files/2020-06/BG3501_0.pdf.

25. Defense references to war have varied over the past few decades from "major combat operation" (MCO) and "major theater war" (MTW) to the current "major regional contingency" (MRC). Arguably, there is a supporting rationale for such shifts as planners attempt to find the best words to describe the scope and scale of significant military efforts, but the terms are basically interchangeable.

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28. The Department of Defense, through the Joint Staff and Geographic Combatant Commanders, manages a relatively small set of real-world operational plans (OPLANS) focused on specific situations where the U.S. feels it is most likely to go to war. These plans are reviewed and updated regularly to account for changes in the Joint Force or with the presumed enemy. They are highly detailed and account not only for the amount of force the U.S. expects that it will need to defeat the enemy, but also for which specific units would deploy; how the force would actually flow into the theater (the sequencing of units); what ports and airfields it would use; how much ammunition, fuel, and other supplies it would need at the start; how much transportation or "lift" would be needed to get the force there (by air, sea, trucks, or rail); and the basic plan of attack. The Pentagon also routinely develops, explores, and refines various notional planning scenarios so that it can better understand the implications of different sorts of contingencies, which approaches might be more effective, how much of what type of force might be needed, and the regional issue or issues for which there would have to be an accounting. These types of planning events inform service efforts to develop,

equip, train, and field military forces that are up to the task of defending national security interests. All of these efforts and their products are classified national security information and therefore not available to the public.

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U.S. Army

Thomas W. Spoehr

The U.S. Army is America's primary land warfare component. Although it addresses all types of operations across the range of ground force employment, its chief value to the nation is its ability to defeat and destroy enemy land forces in battle. Operationally, as of March 3, 2020, the Army had "over 190,000 soldiers deployed in 140 countries all around the world."[1]

The summer of 2020 finds the Army, like the rest of the U.S. Department of Defense (DOD), dealing with and supporting national efforts to mitigate the effects of the SARS-CoV-2 virus. Thus far, the impacts have been moderate and manageable. As of July 1, 2020, DOD reported a total of 12,521 "cumulative cases" of coronavirus,[2] and this number can certainly be expected to grow. Army recruiting has shifted to virtual, basic training and has been modified to allow for greater social distancing, and normal permanent change of station moves for Army personnel, like the rest of DOD, were paused until at least the end of June 2020. The largest impact on the Army thus far has been forced cancellation of major training exercises and collective training opportunities. DEFENDER-Europe 20, "which was supposed to be the Army's largest exercise in Europe in 25 years," had to be truncated, although there still was some deployment training.[3]

Social distancing is not a true option for the U.S. Army. Realistic training involves manning combat vehicles and platforms where distancing is not possible. Command posts of all sizes bring soldiers into close proximity. If the COVID-19 pandemic continues past the summer, greater impacts on readiness should be expected.

To understand the Army of 2020 requires knowledge of what has transpired in the past two decades. Starting in 2001, the Army's focus became consumed by counterinsurgency (CI) operations in Iraq and Afghanistan. By 2016, however, the Army had begun to reorient toward great-power conflict. Publication of the National Security Strategy in December 2017[4] and the National Defense Strategy (NDS) in January 2018[5] gave further impetus to the need to reorient Army modernization programs, training, and doctrine to address near-peer conflict, especially conflict involving China and Russia. The 2018 National Defense Strategy captured the situation:

> Today, we are emerging from a period of strategic atrophy, aware that our competitive military advantage has been eroding. We are facing increased global disorder, characterized by decline in the long-standing rules-based international order—creating a security environment more complex and volatile than any we have experienced in recent memory. Inter-state strategic competition, not terrorism, is now the primary concern in U.S. national security.[6]

Two factors have placed the Army at a relative disadvantage compared to near-peer competitors in the past 10 years: years of relentless

counterinsurgency commitments and budget constraints imposed by the Budget Control Act (BCA) of 2011.[7] A narrow focus on CI slowed or stopped most Army modernization programs except those designed specifically for CI-type operations. Development of next-generation capabilities in air and missile defense, electronic warfare, precision fires, and ground combat vehicles was curtailed in favor of CI capabilities. Training centers prepared forces exclusively for counterinsurgency. The BCA reinforced the damage by removing billions of dollars of expected funding at the very time the Army was again beginning to concentrate on great-power competition. As a result of the BCA, Army end strength was shrinking to meet lower expected resources, remaining equipment programs were terminated, and funding for operations and maintenance was constrained.

The situation was aptly summarized in 2018 by former Defense Secretary James Mattis:

> Let me be clear: As hard as the last 16 years of war have been on our military, no enemy in the field has done as much to harm the readiness of U.S. military than the combined impact of the BCA's [Budget Control Act] defense spending caps, worsened by operating for 10 of the last 11 years under continuing resolutions of varied and unpredictable duration.[8]

The Army has since responded admirably, shifting its focus to concentrate on great-power competition. Combat Training Center (CTC) scenarios now focus nearly exclusively on high-end decisive action scenarios, new materiel programs like longer-range artillery and precision missiles with utility in near-peer competitor situations are underway, and organizational structures are being designed and in some cases implemented. Warfighting concepts and doctrine are also shifting to this new construct.

This is all appropriate, but unlike the aftermath of the Vietnam War, when the 1976 version of the Army's primary doctrinal manual

omitted any mention of counterinsurgency operations, the Army thus far has also seen fit to maintain some capabilities like Security Force Assistance Brigades, counter-drone equipment, and robust Special Operations capabilities that have utility in operations at a lower level of intensity. As it moves into the future, the Army should continue to guard against the pendulum swinging too far in the new direction of great-power competition and maintain critical capabilities for CI and stability operations, as well as support for their intellectual underpinnings.

Beginning with supplemental appropriations in the summer of 2016, increased defense budgets initiated by the Trump Administration and approved by Congress have begun to bear fruit. Readiness levels have improved among Army Brigade Combat Teams (BCTs); numerous modernization programs have been initiated; and end strength has grown, albeit modestly.

Both former Secretary of Defense James Mattis and current Secretary of Defense Mark Esper have stated that DOD needs 3 percent–5 percent real growth in its budget from 2017 to 2023.[9] Starting with the 2018 budget request, however, the Army's funding levels first plateaued and then declined. The Army received a total of $179 billion in fiscal year (FY) 2018 and has requested $178 billion for FY 2021. Because of the inexorable march of inflation, the flat line in the budget for the three consecutive fiscal years of 2019, 2020, and 2021 represents a net loss of about 6 percent in buying power.[10] Secretary of the Army Ryan McCarthy has testified that with the prospect of a flat budget, the Army is faced with "either flattening [e]nd strength or tiering the modernization strategy," which means, "within the portfolios, choos[ing] divisions that you would scale first." This leaves the Army with "nothing but really, very difficult challenges, without an increased top line."[11]

Capacity

Capacity refers to sufficiency of capabilities needed to execute the strategy. Among

CHART 5

Army Spending Takes Additional Hit Due to Inflation

The Army's total obligation authority (TOA) is declining in actual dollars, but because of inflation, those declines also result in an additional loss in buying power. From 2019 to 2021, those losses have totaled $22.7 billion.

BILLIONS OF DOLLARS

TOA adjusted for inflation

$191.3

$187.3

$183.1

$2.1

$181

Loss in buying power

$13.3

$7.3

$180

Actual TOA

$178

2019   2020   2021

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the ways the Army quantifies its warfighting capacity is in numbers of Brigade Combat Teams, which are the basic building blocks for employment of Army combat forces. BCTs are usually employed within a larger framework of U.S. land operations but are equipped and organized so that they can conduct independent operations as circumstances demand.[12] According to the DOD Inspector General, an Armored BCT "has an approximate personnel strength of 4,700 soldiers," an Infantry BCT "has an approximate personnel strength of 4,400 soldiers," and a Stryker BCT "has an approximate personnel strength of 4,500 soldiers."[13]

However, the number of BCTs is a more telling measure of actual hard Army power. End strength reductions forced by the BCA and the priorities of the Obama Administration caused the Regular Army to decrease from 45 BCTs in FY 2013 to the 31 BCTs that remain in FY 2020.[14] Then, when the President and Congress reversed the drawdown in end strength and

authorized growth starting in 2017, instead of "re-growing" the numbers of BCTs, the Army chose primarily to "thicken" the force and raise the manning levels within the individual BCTs to increase unit readiness. The Army's goal is to fill operational units to 105 percent of their authorized manning by the end of 2020.[15]

The Army also has a separate air component organized into Combat Aviation Brigades (CABs), which can operate independently. CABs are made up of Army rotorcraft, such as the AH-64 Apache, and perform various roles including attack, reconnaissance, and lift. The number of Army aviation units has also experienced a reduction. In May 2015, the Army deactivated one of its 12 CABs, leaving only 11 in the Regular Army.

CABs and Stryker, Infantry, and Armored BCTs make up the Army's main combat forces, but they obviously do not make up the entirety of the Army. About 90,000 Regular Army troops form the Generating Force and provide such types of support as preparing and training troops for deployments, carrying out key logistics tasks, and overseeing military schools and Army educational institutions. The troops constituting the Generating Force cannot be reduced at the same ratio as BCTs or CABs, and the Army endeavors to insulate these soldiers from drawdown and restructuring proposals in order to "retain a slightly more senior force in the Active Army to allow growth if needed."[16]

In addition to the institutional Army, a great number of functional or multifunctional support brigades (amounting to approximately 42 percent of the active component force based on historical averages[17]) provide air defense; engineering; explosive ordnance disposal (EOD); chemical, biological, radiological, and nuclear protection; military police; military intelligence; and medical support among other types of battlefield support. Many of these units are proving valuable in responding to the COVID-19 crisis. Special operations forces such as the 75th Ranger Regiment, Special Forces Groups, and the 160th Special Operations Aviation Regiment are also included in these numbers.

The Army has begun the process of adapting its force structure to meet the anticipated new demands of near-peer competition. The foundations for these changes are contained in the Army's 2018 concept for multi-domain operations (MDO), which outlines how the Army views the future.[18] In April 2020, the Army announced that it is bundling its efforts to modify force structure for MDO under the designation "AimPoint Initiative." As part of this initiative, the Army intends to reactivate the V Corps Headquarters in the fall of 2020 and create three Multi-Domain Task Forces (MDTFs). The first MDTF already exists under U.S. Army Pacific Command as a pilot program and is intended to "focus on penetrating an enemy environment, employing assets that can counter enemy A2/AD [anti-access/aerial denial] capabilities and enemy network-focused targeting of U.S. units." The second MDTF is scheduled to be activated in Europe in 2021, and the third is scheduled to be activated in the Pacific in 2022.[19]

In 2017, to relieve the stress on the use of BCTs, the Army activated the first of six Security Force Assistance Brigades (SFABs). These units, composed of about 800 soldiers per unit, are designed specifically to train, advise, and mentor other partner-nation military units.[20] The Army had been using BCTs for this mission, but because train-and-assist missions typically require senior officers and noncommissioned officers, a BCT comprised predominantly of junior soldiers is a poor fit. Since 2018, SFABs have deployed to assist foreign partners in Afghanistan, Iraq, and Africa. The last SFAB to activate, the 5th SFAB, was scheduled to activate in the summer of 2020 at Joint Base Lewis–McChord, Washington.[21] Of the six SFABs, one is in the National Guard, and the other five are in the Regular Army.

In FY 2020, the Army was authorized a total end strength of 1,005,500 soldiers: 480,000 in the Regular Army, 189,500 in the Army Reserve, and 336,000 in the Army National Guard (ARNG).[22] Although these numbers admittedly sound impressive, Army leaders have consistently stated that the Army is too small to

execute the National Defense Strategy at less than significant risk. In 2017, in perhaps the clearest of these statements, General Mark Milley, then Chief of Staff of the Army, testified that in his judgment, the numbers should be 540,000–550,000 for the Regular Army, 350,000–355,000 for the National Guard, and 205,000–209,000 for the Army Reserve.[23] Since then, with the publishing of the 2018 NDS and its emphasis on great-power competition, the requirements placed on the Army have increased.

More recently, responding to written "Advance Policy Questions" from the Senate Armed Services Committee in conjunction with his nomination, Secretary of the Army Ryan McCarthy has stated that he believes the Army's "end strength levels are insufficient to meet national defense objectives" and that "I am concerned about the Army's ability to defeat a near-peer adversary while nearly simultaneously denying the objectives of another, defending the homeland, and sustaining counter terrorism efforts."[24] Current Army Chief of Staff General James McConville echoed this statement: "The total Army needs to be larger and fully resourced with timely, adequate, predictable, and sustainable funding to reduce the risk."[25]

Secretary McCarthy has said the nation needs a Regular Army of at least 500,000, but under current plans, the Army is many years from achieving that goal.[26] On March 31, 2020, the Regular Army stood at 479,233 soldiers—20,767 less than the minimum that Army leaders have testified is necessary.[27] The Army's FY 2021 budget request specifies an end strength of 485,900 for FY 2021 and projects an end strength of 490,500 by the end of FY 2025, which represents an average growth of 1,150 soldiers per year.[28] At that rate, the service will not reach its minimum stated goal of 500,000 until 2034, 14 years from now. The slowdown in planned growth is being driven first and foremost by a lack of funding, although recruiting has also emerged as a challenge.

Most outside experts agree that the U.S. Army is too small. In 2017, Congress established the bipartisan National Defense Strategy Commission to provide an "independent, non-partisan review of the 2018 National Defense Strategy." Among its findings, the commission noted that the NDS now charges the military with facing "five credible challengers, including two major-power competitors and three distinctly different geographic and operational environments." The commission assessed that "this being the case, a two-war force sizing construct makes more strategic sense today than at any previous point in the post-Cold War era." In other words, *"[s]imply put, the United States needs a larger force than it has today if it is to meet the objectives of the strategy."*[29]

The Army also has transitioned from a force with a third of its strength typically stationed overseas, as it was during the Cold War, to a force that is based in the continental United States. In 1985, 31 percent of the active-duty Army was stationed overseas; by 2015, that figure had declined to 9 percent.[30] The desire to find a peace dividend following the dissolution of the Soviet Union, combined with a reluctance to close bases in the United States, led to large-scale base closures and force reductions overseas. Lack of a substantial overseas presence makes prompt response more difficult and lessens deterrence.

In addition to the increased strategic risk of not being able to execute the NDS within the desired time frame, the result of an insufficient number of BCTs and a diminished Army end strength has been a higher than desired level of operational tempo (OPTEMPO). Despite a reduction in large unit deployments, particularly to Iraq and Afghanistan, Army units continue to experience sustained demand. In March 2020, the Army was experiencing deployment-to-dwell ratios as high as 1 to 1, which is much higher than desired.[31]

Included in these deployments are the rotations of Armored BCTs to and from Europe and Korea. Rather than relying on forward-stationed BCTs, the Army rotates Armored BCTs to Europe and Korea on a "heel-to-toe" basis. There is disagreement as to which

represents the best option. Proponents of rotational BCTs argue that they arrive fully trained and remain at a high state of readiness throughout their typically nine-month overseas rotation; those who favor forward-stationed forces point to a lower cost, forces that typically are more familiar with the operating environment, and a more reassuring presence for our allies.[32] In reality, both are needed not only for the reasons mentioned, but also because the mechanisms by which a unit is deployed, received into theater, and integrated with the force stationed abroad must be practiced on a regular basis.

In an effort to mitigate risk, the Army is resourcing select Army National Guard BCTs with additional training days, moving from the standard number of 39 training days to as many as 63 per year to increase readiness levels. To apply these resources, the National Guard has implemented a multi-year training cycle to build readiness over time. As part of this concept, the Army increased the number of National Guard BCTs participating in a Combat Training Center (CTC) rotation from two to four starting in FY 2019. This continues in the fiscal year 2021 budget request.[33]

As a result of this change in strategy and the increased investment in the National Guard, the 2021 *Index of U.S. Military Strength* counts four ARNG BCTs in the overall Army BCT capacity count, reflecting their ability to be employed on a dramatically shortened timeline as a result of their training at a Combat Training Center and the increased number of resourced training days.

Capability

Capability in this context refers to the quality, performance, suitability, and age of the Army's various types of combat equipment. As a general rule, the Army is primarily using equipment developed in the 1970s, fielded in the 1980s, and incrementally upgraded since then. This modernization gap was caused by several factors: the predominant focus on the wars in Iraq and Afghanistan since 9/11; pressures caused by budget cuts, especially those

associated with the Budget Control Act of 2011; and failures in major modernization programs like the Future Combat System, Ground Combat Vehicle, and Crusader artillery system.

Army leaders today clearly view this situation as a serious challenge. Secretary of the Army Ryan McCarthy has testified that "the most significant challenge" the Army faces "is being able [to] execute our aggressive modernization strategy while maintaining a sustainable level of readiness to meet current operational requirements."[34] Through 2022 and later, most of the Army's proposed programs will still be in development and sensitive to changes in funding or priorities. Even once the programs enter procurement, funding constraints will drive fielding into the 2030s, delaying the arrival of new capability.

As an example, the M109 series howitzer was first introduced in the early 1960s and has been upgraded multiple times since then. An important part of an artillery system is its range. Today, most modern countries have artillery systems that can outrange the Paladin 109A7, the Army's current self-propelled howitzer. The Paladin can fire an artillery shell about 22 kilometers–30 kilometers. The Russian 2S33 Msta-SM2 reportedly can hit targets at 40 kilometers.[35] Similarly, the German PzH 2000, Chinese PLZ-05, South Korean K9, and French CAESAR systems all outrange the Paladin.[36] The Army has an extended-range cannon in development that can fire to 70 kilometers, but it is not yet available and is not expected until at least 2023.[37]

Within the Army's inventory of equipment are hundreds of combat systems, including small arms, trucks, aircraft, soldier-carried weapons, radios, tracked vehicles, artillery systems, missiles, and drones. The following paragraphs provide an update on some of the major systems as they pertain to Armored, Stryker, and Infantry BCTs and Combat Aviation Brigades, but it is by no means exhaustive.

Armored Brigade Combat Team (ABCT). The Armored BCT's "role is to close with the enemy using fire and movement to destroy or capture enemy forces, to repel enemy attacks

FIGURE 1

U.S. Artillery Falls Short—Literally—Compared to Rivals

The U.S. M109A7 Paladin artillery system, in the U.S. Army's arsenal since 2015, has a maximum range of only 30 kilometers—10 kilometers less than the range of Russia's 2S33 system and 23 kilometers short of China's PLZ–052.

RANGE IN KILOMETERS

30 KM
• U.S. M109A7 Paladin

40 KM
• Russia 2S33
• S. Korea K9
• France CAESAR

53 KM
• China PLZ–052

56 KM
• Germany PzH 2000
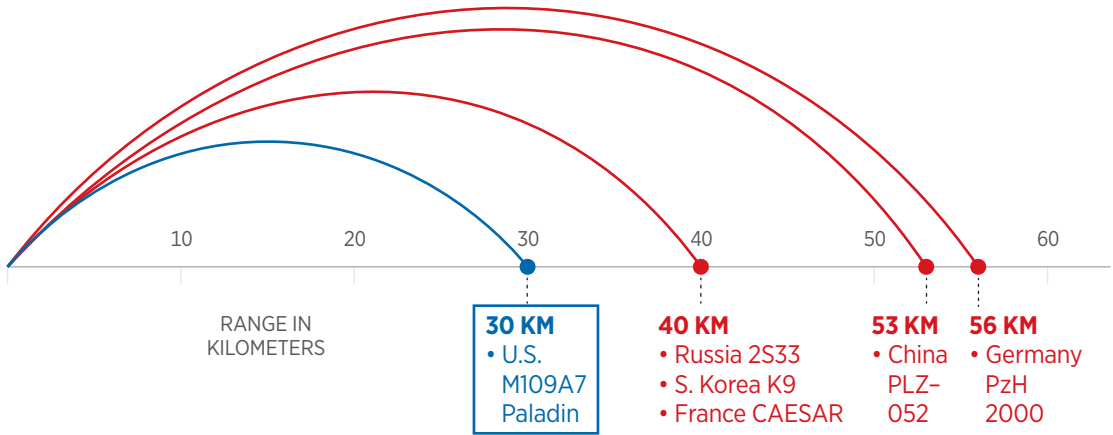
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by fire, to engage in close combat, and to counterattack to control land areas, including populations and resources."[38] The Abrams Main Battle Tank (latest version: M1A2 SEPv3, service entry date 2017) and Bradley Fighting Vehicle (latest version: M2A4) are the primary combat platforms in Armored BCTs. The M-1 tank and Bradley first entered service in 1980 and 1981, respectively. Today, there are 87 M-1 Abrams tanks and 152 Bradley Fighting Vehicle variants in an ABCT.[39] Despite upgrades, the M-1 tank and the Bradley are now 40 years old, and their replacements will likely not arrive until the platforms are at least 50 years old.

The Army's replacement program for the Bradley, the Optionally Manned Fighting Vehicle, was formerly on an aggressive timeline, but the Army cancelled the request for proposals on January 16, 2020, and is now reworking the requirements in conjunction with industry.

"The Army now plans for the first unit to be equipped in the fourth quarter of FY 2028."[40] A potential replacement for the M-1 tank is even further down the road; the Army does not intend to decide "what direction we want to go for decisive lethality and survivability on the battlefield" until at least 2023.[41]

Also in Armored BCTs, the venerable M113 multi-purpose personnel carrier, which fills multiple roles like mortar carrier and ambulance, entered service in 1960 and is scheduled to be replaced by the new Armored Multi-Purpose Vehicle (AMPV), which passed acquisition milestone C on January 25, 2019, and was scheduled to begin low-rate initial production in the first half of FY 2020. In a signal of budget pressure, program problems, or both, the Army reduced its planned procurement of the AMPV in its FY 2021 budget request.[42] At the new projected average procurement rate of about 190 vehicles per year starting in 2022, the Army will not reach its stated objective of 2,897 AMPVs until around 2037.[43]

Stryker Brigade Combat Team (SBCT). The Stryker BCT "is an expeditionary combined arms force organized around mounted infantry" and able to "operate effectively in most terrain and weather conditions due to their rapid strategic deployment and mobility."[44] Stryker BCTs are equipped with approximately 321 eight-wheeled Stryker vehicles. These vehicles are among the Army's newest combat platforms, having entered service in 2001. In response to an Operational Needs Statement, the Stryker BCT in Europe received Strykers fitted with a 30mm cannon to provide an improved anti-armor capability.[45] Based on the success of that effort, the Army decided to outfit at least three of its SBCTs— the ones equipped with the Double V-hull, which affords better underbody protection against such threats as improvised explosive devices (IEDs)—with the XM813 30mm autocannon, although the competition to integrate those weapons is currently delayed because of the COVID-19 pandemic.[46] The Army is also integrating Javelin missiles on the Stryker platform.

Infantry Brigade Combat Team (IBCT). The Infantry BCT "is an expeditionary, combined arms formation optimized for dismounted operations in *complex terrain*—a geographical area consisting of an urban center larger than a village and/or of two or more types of restrictive terrain or environmental conditions occupying the same space."[47] Infantry BCTs have fewer vehicles and rely on lighter platforms such as trucks and High Mobility Multipurpose Wheeled Vehicles (HMMWVs) for mobility.

The Joint Lightweight Tactical Vehicle (JLTV) is designed to combine the protection offered by Mine Resistant Ambush Protected Vehicles (MRAPs) with the mobility of the original unarmored HMMWV. The vehicle features design improvements that increase its survivability against anti-armor weapons and IEDs. The Army plans to procure 49,099 JLTVs over the life of the program, replacing about 50 percent of the current HMMWV fleet. Requested FY 2021 funding of $894.4 million would procure 1,920 JLTVs and 1,334 trailers.[48] This is a reduction of $202 million from the amount planned just a year ago and reflects the budget pressures the Army is facing. Taking into account the 5,162 JLTVs the Army has already procured, and procuring at a rate of 1,920 vehicles per year starting in 2021, the Army will not reach its acquisition objective for the JLTV until 2043, forcing continued reliance on aging HMMWVs, which began fielding in 1983.

The Army is developing a system called Mobile Protected Firepower to provide IBCTs with the firepower to engage enemy armored vehicles and fortifications. In FY 2020, the Army is scheduled to receive 24 prototypes (12 each) from General Dynamics Land Systems and BAE for testing and evaluation.[49] A full-rate production decision is planned for the third quarter of FY 2025.[50]

Airborne BCTs are the first IBCTs to receive a new platform, the Ground Mobility Vehicle (GMV), to increase their speed and mobility. The GMV provides enhanced tactical mobility for an IBCT nine-soldier infantry squad with their associated equipment. The first GMVs

were delivered in September 2018.[51] The Army has approved "a procurement objective of 11 IBCT sets at 59 vehicles per IBCT (649 vehicles) to be completed by FY 2024."[52]

Combat Aviation Brigade. Combat Aviation Brigades are composed of AH-64 Apache attack, UH-60 Black Hawk medium-lift, and CH-47 heavy-lift Chinook helicopters. The Army has been methodically upgrading these fleets for decades.

The H-60 medium-lift helicopter acquisition objective is 2,135, which is planned to be filled by 1,375 H-60M and 760 recapitalized 60-A/L/V aircraft. The FY 2021 procurement request for the UH-60M is approximately $830.4 million, which will procure 36 aircraft (38 less than the 74 requested in FY 2020). With the FY 2021 procurement quantities, the Army will have procured 1,159 UH/HH-60Ms, or 54.2 percent of its acquisition objective of 2,135 for that aircraft.[53]

The CH-47F Chinook, a rebuilt variant of the Army's CH-47D heavy-lift helicopter, has an acquisition objective of 550 aircraft and is expected to remain the Army's heavy-lift helicopter for the next several decades, as there is no replacement on the horizon. The FY 2021 budget request of $229.6 million supports the procurement of seven aircraft, of which six will be MH-47G and one a CH-47F. With the FY 2021 procurement, the Army will have purchased 382 CH-47Fs, or 69 percent of its acquisition objective of 550.[54]

The AH-64E heavy attack helicopter has an acquisition objective of 812 aircraft, which is being satisfied by building new aircraft remanufacturing older AH-64 models. The FY 2021 procurement request of $961.5 million for remanufacturing and $69.2 million for new builds will buy 52 AH-64E aircraft. This means that the Army will have procured a total of 562 aircraft, or 69 percent of its acquisition objective of 812.[55]

Overall, the Army's equipment inventory, while increasingly dated, is well maintained. Despite high usage in Afghanistan and Iraq, because the Army deliberately undertook a "reset" plan that Congress supported with supplemental funding, most Army vehicles are relatively "young" because recent remanufacture programs for the Abrams and Bradley vehicles have extended the service lives of both vehicles beyond FY 2028.[56]

In addition to the viability of today's equipment, the military must look to the health of future equipment programs. Although future modernization programs are not current hard-power capabilities that can be applied against an enemy force today, they are a leading indicator of a service's overall fitness for future sustained combat operations. In future years, the service may be able to engage an enemy but be forced to do so with aging equipment and no program in place to maintain viability or endurance in sustained operations.

The U.S. military services are continually assessing how best to stay a step ahead of competitors: whether to modernize the force today with currently available technology or wait to see what investments in research and development produce years down the road. Technologies mature and proliferate, becoming more accessible to a wider array of actors over time.

After years of a singular focus on counterinsurgency due to the wars in Iraq and Afghanistan, followed by a concentration on the readiness of the force, the Army is now playing catch-up in the area of equipment modernization. Former Chairman of the Joint Chiefs of Staff General Joseph Dunford has stated that "[t]he U.S. military advantage over near-peer competitors is eroding,"[57] and nowhere is that more apparent than when examining U.S. Army equipment.

When the M-1 Abrams was introduced in 1980, for example, it was indisputably the world's best tank. Now, in 2020, Russia is beginning the process to export their T-14 Armata tank, which has an unmanned turret, reinforced frontal armor, an information management system that controls all elements of the tank, a circular Doppler radar, an option for a 155mm gun, and 360-degree ultraviolet high-definition cameras. The M-1 remains a great tank, but the decisive advantage that the U.S. once enjoyed has disappeared.[58]

The Army established a new four-star headquarters, Army Futures Command, to manage modernization, achieving full operational capability in July 2019.[59] Additionally, the Army established eight cross-functional teams (CFTs) to improvement the management of its top modernization priorities.[60] Army leadership—in particular the Under Secretary and Vice Chief of Staff of the Army—are devoting an extraordinary amount of time to issues of equipment modernization, but only time will tell whether the new structures, commands, and emphasis will result in long-term improvement in modernization posture. The Army aspires to develop and procure an entire new generation of equipment based on its six new modernization priorities: long-range precision fires, a next-generation combat vehicle, future vertical lift, the network, air and missile defense, and soldier lethality.

Although the Army has put in place new organizations, plans, and strategies to manage modernization, the future is uncertain. The Army has shown great willingness to make tough choices and reallocate funding toward its modernization programs. For the program years FY 2020–FY 2024, the service moved $33 billion around to fund its six modernization priorities.[61] Some are predicting that the COVID-19 pandemic, along with accompanying concerns about the federal debt, might create conditions that restrain future DOD budget growth. Still others point to the impending November 2020 election and predict that a change in Administrations could also portend a budget downturn. Formidable DOD budget challenges in the next five years include bills for nuclear deterrence programs, rising personnel costs, health care, and the need to invest in programs to respond to China's increasingly aggressive activities. The Army desperately needs time and funding to modernize its inventory of equipment.

The Army's principal modernization programs are not currently encumbered by any major problems, but there is justifiable concern about past difficulties and current status. Cancellation of the OMFV program in January 2020 was an ominous sign that the Army has not shaken off past acquisition management issues. It also probably resulted in the loss of hundreds of millions of dollars of Army buying power. Many new research and development programs have been initiated with an extraordinary amount of publicity, excitement, and oversight. Only time will tell whether this enthusiasm is well-founded.

Readiness

The Army has made considerable progress in increasing the readiness of its forces. Its goal is to have 66 percent of the Regular Army and 33 percent of National Guard BCTs at the highest levels of readiness. In March 2020, Secretary McCarthy and General McConville reported that "74 percent of Active Component Brigade Combat Teams have been at the highest levels of tactical readiness."[62] This means that 23 of the Army's 31 active BCTs were at either C1 or C2, the two highest levels of tactical readiness, and ready to perform all or most of their wartime missions immediately.[63] This is double the number of ready active BCTs compared to 2017. Army leaders have also said that "nearly half" of the Army's 58 BCTs "are at the highest levels of readiness."[64] Since we know that 23 active component BCTs are at the highest levels of readiness, we can infer that four to five of the 27 National Guard BCTs probably are as well.

As part of the $712.6 billion provided for defense overall in the FY 2020 defense appropriations bill, Congress provided much-needed relief to the Army by appropriating approximately $180 billion. This influx of resources, combined with on-time funding, has had a very positive effect on the rebuilding of readiness.[65]

In the FY 2021 budget request, training activities are relatively well resourced. When measuring training resourcing, the Army uses operating tempo full-spectrum training miles and flying hours, which reflect the number of miles that formations are resourced to drive their primary vehicles on an annual basis and the number of hours that aviators can fly their helicopters per month.[66] According to the

FIGURE 2

Army Readiness: Brigade Combat Teams

Based on historical force requirements, The Heritage Foundation assesses that the Army needs a total of 50 Brigade Combat Teams (BCTs). In addition to active-duty forces, the Army National Guard has four BCTs that operate at a high level of readiness.

The U.S. Army currently has an available force of **35 BCTs.***

Of those, **28 BCTs** are considered "ready."

An additional **15 BCTs** are needed to reach 50.
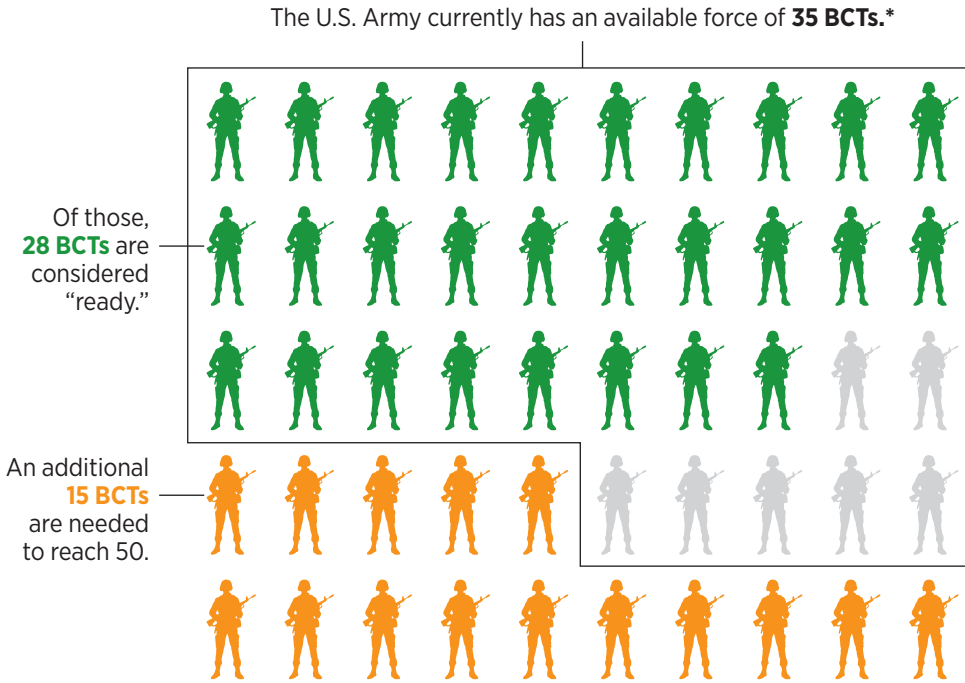
* Includes four Army National Guard BCTs.
SOURCES: The Honorable Ryan D. McCarthy, Secretary of the Army, and General James P. McConville, Chief of Staff, United States Army, statement "On the Posture of the United States Army" before the Committee on Armed Services, U.S. Senate, March 26, 2020, p. 4, https://www.armed-services.senate.gov/imo/media/doc/McCarthy--McConville_03-26-20.pdf (accessed August 19, 2020), and *Congressional Quarterly*, "House Armed Services Committee Holds Hearing on the Fiscal 2021 Budget Request for the Army," March 3, 2020, p. 7, https://plus.cq.com/alertmatch/434900672?0&deliveryId=57664418&uid=congressionaltranscripts-5851233&utm_medium=alertemail&utm_source=%E2%80%A6 (accessed August 19, 2020).

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Army's budget justification exhibits, "[t]he FY 2021 budget funds 1,598 Operating Tempo Full Spectrum Training Miles (OTFSTM) and 10.8 flying hours per crew, per month" to meet "required training readiness levels."[67] The OTFSTM is higher than resourced levels of 1,549 miles and lower than the 11.6 flying hours enacted in the FY 2020 budget.[68]

The Army reports broadly increasing readiness across all units. Part of this improvement is due to the Army's success in reducing the percentage of soldiers who are nondeployable. Nonetheless, structural readiness problems evidenced by too small a force attempting to satisfy too many global presence requirements and Operations Plan (OPLAN)

warfighting requirements will continue to challenge the Army.

As part of its Sustainable Readiness Model (SRM),[69] the Army uses Combat Training Centers (CTCs) to train its forces to desired levels of proficiency. The CTC program's mission is to "provide realistic joint and combined arms training…approximating actual combat" and increase "unit readiness for deployment and warfighting."[70] The Army requested resources for 24 CTC rotations in FY 2021, including four for the Army National Guard.[71]

Scoring the U.S. Army

Capacity Score: Weak

Historical evidence shows that, on average, the Army needs 21 Brigade Combat Teams to fight one major regional conflict (MRC). Based on a conversion of roughly 3.5 BCTs per division, the Army deployed 21 BCTs in Korea, 25 in Vietnam, 14 in the Persian Gulf War, and around four in Operation Iraqi Freedom—an average of 16 BCTs (or 21 if the much smaller Operation Iraqi Freedom initial invasion operation is excluded). In the 2010 Quadrennial Defense Review, the Obama Administration recommended a force capable of deploying 45 Active BCTs. Previous government force-sizing documents discuss Army force structure in terms of divisions and consistently advocate for 10–11 divisions, which equates to roughly 37 Active BCTs.

Considering the varying recommendations of 35–45 BCTs and the actual experience of nearly 21 BCTs deployed per major engagement, our assessment is that 42 BCTs would be needed to fight two MRCs.[72] Taking into account the need for a strategic reserve, the Army force should also include an additional 20 percent of the 42 BCTs.

Because of the investment the Army has made in National Guard readiness with the provision of extra training days and four CTC rotations, this *Index* counts four additional ARNG BCTs in the Army's overall BCT count, giving the service 35 (31 Regular Army plus four ARNG), but 35 is still not enough to meet the two-MRC construct. The Army's overall capacity score therefore remains unchanged from 2020.

- **Two-MRC Benchmark:** 50 Brigade Combat Teams.

- **Actual Projected 2020 Level:** 35 (31 Regular Army plus four ARNG) Brigade Combat Teams.

The Army's current BCT capacity meets 70 percent of the two-MRC benchmark and thus is scored as "weak."

Capability Score: Marginal

The Army's aggregate capability score remains "marginal." This aggregate score is a result of "marginal" scores for "Age of Equipment," "Size of Modernization Programs," and "Health of Modernization Programs." More detail on these programs can be found in the equipment appendix following this section. The Army scored "weak" for "Capability of Equipment."

In spite of modest progress with the JLTV and AMPV, and in spite of such promising developments as creation of Army Futures Command, CFTs, and the initiation of new Research, Development, Testing and Evaluation (RDTE) funded programs, new Army equipment programs remain in the development phase and in most cases are two to three years from entering procurement phases. Thus, they are not yet replacing legacy platforms and cannot contribute to warfighting capability today—which is what this *Index* measures. These planned procurements are highly sensitive to any turbulence or reduction in funding.

Readiness Score: Very Strong

As noted, the Army has said that "nearly half" of its 58 BCTs "are at the highest levels of readiness."[73] Four to five of those BCTs are

National Guard Brigades that have benefited from the Army's efforts to focus personnel, equipment, and training on those units, and 23 are Regular Army BCTs out of 31 that are ready (74 percent). The Army's internal requirement for Active BCT readiness is 66 percent, or 20.5 BCTs ready. Using the assessment methods of this *Index*, this results in a percentage of service requirement of 100 percent, or "very strong."

Overall U.S. Army Score: Marginal

The Army's overall score is calculated based on an unweighted average of its capacity, capability, and readiness scores. The unweighted average is 3.33; thus, the overall Army score is "marginal." This was derived from the aggregate score for capacity ("weak"); capability ("marginal"); and readiness ("very strong"). This score is the same as the assessment of the 2020 *Index*, which also rated the Army as "marginal."

U.S. Military Power: Army

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✔			
Capability			✔		
Readiness					✔
OVERALL			✔		

ARMY SCORES

1 **2** **3** **4** **5**
Weakest ⟵⟶ Strongest

Procurement and Spending ■ Through FY 2020 ▢ Pending

Main Battle Tank

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
M1A1/2 Abrams Inventory: **678/1619** Fleet age: **30.5/13.5** Date: **1980/1993** The Abrams is the main battle tank used by the Army in its armored brigade combat teams (BCTs). Its main benefits are lethality, protection, and mobility. The Abrams went through a remanufacture program to extend its life to 2045.	**3**	**4**	**Decisive Lethality Platform (DLP)** The DLP program is intended to replace the Abrams tank. This program is part of the Next Generation Combat Vehicle (NGCV) program, which is number two among the Army's "Big Six" modernization priorities. The soonest a replacement for the Abrams tank could be introduced is 2030.		

Infantry Fighting Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
M2 Bradley Inventory: **4,006** Fleet age: **20** Date: **1981** The Bradley is a tracked vehicle meant to transport infantry and provide covering fire. The Bradley complements the Abrams tank in armored BCTs. The Bradley underwent a remanufacture program to extend its life to 2045.	**3**	**3**	**Optionally Manned Fighting Vehicle (OMFV)** In March 2019, the Army issued a request for proposals to competitively build prototypes of the OMFV, but then did an about-face and cancelled the solicitation in January 2020. The Army is now redefining the requirements and intends to seek digital designs from companies in mid/late 2020. The program has likely slipped to first fieldings in 2028. This program is part of the Next Generation Combat Vehicle (NGCV) program, which is number two among the Army's "Big Six" modernization priorities.		

Armored Fighting Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Stryker Inventory: **4,859** Fleet age: **10** Date: **2001** The Stryker is a wheeled vehicle that is the main platform in Stryker BCTs. The program was considered an interim vehicle to serve until the arrival of the Future Combat System (FCS), but that program was cancelled due to technology and cost hurdles. The original Stryker is being replaced with a double-V hull configuration (DVH) to increase survivability and a 30mm gun to increase lethality. Its components allow for rapid acquisition and fielding. The Stryker is expected to remain in service for 30 years.	**4**	**4**	None		

NOTE: See page 374 for details on fleet ages, dates, and procurement spending.

1 2 3 4 5
Weakest ← → Strongest

Procurement and Spending ■ Through FY 2020 ▪ Pending

Armored Personnel Carrier

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
M113 Armored Personnel Carrier Inventory: **4,339** Fleet age: **36** Date: **1960** The tracked M113 serves in a supporting role for armored BCTs and in units above brigade level. The APC is being slowly replaced by the Armored Multi Purpose Vehicle (AMPV). Plans are to use the platform until 2045.	**1**	**2**	**Armored Multi-Purpose Vehicle (AMPV)** Timeline: **2018–TBD** The AMPV has been adapted from the Bradley Fighting Vehicle which largely allowed the program to bypass the technology development phase. The fleet will consist of five variants. The first unit is set to be equipped at the end of 2021. **PROCUREMENT** 474 2,391 **SPENDING** (*$ millions*) $2,666 $11,126	**2**	**3**

Light Wheeled Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
HMMWV Inventory: **99,800** Fleet age: **18** Date: **1985** The HMMWV is used to transport troops and for a variety of other purposes, such as serving as ambulances. The expected life span of the HMMWV is 15 years. A portion of the HMMWV fleet will be replaced by the Joint Light Tactical Vehicle (JLTV).	**2**	**1**	**Joint Light Tactical Vehicle (JLTV)** Timeline: **2015–2036** The JLTV vehicle program replaces some of the Army's HMMWVs and provides improved protection, reliability, and survivability of vehicles. This is a joint program with USMC. In June 2019, the Army approved the JLTV for full-rate production. Production is underway. The Army has been forced to reduce procurement quantities due to current budget shortfalls. **PROCUREMENT** 13,438 35,661 **SPENDING** (*$ millions*) $6,492 $19,219	**3**	**3**

NOTE: See page 374 for details on fleet ages, dates, and procurement spending.

1 2 3 4 5
Weakest ⟵——⟶ Strongest

Attack Helicopter

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
AH-64 D Apache Inventory: **381** Fleet age: **14.5** Date: **1997** The Apache is used in Combat Aviation Brigades and is the Army's attack helicopter. It can destroy armor, personnel, and material targets. The expected life cycle is about 20 years.	**2**	**3**	**AH-64E Reman** Timeline: **2010–TBD** The AH-64E Reman (short for remanufactured) is a program to remanufacture older Apache helicopters into the more advanced AH–64E version. The AH–64E will have more modern and interoperable systems and be able to carry modern munitions, including the JAGM missile. **PROCUREMENT*** 431 189 **SPENDING*** *($ millions)* $10,639 $3,986	**3**	**5**
AH-64E Inventory: **351** Fleet age: **4** Date: **2012** The AH-64E variant is a remanufactured version with substantial upgrades in powerplant, avionics, communications, and weapons capabilities. The expected life cycle is about 20 years.	**5**	**5**	**AH-64E New Build** Timeline: **2010-2027** The AH-64E New Build program produces new-build, not re-built, Apaches. The program is meant to modernize and sustain the current Apache inventory. The AH-64E has more modern and interoperable systems and is able to carry modern munitions, including the JAGM missile. **PROCUREMENT*** 79 2 **SPENDING*** *($ millions)* $2,404	**3**	**5**

* Additional procurement expected.
NOTE: See page 374 for details on fleet ages, dates, and procurement spending.

	1	2	3	4	5	
	Weakest ⟵ ⟶ Strongest					

Procurement and Spending ■ Through FY 2020 ■ Pending

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
UH-60A Black Hawk Inventory: **157** Fleet age: **35.5** Date: **1978** The UH-60A is a utility helicopter that provides air assault, aeromedical evacuation, and supports special operations. The expected life span is about 25 years. This variant of the Black Hawk is now being replaced by the newer UH-60M variant.	1	2	**UH-60M Black Hawk** Timeline: **2004–TBD** The UH-60M, currently in production, is intended to modernize and replace current Black Hawk inventories. The newer M-variant will improve the Black Hawk's range and lift by upgrading the rotor blades, engine, and computers. The UH-60M will replace both the UH-60A and the UH-60L. **PROCUREMENT*** 1,123 145 **SPENDING*** *($ millions)* $21,175 $6,650	3	5
UH-60L Black Hawk Inventory: **958** Fleet age: **14.5** Date: **1989** The UH-60L is the follow-on helicopter to the UH-60A. As the UH-60A is retired, the M-variant will be the main medium-lift rotorcraft used by the Army. They are expected to remain in service until at least 2030.	3	3	**UH-60V Black Hawk** Timeline: **2021–TBD** The Army plans to upgrade older model UH-60L to the UH-60V configuration which incorporates a digital cockpit, like one on the UH-60M. This is an Army cost-savings measure as it is cheaper to make a UH-60V from a UH-60L, than to buy a new UH-60M. The UH-60V will only replace the UH-60L.	1	4
UH-60M Black Hawk Inventory: **1,070** Fleet age: **7.5** Date: **2005** The UH-60M, currently in production, is intended to modernize and replace current Black Hawk inventories. The newer M-variant will improve the Black Hawk's range and lift by upgrading the rotor blades, engine, and computers.	5	4			

NOTE: See page 374 for details on fleet ages, dates, and procurement spending.

ARMY SCORES

	1	2	3	4	5
Weakest ← → Strongest					

Procurement and Spending: ■ Through FY 2020 ▪ Pending

Heavy Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
CH-47F Chinook Inventory: **439** Fleet age: **9** Date: **2002** The F-variant includes a new digital cockpit and monolithic airframe to reduce vibrations. It transports forces and equipment while providing other functions such as parachute drops and aircraft recovery. The expected life span is 35 years. The Army plans to use the CH-47F until the late 2030s.	5	5	**CH-47F** Timeline: **2001–TBD** Currently in production, the CH-47F program is intended to keep the fleet of heavy-lift rotorcraft healthy as older variants of the CH-47, notably the CH-47D, are retired. The program includes both remanufactured and new builds of CH-47s. The F-variant has engine and airframe upgrades to lower the maintenance requirements. Total procurement numbers include the MH-47G configuration for U.S. Special Operations Command.	3	5
MH-47G Inventory: **67** Fleet age: **9** Date: **2014** MH-47G is a special operations variant of the CH-47 Chinook multi-role helicopter used in heavy-lift missions such as the transportation of troops, ammunition, vehicles, equipment, fuel and supplies, as well as civil and humanitarian relief missions. The helicopter can conduct long-range missions at low levels and in adverse weather conditions, both during the day and at night.	5	5			

PROCUREMENT* 1,183 / 172

SPENDING* ($ millions) $1,369 / $25,517

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
MQ-1C Gray Eagle Inventory: **158** Fleet age: **4.5** Date: **2011** The Gray Eagle is a medium-altitude long-endurance (MALE) unmanned aerial vehicle (UAV) used to conduct ISR missions. The use of MALE UAVs is a new capability for the Army. The Gray Eagle is currently in production.	4	4	**MQ-1C Gray Eagle** Timeline: **2010–2022** The MQ-1C UAV provides Army reconnaissance, surveillance, and target acquisition capabilities. The Army is continuing to procure MQ-1Cs to replace combat losses.	3	5

PROCUREMENT 277

SPENDING ($ millions) $6,140 / $1

* Additional procurement expected.
NOTES: See Methodology for descriptions of scores. Fleet age is the average between the first and last year of delivery. The date is the year of first delivery. The timeline is from the first year of procurement to the last year of delivery/procurement. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E).

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U.S. Navy

Brent Sadler

The President's fiscal year (FY) 2021 budget request seeks nearly $160 billion for the U.S. Navy. This budget request seeks a balance of readiness, lethality, and capacity to provide a Navy that is "ready to fight today" while investing in the means to win future wars.[1] At the same time, working in concert with the other services and under the leadership of U.S. Indo-Pacific Command (INDOPACOM), the Navy is the primary military component of our government's efforts to ensure "a free and open Indo-Pacific," by which is meant an Indo-Pacific that is "free from coercion by other nations" and free to choose trading partners and exercise sovereignty.[2]

The demands of being a force in readiness for combat while also competing in the day-to-day great-power competition with Russia and China are placing increasing strain on the fleet. In 2000, the Navy had 318 battle force ships, and today, despite growing maritime challenges, it must meet its operational obligations with only 300. Yet the average number of ships underway since 2000 has "remained roughly constant."[3] Confronting persistent and increasingly dire maritime challenges while recovering from a series of fatal collisions in 2017 and overcoming institutional confusion caused by highly visible leadership changes, the Navy is at an inflection point.

Strategic Framework. The Navy, Marine Corps, and Coast Guard (known collectively as the sea services) have enabled the U.S. to project power across the oceans, controlling activities on the seas when and where needed. However, competitors increasingly contest U.S. maritime presence, stressing the ability of the current fleet to execute national missions and causing allies and potential security partners around the world to question the nation's reliability.

As the U.S. military's primary maritime arm, the Navy provides enduring forward global presence that enables the U.S. to respond quickly to global crises. As a result, naval forces are often the first responders, preserving and safeguarding U.S. security interests. To this end, the Navy's strategic approach has been to focus its investments in several functional areas: power projection, control of the seas, maritime security, strategic deterrence, and domain access. This approach is informed by several key documents:

- The 2017 National Security Strategy;[4]

- The 2018 National Defense Strategy (NDS);[5]

- The Global Force Management Allocation Plan (GFMAP);[6] and

- The Chief of Naval Operations (CNO) December 2019 Fragmentary Order.[7]

Significantly, the 2018 NDS directs the building of a more lethal, resilient, and agile force to deter and defeat aggression by great-power competitors across the spectrum of military operations. In recent years, this

TABLE 4

Navy Force Structure Assessment

Ship Type/Class	Current Fleet	2016 Force Structure Assessment	*Index* Recommendation*
Ballistic Missile Submarines	14	12	12
Aircraft Carriers	11	12	13
Large Surface Combatants	91	104	105
Small Surface Combatants	32	52	71
Attack Submarines	52	66	65
Guided Missile Submarines	4	0	0
Amphibious Warships	33	38	45
Combat Logistics Force	30	32	54
Command and Support	32	39	35
Total	**299**	**355**	**400**

* The recommendation for a 400-ship navy comes from Thomas Callender, "The Nation Needs a 400–Ship Navy," Heritage Foundation *Special Report* No. 205, October 26, 2018, https://www.heritage.org/defense/report/the-nation-needs-a-400-ship-navy.
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requirement has necessitated a shift to an emphasis on forward presence that ensures the Navy's positional advantage to execute sea control and denial of key maritime theaters.[8] The GFMAP specifies the global forward force presence to meet the challenges posed by our competitors.

Shortly after assuming his responsibilities as CNO, Admiral Michael M. Gilday issued a fragmentary order (FRAGO) updating the current Navy strategy. This update does not diverge from the previous Navy strategy, which focused on implementing the National Defense Strategy by supporting investments in readiness, capability, and capacity.[9] Typically, a FRAGO is a temporary update before a fuller revision is released.[10] That said, the Navy's goal remains being "ready to fight and win."[11]

However, competitors like China and Russia have studied how the U.S. military operates and have developed capabilities and implemented concepts of operations that challenge our Navy below the level of armed conflict. Too often, the fact that the U.S. does not have an effective response enables a competitor to achieve its objective, thus undermining the rules-based status quo. For the past several years, acknowledging today's reality and closing this strategic and tactical seam has been a focus of what INDOPACOM Commander Admiral Philip S. Davidson calls "win before fighting."[12] The Navy's effectiveness in this "gray zone" can contribute significantly to a free and open Indo-Pacific against malign actors that seek political objectives without firing a shot.

With this in mind, attempts to measure the capacity, capability, and readiness of the Navy increasingly must take into account metrics beyond conventional warfighting and include operational effectiveness across the spectrum

of day-to-day competition with China and Russia. For the Navy, however, conventional warfighting remains the principal factor informing its size, set of capabilities, and operational readiness. This *Index* therefore focuses on these elements as the primary criteria by which to measure U.S. naval strength:

- Sufficient **capacity** to defeat adversaries in major combat operations and provide a credible peacetime forward presence to maintain freedom of shipping lanes and deter aggression;

- Sufficient technical **capability** to sustain America's advantage against potential adversaries; and

- Sufficient **readiness** to ensure that the fleet can "fight tonight" given proper material maintenance, personnel training, and physical well-being.

Concepts of Operations. Under increasing threat from anti-ship ballistic missiles, cruise missiles, and submarines, the fleet has worked to develop countermeasures to include new concepts of operations.[13] As field testing of these concepts begins, the experience gained will significantly inform future force structure and likely be a key element in the forthcoming Integrated Naval Force Structure Assessment (INFSA) expected in the fall of 2020.

Capacity

Force Structure. The Navy measures capacity by the size of its battle force, which is composed of ships it considers directly connected to combat missions.[14] This *Index* continues the *2020 Index*'s budget-agnostic benchmark of 400 ships for the minimum manned battle force fleet. A fleet of this size is better able to maintain a global forward presence to deter potential aggressors while assuring allies and attracting maritime partners. To this end, the *Index* uses the fleet size required to handle two major wars or major regional contingencies (MRCs) simultaneously or in closely

overlapping time frames as the benchmark against which to measure service capacity.

An accurate assessment of the Navy's capacity takes into account both presence and deterrence. A 400-ship fleet can provide:

- 13 Carrier Strike Groups (CSG), with 11 operationally available and 20 percent as a strategic reserve;

- 13 carrier air wings, with a minimum of 624 strike fighter aircraft;[15]

- 15 Expeditionary Strike Groups (ESGs), requiring 38 amphibious warfare vessels under the two-MRC construct, to ensure the ability to execute two Marine Expeditionary Brigade (MEB)–level operations simultaneously;[16]

- The historical steady-state demand of approximately 100 ships constantly forward deployed in key regions around the world; and

- Sufficient capacity to maintain the Navy's ships properly and ensure that its sailors are adequately trained to "fight tonight."[17]

This benchmark represents a significant increase from the FY 2018 National Defense Authorization Act (NDAA), which specified a battle force fleet of 355 ships,[18] and the Navy's own 2016 Force Structure Assessment (FSA).[19] It is worth noting that the 2016 FSA also concluded that a 653-ship force would be necessary to address all of the demands registered in the FY 2017 Global Force Management (GFM) request but deemed this to be unrealistic given resource constraints.[20] Given such a large disparity and demands levied by the 2018 National Defense Strategy, the Navy's leadership has indicated that the next FSA (the INFSA) will address the force-level requirements of supporting concepts such as Marine Expeditionary Advance Base Operations (EABO).[21]

The need to meet growing national security needs while remaining in budget is forcing the

Navy to rethink force structure. To this end, according to Acting Secretary of the Navy Thomas Modly, CNO Gilday, and Marine Corps Commandant General David Berger, the Navy will have to incorporate more unmanned vessels and larger numbers of smaller vessels.[22]

While the 2020 INFSA has yet to be released, public statements from the Navy's leadership and evolving concepts of operations make it increasingly clear the Navy's future battle force will be composed of a mixture of manned and unmanned ships for a combined total of approximately 435 warships.[23] Given the Navy's continuing fleet readiness demands and the NDS's focus on the "reemergence of long-term strategic competition,"[24] there is a growing argument for an even larger and more capable fleet.

Shipbuilding Capacity. Over a decade, from 2007–2017, as U.S. shipbuilding capacity languished, China's navy grew by more than 27 percent to 335 warships, and its commercial shipbuilding grew by 60 percent.[25] As of March 2020, the U.S. Navy had contracted to build 79 ships with 47 ships under construction and delivery of 12 ships expected in FY 2020.[26] The FY 2021 budget includes $21 billion for the construction of eight new ships with 44 additional battle force ships and 17 unmanned ships to be purchased over the next five years in the Future Years Defense Program (FYDP).[27]

Specific to FY 2021, procurement includes one *Columbia*-class submarine and one *Virginia*-class submarine; two *Arleigh Burke* Flight III destroyers; one guided missile frigate; one LPD (amphibious transport dock) Flight II; and two towing, salvage, and rescue (T-ATS) ships.[28] In a cost-saving effort, the Navy has requested a two-ship block buy in FY 2021, which the Senate Armed Services Committee supports. Assuming that the Navy gets the required congressional authorizations, such a block purchase could be executed in October 2020.[29] Despite these acquisitions, the Navy will struggle to meet the 355-ship goal by 2034.

Larger outlays for new ship construction necessarily impose greater demands on shipyard infrastructure. The Navy's procurement of 12 ships in FY 2020 marked a significant increase in shipbuilding measured against similar outlays over the past 20 years.[30] At the same time, to keep pace with the growing workload at public shipyards facilitating nuclear warships, new hiring has increased public shipyard labor by 16 percent since 2013.[31]

On average, a large U.S. warship joins the fleet three to five years after it is purchased. Importantly, any decision regarding production, maintenance, or design alternations during this long production period can have significant implications for the delivery of needed ships. Production of nuclear-powered warships (i.e., submarines and aircraft carriers) involves particular issues of shipyard capacity. The industrial base, for example, has limited excess capacity over the next 30 years to accelerate the production of attack submarines.[32]

With respect to aircraft carriers, the FY 2019 NDAA states: "It is the sense of Congress that the United States should accelerate the production of aircraft carriers to rapidly achieve the Navy's goal of having 12 operational aircraft carriers."[33] The Congressional Research Service has argued that purchasing one new aircraft carrier every three years would enable the Navy to meet this goal by 2030;[34] however, given the time that has already passed, such a timeline may not be entirely realistic.

The Navy's FY 2020 budget request included a two-ship aircraft carrier procurement of CVN-80 and CVN-81 in FY 2020, realizing an estimated $3.9 billion in savings over buying the ships separately.[35] Under considerable bipartisan pressure, the Navy also delayed the decommissioning of USS *Truman* (CVN-75).[36] Keeping *Truman* operational involves increased operational costs and extensive shipyard refueling, necessitating an additional $16.9 million in FY 2021, $234.7 million in FY 2022, and an additional $1.3 billion in FY 2023 and FY 2024.[37] Unless the Office of the Secretary of Defense and Congress provide increased funding to the Department of the Navy beginning in FY 2021, the Navy will be forced either to make cuts in its shipbuilding plan or

to curtail the development of the new lethal technologies for which the planned savings were earmarked.

Despite congressional mandates that a fleet of 12 aircraft carriers be maintained, early indications are that Secretary of the Navy Kenneth Braithwaite will defer to DOD's Cost Assessment and Program Evaluation (CAPE) and decisions by Secretary of Defense Mark Esper with regard to the number of carriers. Unofficial reporting of an internal Pentagon study suggests that the aircraft carrier fleet could shrink to nine.[38] Adding to this, days after that report was leaked, during a commencement speech at the U.S. Naval Academy, Esper pointed to a fleet consisting of more small surface warships, to include more lightly or unmanned ships, in order to deploy a larger fleet that is more lethal and sustainable.[39] In the absence of a 2020 INFSA, it is impossible to ascertain either the validity of this proposal or how the capacity and capability required can be mitigated if the Navy is directed to implement further reductions in its aircraft carrier fleet.

Munitions. USINDOPACOM is the primary driver of the Navy's procurement of munitions. As the Combatant Command responsible for war plans in the Pacific, USINDOPACOM bases its needs on the distances and maritime nature of war in that setting, which drives requirements for the most advanced long-range munitions. Top priorities for increased procurement are Long Range Anti-Ship Missiles (LRASM); SM-6 long-range, AIM-120D medium-range, and AIM-9X short-range anti-air missiles; MK-48 torpedoes; and BGM-109 Block IV Maritime Strike Tomahawk missiles. In order to sustain the Navy forward in conflict, upgrading of storage facilities, reassessment of prepositioning, and recapitalization of sealift are required based on the evolving Pacific security environment.[40]

The relatively small numbers of key munitions being purchased raise several concerns: sufficiency of the precision-guided munitions stockpiles, the surge capacity of industry to meet demand while in conflict, and security of the supply chain.[41] Even should munitions

be staged and produced in the numbers needed, there remain serious concerns about the ability to move them and restock warships in a timely manner during conflict: a role for which sealift is critical.[42]

Manpower. The Navy assesses that end-strength manpower will need to grow by approximately 35,000 sailors to support a 355-ship Navy.[43] To improve personnel readiness and meet the demands of a growing fleet, the Navy is adding 5,100 sailors in FY 2020.[44] The proposed FY 2021 budget continues these increases in active-duty manning end strength by an additional 7,300 sailors.[45] Although the Navy is working proactively to address manning shortfalls and anticipate the demands of a growing fleet, Admiral Christopher Grady, Commander of United States Fleet Forces Command, informed Congress in February 2019 that the Navy has about 6,200 fewer sailors than it needs to meet at-sea manning requirements.[46]

After insufficient crew manning was found to be a contributing factor in the fatal USS *Fitzgerald* and USS *John S. McCain* collisions, the Navy increased the minimum required number of sailors on all ship classes between 4 percent and 14 percent, exacerbating manning shortfalls. The Navy is taking proactive approaches to meet these challenges head on by increasing the number of recruiters; focusing 70 percent of recruiting campaigns on digital platforms; reassessing some outdated recruiting policies; and offering targeted recruitment bonuses for critical Navy occupations such as nuclear power specialties, special forces (SEALs), and explosive ordnance disposal technicians.

However, the Navy faces several persistent challenges in meeting the growing demand for sailors: Only 29 percent of young adults qualify to join the military, and only 7 percent of young Americans are interested in enlisting in the Navy.[47] Despite this, the Navy has been able to make progress, reducing gapped billets from 6,500 to 4,900 over the year ending in December 2019 while meeting retention goals for all zones in 2019 and retaining 76 percent of the force.[48] Moreover, despite a three-week pause

MAP 8

Key U.S. Naval Installations

1 Joint Base Pearl Harbor-Hickham, HI
U.S. Pacific Fleet headquarters

2 Naval Base Kitsap

3 Naval Station Everett, WA

4 Naval Base San Diego and Naval Base Coronado, CA
U.S. Third Fleet headquarters

5 Naval Station Mayport, FL
U.S. Fourth Fleet headquarters

6 Naval Submarine Base King's Bay, GA

7 Naval Base Norfolk and Joint Expeditionary Base Little Creek, VA
U.S. Fleet Forces Command and U.S. Second Fleet headquarters

8 Naval Submarine Base New London, CT

9 Keflavik, Iceland—Expeditionary Maritime Operations Center

10 Naval Station Rota, Spain

11 Naval Support Activity Gaeta, Italy
U.S. Sixth Fleet headquarters

12 Naval Support Activity, Bahrain
U.S. Fifth Fleet headquarters

13 Lemonnier, Djibouti—Camp Lemonnier

14 Diego Garcia—Navy Support Facility Diego Garcia

15 Singapore—Commander Logistics Group Western Pacific

16 Buson, South Korea—Fleet Activities Chinhae Navy Base

17 U.S. Fleet Activity Yokosuka, Japan
U.S. Seventh Fleet headquarters

18 U.S. Fleet Activity Sasebo, Japan

19 Okinawa, Japan—Naval Base White Beach

20 Naval Base Guam—Navy Expeditionary Force Command Pacific headquarters

21 Darwin, Australia—Marine Rotational Force Darwin

NOTE: Fleet boundaries are approximate.
SOURCE: Heritage Foundation research.

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in recruit training caused by the coronavirus, the Navy remains confident that larger class sizes will allow it to meet its FY 2020 recruiting goal of 40,800 new sailors.[49]

Posture/Presence. To provide continual presence and readiness for the fleet, the FY 2021 budget funds each ship 58 days underway while deployed, and 24 days underway while non-deployed per quarter with an increase of 6.5 percent over last year for ship operations funding. Importantly, the FY 2021 budget increases the Flying Hour program by 5.8 percent with the objective of having squadrons combat-ready upon deployment.[50] As of July 10, 2020, of a total battle force of 300 ships, 64 (21 percent) were deployed forward, and 32 (11 percent) were being used for local operations and training.[51]

While the Navy remains committed to deploying roughly a third of its fleet at all times, it increasingly struggles to maintain this ratio. Given Combatant Commanders' requirements for naval presence, there is impetus to have as many ships forward deployed as possible by:

- **Homeporting:** The ships, crew, and their families are stationed at the port or based abroad (e.g., a CSG in Yokosuka, Japan).

- **Forward Stationing:** Only the ships are based abroad while crews are rotated out to the ship.[52] This deployment model is currently used for Littoral Combat Ships (LCS) and *Ohio*-class guided missile submarines (SSGNs) manned with rotating blue and gold crews, effectively doubling the normal forward deployment time (e.g., LCS in Singapore).

These options allow one forward-based ship to provide a greater level of presence than four ships based in the continental United States (CONUS) by offsetting the time needed to transit ships to and familiarize their crews with distant theaters.[53] This is captured in the Navy's GFM planning assumptions: a forward-deployed presence rate of 19 percent for a CONUS-based ship compared to a 67 percent presence rate for an overseas-homeported ship.[54]

Capability

A complete measure of naval capabilities requires an assessment of U.S. platforms against enemy weapons in plausible scenarios employing contemporary operational concepts. The Navy routinely conducts war games, exercises, and simulations to assess this, but insight into these assessments is limited by their classified nature. This *Index* therefore assesses capability based on remaining hull life, mission effectiveness, payloads, and the feasibility of maintaining the platform's technological edge.

Most of the Navy's battle force fleet consists of legacy platforms; of the Navy's current 20 classes of ships, only eight are in production. Investments to improve lethality comprise approximately 21 percent of the Navy's budget, with future capability at approximately 11 percent and modernization at approximately 10 percent.[55] Highlights by platform follow.

Strategic Nuclear Deterrence (SSBN). *Columbia*-class is set to relieve the aging *Ohio*-class SSBN fleet. Because of the implications of this for the nation's strategic nuclear deterrence, *Columbia*-class SSBN remains the Navy's top acquisition priorty.[56] From a purely resourcing perspective, the FY 2021 budget should ensure that the first *Columbia*-class SSBN is delivered on time for its first deterrent patrol in 2031 and that construction of a second SSBN begins in FY 2024 with serial production beginning in FY 2026.[57]

Nuclear Attack Submarines (SSN). SSNs are multi-mission platforms whose stealth enables covert intelligence collection; surveillance; anti-submarine warfare (ASW); anti-surface warfare (ASuW); special operations forces insertion and extraction; land attack strikes; and offensive mine warfare. The Navy's FY 2020 budget and shipbuilding plan reduced submarine procurement to eight Block V submarines with the Virginia Payload Module (VPM) enhancement, resulting in a reduced total Tomahawk carrying capacity of 28 missiles by 11 *Virginia*-class submarines.[58]

Despite this, the FY 2021 National Defense Authorization Act working its way through Congress includes $472 million in additional funds for advance procurement to preserve a future option to buy up to 10 *Virginia*-class submarines through FY 2023.[59]

Aircraft Carriers (CVN). The Navy has 11 nuclear-powered aircraft carriers: 10 *Nimitz*-class and one *Ford*-class. The Navy has not announced any delay in USS *Ford*'s first operational deployment in FY 2022. The second ship in the class, *John F. Kennedy* (CVN-79), christened on December 7, 2019, and launched two-months early on December 16, 2019, is 68 percent construction complete.

Large Surface Combatants. Retirement of the two oldest *Ticonderoga*-class cruisers, scheduled for FY 2020, has been deferred to FY 2021 to allow the Navy to assess the cost of maintaining them versus the increased lethality that would come from modernizing these ships.

The Navy's FY 2021 budget request procures two *Arleigh Burke*–class DDG-51 Flight III destroyers as part of a 10-ship Multi-Year Procurement (MYP), bringing the class size to 87 ships.[60] To reach the goal of 355 ships by 2034, according to the Chief of Naval Operations, the Navy plans several "class-wide service life extensions." The FY 2020 budget, for example, included $4 billion for modernization of 19 guided missile destroyers from FY 2021 through FY 2024.[61] In an effort to sustain the industrial base for these ships, the Senate Armed Services Committee's NDAA mark for the FY 2021 budget included $260 million in additional funds to procure *Arleigh Burke*–class long lead time materials.[62] On July 23, 2020, the Senate passed its version of the FY 2021 NDAA, which includes these additional funds.[63] The House version passed on July 21, 2020, does not include these funds.[64] Resolution of this difference one way or the other for FY 2021 is not likely to affect the immediate build rate of these ships.

The *Zumwalt*-class DDG-1000's primary mission is surface strike (the use of missiles to attack surface ships and possibly land targets).[65] The DDG-1000 was on track for final delivery at the end of March 2020 with continued testing to achieve Initial Operational Capability (IOC) by September 2021.[66] The DDG-1001 was commissioned on January 26, 2019, and as of March 2020 was undergoing combat system installation.[67]

Small Surface Combatants. By October 2021, beginning with USS *Montgomery* in 2019, nine Littoral Combat Ships will have deployed overseas.[68] Mission packages (MP) provide various warfighting capabilities—surface warfare (SUW); anti-submarine warfare (ASW); and mine countermeasures (MCM)—on one LCS hull form. MCM MP certification will be completed on *Independence* variants and *Freedom* variants by the end of calendar year 2020.[69] The complete mine mission packages will not reach IOC until 2022 at the earliest.

The FY 2020 budget removed planned life extensions for four mine countermeasure ships and accelerated retirement of all *Avenger*-class MCMs by FY 2023.[70] If delays occur, the Navy risks losing a certified and fully operational MCM capability beginning in FY 2023.

Instead of requesting additional Littoral Combat Ships, the Navy has focused investment on an initial contract for FFG(X) guided missile frigates in FY 2020. On April 30, 2020, the Navy awarded Fincantieri $795 million to build the lead ship at its Marinette Marine shipyard in Wisconsin based on a proven design currently in service with the French and Italian navies.[71] The FY 2021 budget supports purchase of the second ship with annual procurement beginning in FY 2023.[72]

Amphibious Ships. Commandant of the Marine Corps General David Berger issued the 38th "Commandant's Planning Guidance" in July 2019 and "Force Design 2030" in March 2020. Both documents signaled a break with past Marine Corps requests for amphibious lift, specifically moving away from the requirement for 38 amphibious ships that it had determined were necessary to support an amphibious force of two Marine Expeditionary Brigades (MEB).[73] The Commandant envisions a larger yet affordable fleet of smaller, low-signature amphibious

ships that enable littoral maneuver and associated logistics support in a contested theater.[74] The current Navy amphibious fleet remains centered on fewer large ships.

The Navy's 12 landing ships (LSDs), the *Whidbey Island*–class and *Harpers Ferry*–class amphibious vessels, are currently scheduled to reach the end of their 40-year service lives in 2025. The 13-ship LPD-17 Flight II program will replace these legacy landing ships. The *San Antonio*–class LPD-28, currently 65 percent complete, will be delivered in September 2021,[75] and the Senate Armed Services Committee NDAA mark for the FY 2021 budget includes $500 million in additional funds to procure long lead time materials for LPD-32 and LPD-33.[76] The Senate version of the FY 2021 NDAA passed on July 23, 2020, includes these additional funds; the House version passed on July 21, 2020, does not. Resolution of this difference one way or the other is not expected to affect the build rate in the immediate future.

As of July 15, 2020, the Navy had nine amphibious assault ships in the fleet: eight *Wasp*-class LHDs and the USS *America* LHA-6.[77] USS *Tripoli* (LHA-7) was delivered on February 28, 2020, and fabrication has begun on LHA-8, supporting an FY 2024 delivery.[78] The Senate Armed Services Committee NDAA mark for the FY 2021 budget included $250 million in additional funds to accelerate construction of LHA-9.[79] The Senate version of the FY 2021 NDAA passed on July 23, 2020, includes these additional funds; the House version passed on July 21, 2020, does not. How the two chambers resolve this difference could affect the Navy's ability to sustain its amphibious capacity in the wake of the July 2020 fire on USS *Bonhomme Richard*, which makes earlier delivery of the LHA-9 more important.

Unmanned Systems. Currently, the Navy does not include unmanned ships in counting its battle force size. The FY 2021–FY 2025 budget includes $12 billion for unmanned platforms, an increase of 129 percent over FY 2020 that is invested specifically in unmanned surface vessels (USV) and unmanned undersea vessels (UUV).[80] The Navy's single Medium USV (MUSV) *Sea Hunter* prototype and a second scheduled for delivery in late FY 2020 will join two Large USV (LUSV) by FY 2022 under Surface Development Squadron One (SURF-DEVRON 1)[81] to develop associated operating requirements.[82] In a show of concern, both the Senate and House Armed Services Committees' NDAA marks for the FY 2021 budget included stipulations that the Navy qualify the reliability of engines and power generators before procuring unmanned surface vessels.[83]

In 2019, the Marine Corps' Long Range Unmanned Surface Vessel conducted autonomous navigation from Norfolk, Virginia, to Cherry Point, North Carolina, during the Advanced Naval Technology Exercise-East Super Swarm Exercise.[84] Because the Marine Corps will procure three vessels to conduct further evaluation and demonstration, it is unclear how this effort aligns with similar investments in the Navy's *Sea Hunter* program.

Logistics, Auxiliary, and Expeditionary Ships. Expeditionary support vessels are highly flexible platforms consisting of two types: Expeditionary Sea Base (ESB) for prepositioning and sustaining forward operations and shallow-draft high-speed Expeditionary Fast Transport (EPF). ESB-6 and ESB-7 are planned for delivery in FY 2022 and FY 2023, respectively, and an enhanced medical capability is planned for EPF-14.[85]

The Navy's Combat Logistics Force (CLF) consists of dry-cargo and ammunition ships (T-AKE); fast combat support ships (T-AOE); and oilers (AO). The CLF provides critical support that includes at-sea replenishment that enables the Navy to sustain the fleet at sea for prolonged periods.[86] T-AO 205 is 76 percent complete, and delivery is planned for June 2021.[87] The FY 2021 budget request increases towing, salvage, and rescue (T-ATS) procurement for a total of two ships and also increases resources for CLF operations and sustainment and the acquisition of two Maritime Prepositioning Force (MPF) ships.[88]

Strike Platforms and Key Munitions. The proposed budget for FY 2021 continues the Navy's focus on developing long-range,

offensive strikes launched from ships, submarines, and aircraft, including Conventional Prompt Strike (CPS); the Maritime Strike Tomahawk (MST); the Joint Standoff Weapon Extended Range (JSOW-ER); the Long-Range Anti-Ship Missile (LRASM); and the Standard Missile-6 (SM-6).

Specifically, the budget sustains the rapid prototyping of upgraded SM-2 Block IIIC and SM-6 Block IB.[89] It also supports procurement of 155 Block V Tactical Tomahawk (TACTOM) cruise missiles, 156 Navigation/Communication upgrade kits to improve performance in A2/AD environments, and 44 Maritime Strike Tomahawk (MST) kits in addition to 48 LRASM.[90] The Senate Armed Services Committee NDAA mark for the FY 2021 budget included $26 million for 10 additional TACTOMs for a new total of 165 missiles to be purchased.[91] It also included $35 million in additional funds to procure 10 additional LRASM for a new total of 58 missiles to be purchased, in part by shifting funding from Joint Air-to-Surface Stand-off Missile (JASSM) production.[92] The Senate version of the FY 2021 NDAA passed on July 23, 2020, includes these additional funds; the House version passed on July 21, 2020, does not.

Shore-Based Anti-Ship Capabilities. Following the August 2019 U.S. withdrawal from the Intermediate-Range Nuclear Forces (INF) Treaty, new conventional strike options became viable, especially when considering the use of medium-range missiles that would have great relevance along the first island chain in any conflict with China.[93] The FY 2020 budget included $76 million to develop ground-launched cruise missiles.[94] In a sign of confidence in this capability, the Senate Armed Services Committee NDAA mark for the FY 2021 budget included $59.6 million in additional funds to procure 36 ground-based anti-ship missiles.[95] Both the House and Senate versions of the FY 2021 NDAA, passed on July 21 and July 23, 2020, respectively, include this additional funding, indicating bipartisan support for increasing the Army's role in maritime combat.

Electronic Warfare. Electronic Warfare (EW) is a critical element of successful modern warfare, the goal being control of the electromagnetic spectrum (EMS) by exploiting, deceiving, or denying its use by an enemy while ensuring its use by friendly forces. The final dedicated EW aircraft, EA-18G, was delivered in July 2019, meeting the Navy's requirement of nine carrier air wings, five expeditionary squadrons, and one reserve squadron.[96] Anticipating the EA-18G's retirement in the 2030s, the Navy has been exploring follow-on manned and unmanned systems to replace the EA-18G. In order to maintain this critical warfighting capability at capacity, however, the Navy will need to decide soon on a future platform.

Air Early Warning. The E-2D forms the hub of the Naval Integrated Control-Counter Air system and provides critical Theater Air and Missile Defense capabilities. The Navy's FY 2021 budget procures four aircraft with an additional 10 aircraft to be procured over the next two years.[97] Sustaining effective air early warning and air control of unmanned platforms remains a critical element of naval power projection.

High Energy Laser (HEL). The FY 2020 budget included $101 million for the Navy Laser Family of Systems (NLFoS).[98] The FY 2021 budget would sustain these investments with $170.3 million requested for directed energy programs.[99] A recent milestone was achieved when USS *Portland* (LPD-27) used its HEL Weapon System Demonstrator to shoot down an unmanned aerial vehicle (UAV) over the Pacific on May 16, 2020.[100]

Command and Control. The Navy has consolidated information management in the Office of the Chief Information Officer (CIO). The Navy plans to spend $4.17 billion from FY 2021–FY 2026 to bolster cyber defense and resiliency to attack.[101] Such investments are meant to prevent competitors' efforts to nullify the Navy's technological advantage or interfere in its logistic infrastructure (much of it on unclassified networks), which is especially critical during early phases of a crisis.

CHART 6

Navy Combat Ships Nearing End of Service Life

Combat Class	Ships	Average Years Until Class End of Service Life
Avenger MCM	11	1.7
Los Angeles SSN	30	3.7
Ticonderoga CG	22	9.8
Ohio SSGN	18	10.5
Seawolf SSN	3	12.8
Whidby Island LSD	8	13.3
Harpers Ferry LSD	4	15.6
Wasp LHD	8	16.6
Nimitz CVN	10	20.4
Virginia SSN	17	24.9
Arleigh Burke DDG	67	27.1
Zumwalt DDG	2	27.2
San Antonio LPD	11	30.8
Ford CVN	1	46.8

(x-axis: 0, 10, 20, 30, 40, 50)
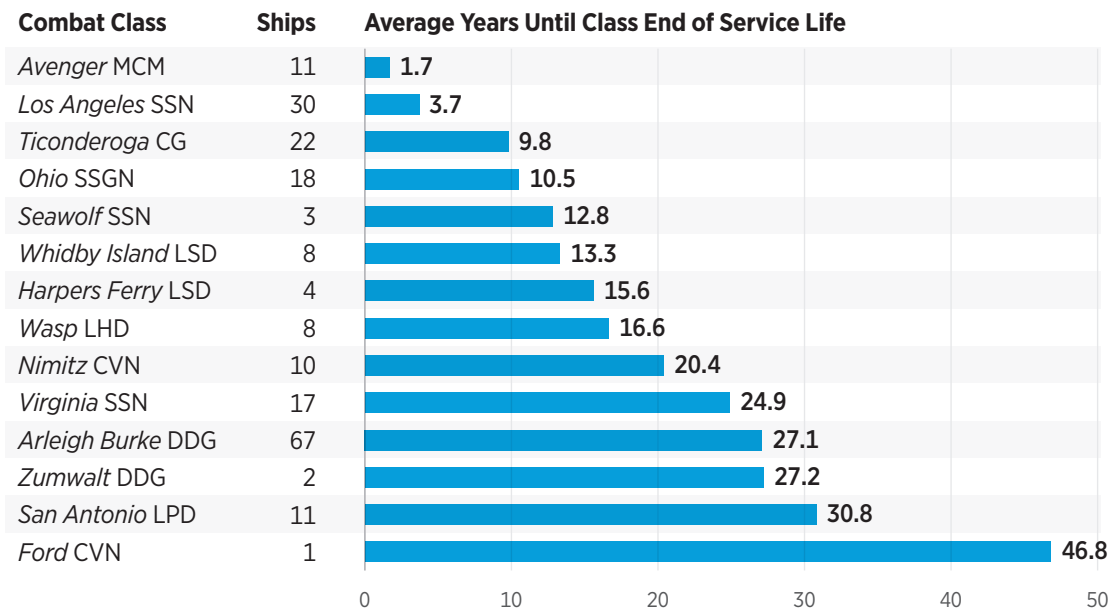
NOTE: Figures are based on calculations for October 2020.
SOURCE: Naval Sea Systems Command, Naval Vessel Register, "Fleet Size," http://www.nvr.navy.mil/NVRSHIPS/FLEETSIZE.HTML (accessed August 19, 2020).

🕿 heritage.org

Readiness

In the 1980s, the Navy had nearly 600 ships in the fleet and kept roughly 100 (17 percent) deployed at any one time. Today, the fleet numbers 300 ships, of which 92 (30.7 percent) are at sea or deployed. The commanding officer's discretion time for training and crew familiarization is a precious commodity that is made ever scarcer by the increasing operational demands on fewer ships.

FY 2019 marked the first time in over a decade that the Defense Department and the Navy did not operate under a continuing resolution for at least part of the fiscal year. Having a full fiscal year to plan and execute maintenance and operations helped the Navy continue on its path to restoring fleet readiness,

but Admiral John Richardson, Chief of Naval Operations, testified before the Senate Armed Services Committee in April 2018 that it would take until 2021 or 2022 to restore fleet readiness to an "acceptable" level and that the continued lack of "stable and adequate funding" would delay these efforts.[102] Having to begin FY 2020 under a continuing resolution introduced uncertainty again, causing the planned maintenance periods of two ships, the USS *Bainbridge* (DDG-96) and USS *Gonzalez* (DDG-66), to be postponed.[103]

Impact of COVID-19. The Navy, like the rest of the nation, was not as prepared as it should have been for the COVID-19 pandemic. The coronavirus's most visible impact on the Navy was the sidelining of the USS *Theodore*

MAP 9

Steaming Times to Areas of Vital U.S. National Interest

Steam times are approximates based on an average speed of 15 knots.
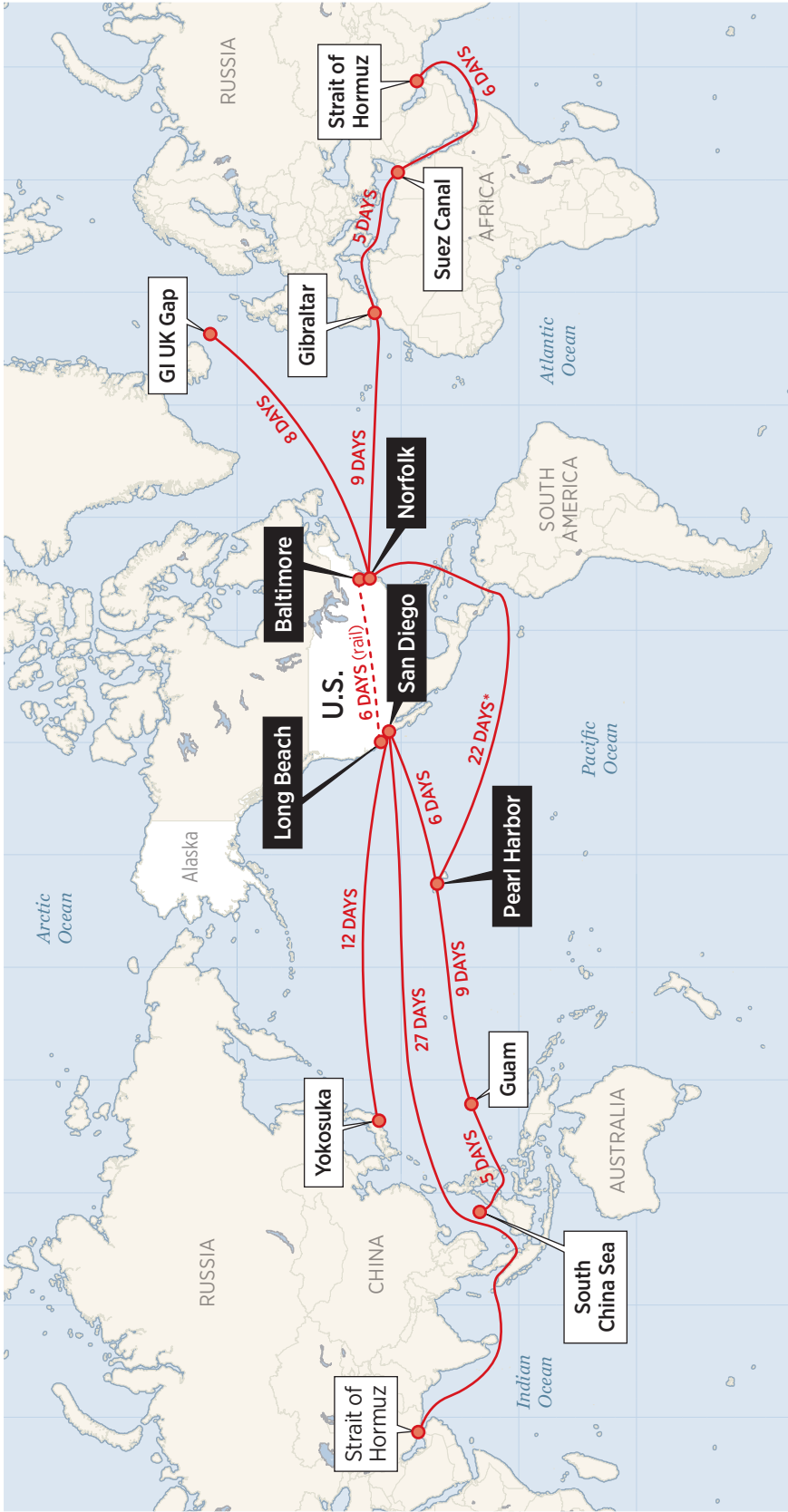
* Assumes no delay in passage through the Panama Canal.
SOURCE: Heritage Foundation research.

heritage.org

Roosevelt (CVN-71) in Guam for 55 days. As of September 23, 2020, the Navy had registered 9,930 uniformed military COVID-19 cases with one death.[104] The Navy also has scaled back the major biannual Rim of the Pacific Exercise (RIMPAC) to include only the at-sea portions of the event and has created a limited number of "safe haven" COVID-free ports where warships can call.[105]

Impacts on maintenance at the Navy's four public shipyards necessitated the activation of 1,629 reservists to backfill a quarter of the civilian workforce deemed to be at "high risk" for COVID-19.[106] Despite Navy press statements of June 2, 2020, that the *Columbia* program remains on track, its timeline has been affected, and how these reservists will mitigate those delays remains an open question.[107] As the pandemic passes, the several audits and inspector general investigations initiated following USS *Roosevelt*'s experience are expected to lead to numerous recommendations as to how the Navy can improve its resilience in responding to future pandemics.

Maintenance and Shipyard Capacity. Naval Sea Systems Command completed its Shipyard Optimization and Recapitalization Plan in September 2018.[108] To assist in its execution, on October 1, 2019, the Navy established a new office under a Deputy Assistant Secretary of the Navy for Sustainment that will align Navy and Marine Corps maintenance and modernization efforts.[109] In conjunction with implementing the $21 billion multi-year Shipyard Infrastructure Optimization Plan (SIOP), the Senate Armed Services Committee in its mark of the FY 2021 budget directed the establishment of a joint Department of the Navy–Department of Labor shipbuilding industrial base working group.[110] Improving public shipyard capacities is only just beginning, and the SIOP represents only one of several sustained efforts required.

A critical factor in assuring timely and quality warship maintenance periods at private shipyards is workload stability. For a sense of scale, as of December 2019, there were 45 ships in maintenance at private yards with 100 ships in various stages of planning for work in these shipyards. In essence, maintenance on one-half of the Navy's fleet is conducted by private shipyards.[111] The Navy has achieved some predictability by awarding multiple maintenance periods, giving shipyards a backlog of work that creates confidence in hiring and retaining a skilled workforce and making investments in infrastructure.

Training, Ranges, and Live Fires. Ship and aircraft operations and training are a critical element of fleet readiness. To this end, the Navy is seeking to expand and update instrumentation of the training range at Naval Air Station Fallon, Nevada, to enable practice with the most advanced weapon systems.[112] At the same time, core proficiency training in basic seamanship remains a priority.

During the summer of 2017, the U.S. Navy experienced the worst peacetime surface ship collisions in over 41 years when the USS *John S. McCain* (DDG-56) and USS *Fitzgerald* (DDG-62) collided with commercial vessels, claiming the lives of 17 sailors. Subsequently, the Vice Chief of Naval Operations ordered the *Comprehensive Review of Recent Surface Force Incidents*, which recommended corrective actions to address the root causes of poor operational risk management and unit readiness.[113] Concurrently, the Secretary of the Navy directed a *Strategic Readiness Review*, which made broad institutional recommendations that include (among others) the following:

- "The creation of combat ready forces must take equal footing with meeting the immediate demands of Combatant Commanders."

- "The Navy must establish realistic limits regarding the number of ready ships and sailors and, short of combat, not acquiesce to emergent requirements with assets that are not fully ready."

- "The Navy must realign and streamline its command and control structures to tightly align responsibility, authority, and accountability."

- "Navy leadership at all levels must foster a culture of learning and create the structures and processes that fully embrace this commitment."[114]

Despite the fact that the Navy implemented several maintenance and training reforms to improve fleet and aviation readiness, it will take several years of Navy leadership oversight and stable funding to ensure that sailors and platforms are returned to required readiness. It will take even longer to implement the recommendations in the *Strategic Readiness Review*'s recommendations on the institutional culture.

Scoring the U.S. Navy

Capacity Score: Weak

This *Index* assesses that a minimum of 400 battle force ships is required for the U.S. Navy to do what is expected of it. The Navy's current battle force fleet of 300 ships and intensified operational tempo combine to reveal a Navy that is much too small relative to its tasks. The result is a score of "weak," unchanged from the *2020 Index*. Depending on the Navy's ability to fund more aggressive growth options and service life extensions as identified in the FY 2020 30-year shipbuilding plan, the Navy's capacity score could fall further.

Capability Score: Marginal Trending Toward Weak

The overall capability score for the Navy remains "marginal" with downward pressure as the Navy's technological edge narrows against peer competitors China and Russia. The combination of a fleet that is aging faster than old ships are being replaced with new ships and the rapid growth of competitor navies with corresponding deployment of the most modern technologies does not bode well for U.S. naval power.

Readiness Score: Marginal Trending Toward Weak

The Navy's readiness is rated "marginal" trending toward "weak" as the Navy takes overdue readiness corrective actions that are complicated by an inadequate fleet size and overwhelmed maintenance infrastructure. Echoing the CNO, on the current trajectory relative to principal competitors (i.e., Russia and China), it will take at least until 2022 for the Navy to restore its readiness to required levels.

Overall U.S. Navy Score: Marginal Trending Toward Weak

The Navy's overall score for the *2021 Index* is "marginal" trending toward "weak." Correcting this trend will require successfully addressing several readiness and capacity bottlenecks while seeing to it that America has an operational fleet with the numbers and capabilities that it needs to counter Russian and Chinese advances in capability.

U.S. Military Power: Navy

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✔			
Capability			✔		
Readiness			✔		
OVERALL			✔		

1	2	3	4	5

Weakest ⟵⟶ Strongest

Procurement and Spending	■ Through FY 2020
	▪ Pending

Aircraft Carrier

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Nimitz-Class Aircraft Carrier (CVN-68) Inventory: **10** Fleet age: **28** Date: **1975** The *Nimitz*-class is a nuclear-powered multipurpose carrier. The aircraft carrier and its embarked carrier air wing can perform a variety of missions including maritime security operations and power projection. Its planned service life is 50 years. The class will start retiring in FY 2025 and will be replaced by *Ford*-class carriers.	3	3	**Ford-Class Aircraft Carrier (CVN-78)** Timeline: **2017–2032** Currently in production, the *Ford*-class will replace the *Nimitz*-class aircraft carriers. The *Ford*-class design uses the basic *Nimitz*-class hull form but incorporates several improvements to achieve: 33 percent higher sortie rate; a smaller crew with approximately 600 fewer sailors; two-and-a-half times greater electrical power, and more than $4 billion in life-cycle cost savings over the *Nimitz*-class	2	2
Ford-Class Aircraft Carrier (CVN-78) Inventory: **1** Fleet age: **3** Date: **2017** The *Ford*-class incorporates new technologies that will increase aircraft sortie rates, reduce manning, provide greater electrical power for future weapons systems, and decrease operating costs. Its planned service life is 50 years.	5	4			

PROCUREMENT

3

SPENDING *($ millions)*

$34,680 $18,291

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

NAVY SCORES

Large Surface Combatant

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Ticonderoga-Class Cruiser (CG-47) Inventory: **22** Fleet age: **31.5** Date: **1983** The *Ticonderoga*-class is a multi-mission battle force ship equipped with the Aegis Weapons System. While it can perform strike, anti-surface warfare and anti-submarine warfare, its primary focus is air and missile defense. Having a life expectancy of 40 years, the Navy plans to retire eight of the 22 CGs between FY 2021 and FY 2024.	②	③	**Zumwalt-Class Destroyer (DDG-1000)** Timeline: **2016–2022** The DDG-1000 was designed to be a new-generation destroyer capable of handling more advanced weapon systems for long-range strike with a hull design aimed to reduce radar detectability for its original primary mission of naval surface fire support (NSFS) . The DDG-1000 program was intended to produce a total of 32 ships, but this number reduced to three. The first DDG-1000 was commissioned in October 2016. **PROCUREMENT**　　　**SPENDING** (*$ millions*) ━━━━━　　　　　　━━━━━ 3　　　　　　　　$12,987　　$208	①	①
Zumwalt-Class Destroyer (DDG-100) Inventory: **1** Fleet age: **4** Date: **2016** The *Zumwalt*-class is multi-mission destroyer that incorporates several technological improvements, such as a stealthy hull design and integrated electric-drive propulsion system. Although it has passed sea trials, it continues to experience problems with its combat systems. The third and final ship of the class was commissioned in FY 2020.	⑤	②			
Arleigh Burke-Class Destroyer (DDG-51) Inventory: **67** Fleet age: **15** Date: **1991** The *Arleigh Burke*-class is a multi-mission guided missile destroyer featuring the Aegis Weapons System with a primary mission of air defense. The Navy plans to extend the service life of the entire class to 45 years from its original life expectancy of 35-40 years.	④	④	**Arleigh Burke-Class Destroyer (DDG-51)** Timeline: **1991–2029** DDG–51 production was restarted in FY 2013 to make up for the reduction in DDG–1000 acquisitions. Beginning in FY 2017, all DDG-51s procured will use the Flight III design, which includes the Advanced Missile Defense Radar (AMDR), a more capable missile defense radar. **PROCUREMENT**　　　**SPENDING** (*$ millions*) ━━━━━━━━━　　　━━━━━━━━ 82　　　　15　　$89,948　　$28,020	④	④

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

NAVY SCORES

Small Surface Combatant

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Littoral Combat Ship (LCS) Inventory: **19** Fleet age: **6.5** Date: **2008** The Littoral Combat Ship includes two classes: the *Independence*-class and the *Freedom*-class. The modular LCS design depends on mission packages (MP) to provide warfighting capabilities in the SUW, ASW, and MCM mission areas. The ship has an expected service life of 25 years.	**5**		**Littoral Combat Ship (LCS)** Timeline: **2009–2019** The LCS is intended to fulfill the mine countermeasure, antisubmarine warfare, and surface warfare roles for the Navy. It will be the only small surface combatant in the fleet once the Navy's MCM ships retire and until the new FFG(X) enter service.	**2**	**2**
Avenger-Class Mine Counter Measure (MCM-1) Inventory: **11** Fleet age: **28.5** Date: **1989** *Avenger*-class ships are designed as mine sweepers/hunter-killers capable of finding, classifying, and destroying moored and bottom mines. The class has an expected 30–year service life. The remaining MCMs are expected to be decommissioned throughout the 2020s. While there is no direct replacement single-mission MCM ship in production, the Navy plans to fill its mine countermeasure role with the LCS and its MCM MP.	**1**	**2**	**FFG(X)** A new program called the FFG(X) will augment the LCS program to fill out the remaining 20–ship small surface combatant requirement for a total of 52 Small Surface Combatants.		

PROCUREMENT — 33

SPENDING (*$ millions*) — $16,719 $80

SSGN Cruise Missile Submarine

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
Ohio-Class (SSGN-726) Inventory: **4** Fleet age: **37.5** Date: **1981** The SSGNs provide the Navy with large stealthy strike and special operations mission capabilities. From 2002 to 2007, the four oldest *Ohio*-class ballistic missile submarines were converted to guided missile submarines. Each SSGN is capable of carrying up to 154 Tomahawk land-attack cruise missiles and up to 66 special operations forces for clandestine insertion and retrieval. All four SSGNs will retire between FY 2026 and FY 2028. The Navy has tentative plans to replace the SSGNs with a new Large Payload Submarine beginning in FY 2036.	**2**	**4**	None		

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

NAVY SCORES

1 2 3 4 5
Weakest ←——→ Strongest

Procurement and Spending ■ Through FY 2020 □ Pending

Attack Submarines

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Seawolf-Class (SSN-21) Inventory: **3** Fleet age: **19** Date: **1997** The *Seawolf*-class is exceptionally quiet, fast, well-armed, and equipped with advanced sensors. Though lacking a vertical launch system, the *Seawolf*-class has eight torpedo tubes and can hold up to 50 weapons in its torpedo room. Although the Navy planned to build 29 submarines, the program was cut to three submarines. The *Seawolf*-class has a 33–year expected service life. They have been succeeded by the *Virginia*-class attack submarine.	3	4	**Virginia-Class (SSN–774)** Timeline: **2004–2019** The Virginia Payload Module (VPM) will be incorporated into eight of the 11 planned Block V submarines beginning in FY 2019. VPM includes four large-diameter, vertical launch tubes that can carry up to 28 additional Tomahawk missiles or other payloads.	2	3

PROCUREMENT

30   28

SPENDING *($ millions)*

$79,794 $68,285

PLATFORM	Age Score	Capability Score
Los Angeles-Class (SSN-688) Inventory: **30** Fleet age: **34** Date: **1976** The *Los Angeles*-class comprises the largest portion of the Navy's attack submarine fleet. They are multi-mission submarines that can perform covert intelligence collection, surveillance, ASW, ASuW, and land attack strike. The *Los Angeles*-class has a 33-year expected service life. The last *Los Angeles*-class submarine is expected to retire in the late 2020s and is being replaced by the *Virginia*-class.	1	3
Virginia-Class (SSN-774) Inventory: **19** Fleet age: **8** Date: **2004** The *Virginia*-class is the U.S. Navy's next-generation attack submarine. The *Virginia*-class includes several improvements over previous attack submarine classes that provide increased acoustic stealth, improved SOF support, greater strike payload capacity and reduced operating costs. The planned service life of the *Virginia*-class is 33 years. The *Virginia*-class is in production and will replace the *Los Angeles*-class and *Seawolf*-class attack submarines as they are decommissioned.	4	4

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

1 **2** **3** **4** **5**
Weakest ⟶ Strongest

Procurement and Spending ■ Through FY 2020 ▪ Pending

SSBN Ballistic Missile Submarine

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Ohio-Class (SSBN) Inventory: **14** Fleet age: **31** Date: **1981** The _Ohio_-class SSBN is most survivable leg of the U.S. military's strategic nuclear triad. The _Ohio_ SSBN's sole mission is strategic nuclear deterrence, for which it carries long-range submarine-launched ballistic missiles. The _Ohio_-class's expected service life is 42 years. The _Ohio_-class fleet will begin retiring in 2027 at an estimated rate of one submarine per year until 2039. The _Ohio_-class is being replaced by the _Columbia_-class SSBN.	**2**	**4**	**_Columbia_-Class (SSBN–826)** Timeline: **TBD** The 12-ship _Columbia_-class will replace the existing _Ohio_-class nuclear ballistic submarine force, which provides a credible and survivable sea-based strategic deterrent. The Navy's FY 2021 budget estimates total procurement cost for 12 ships to be $109.8 billion. The first patrol of the lead ship, SSBN 826, is scheduled for FY 2031. PROCUREMENT — 12 SPENDING ($ millions) — $109,800		

Amphibious Warfare Ship

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Wasp-Class Amphibious Assault Ship (LHD-1) Inventory: **8** Fleet age: **21** Date: **1989** The _Wasp_-class can support amphibious landing operations with Marine Corps landing craft via its well deck. It can also support Marine Air Combat Element operations with helicopters, tilt-rotor aircraft and Vertical/Short Take-Off and Landing (V/STOL). This ship has a planned 40–year service life.	**3**	**3**	**_America_-Class (LHA-6)** Timeline: **2004–TBD** LHA Flight 0 (LHA-6 and 7) were built without a well deck to provide more space for Marine Corp aviation maintenance and storage as well as increased JP-5 fuel capacity. LHA Flight 1 (LHA-8 and beyond) will reincorporate a well deck for increased mission flexibility. The _America_-class is in production with three LHA-6s already procured. Advance procurement for LHA-9 will begin in FY 2023. PROCUREMENT — 3 / 1 SPENDING ($ millions) — $10,640 / $3,376	**3**	**3**
America-Class Amphibious Assault Ship (LHA-6) Inventory: **1** Fleet age: **6** Date: **2014** This new class of large-deck amphibious assault ships is meant to replace the retiring _Wasp_-class LHD. LHAs are the largest of all amphibious warfare ships, resembling a small aircraft carrier. The _America_-class is designed to accommodate the Marine Corps' F-35Bs.	**5**	**4**			

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

1 2 3 4 5
Weakest ← → Strongest

Procurement
and Spending ■ Through FY 2020
■ Pending

Amphibious Warfare Ship

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
***San Antonio*-Class Amphibious Transport Dock (LPD-17)** Inventory: **11** Fleet age: **8.5** Date: **2006** The LPDs have well decks that allow the USMC to conduct amphibious operations with its landing craft. The LPD can also carry four CH-46s or two MV-22s. 11 of the planned 13 Flight I LPD-17-class ships are operational with the remaining two under construction. The class has a 40–year planned service life.	**5**		***San Antonio*-Class Amphibious Transport Dock (LPD-17)** Timeline: **2006-2017** The 13 LPD-17s are replacements for the *San Antonio*-class LPDs. Both Flight I and Flight II LPDs are multi-mission ships designed to embark, transport, and land elements of a Marine landing force by helicopters, tilt rotor aircraft, landing craft, and amphibious vehicles. **PROCUREMENT** **SPENDING** (*$ millions*) 13 $21,309 $63	**5**	**4**
***Whidbey Island*-Class Dock Landing Ship (LSD-41)** Inventory: **8** Fleet age: **31.5** Date: **1985** *Whidbey Island*-class ships were designed specifically to transport and launch four Marine Corps Landing Craft Air Cushion vehicles. They have an expected service life of 40 years. All eight ships in the class will retire between FY 2026 and FY 2033. The *Whidbey Island*-class will be replaced by LPD–17 Flight II program, which began procurement in FY 2018.	**2**	**3**	**LPD-17 Flight II** Timeline: **2025–TBD** Previously known as LX(R), the LPD–17 Flight II program will procure 13 ships to replace the Navy's LSD-type ships. The Navy originally planned to procure the first Flight II ship in FY 2020, however accelerated procurement funding enabled procurement of the first LPD-17 Flight II in FY 2018. The Navy delayed the second ship planned for FY 2020 until FY 2021. **PROCUREMENT** **SPENDING** (*$ millions*) 1 8 $2,164 $3,577	**5**	**4**
***Harpers Ferry*-Class Dock Landing Ships (LSD-49)** Inventory: **4** Fleet age: **24** Date: **1994** The *Harpers Ferry*-class reduced LCAC capacity to two while increasing cargo capacity. They have an expected service life of 40 years, and all ships will be retired by FY 2038. The LSD-49 will be replaced by the LPD–17 Flight II, which began procurement in FY 2018.	**3**				

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

1	2	3	4	5

Weakest ⟵⟶ Strongest

Procurement and Spending ■ Through FY 2020 ▪ Pending

Airborne Early Warning

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
E-2C Hawkeye Inventory: **50** Fleet age: **37** Date: **1973** The E-2C Hawkeye is a battle management and airborne early warning aircraft. The E-2C fleet received a series of upgrades to mechanical and computer systems around 2000. While still operational, the E-2C is nearing the end of its service life and is being replaced by the E-2D Advanced Hawkeye.	**1**	**3**	**E-2D Advanced Hawkeye** Timeline: **2014–2022** The E-2D Advanced Hawkeye replaces the legacy E-2C and is in production. The Navy received approval for a five-year multi-year procurement plan beginning in FY 2019 for 24 aircraft to complete the program of record.	**4**	**4**
E-2D Advanced Hawkeye Inventory: **32** Fleet age: **4** Date: **2014** The E-2D program is the next-generation, carrier-based early-warning, command, and control aircraft that provides improved battle space detection, supports theater air missile defense, and offers improved operational availability.	**5**	**4**			

PROCUREMENT

96   18

SPENDING *($ millions)*

$14,483 $3,910

Electronic Attack Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
EA-18G Growler Inventory: **158** Fleet age: **7** Date: **2009** The EA-18G Growler is the U.S. Navy's electronic attack aircraft, providing tactical jamming and suppression of enemy air defenses. The final EA-18G aircraft was delivered in FY 2018, bringing the total to 160 aircraft and fulfilling the Navy's requirement. It replaced the legacy EA-6B Prowlers.	**5**	**4**	None		

NOTE: See page 402 for details on fleet ages, dates, and procurement spending.

1 2 3 4 5
Weakest ←——→ Strongest

Procurement and Spending ■ Through FY 2020 ▪ Pending

Fighter/Attack Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
F/A-18E/F Super Hornet Inventory: **584** Fleet age: **16** Date: **2001** The F/A-18 E/F Super Hornet has longer range, greater weapons payload, and increased survivability than the F/A-18A-D Legacy Hornet. The Navy plans to achieve a 50/50 mix of two F-35C squadrons and two F/A-18E/F Block III squadrons per carrier air wing by the mid-2030s The ongoing service life extension program will extend the life of all Super Hornets to 9,000 flight hours.	**3**	**3**	**F-35C Joint Strike Fighter** Timeline: **2019–TBD** The C-variant is the Navy's fifth-generation aircraft, bringing radar-evading technology to the carrier deck for the first time. The F-35C performs a variety of missions to include air-to-air combat, air-to-ground strikes, and ISR missions. **PROCUREMENT** ▬▬▬ 118 · · · 251 **SPENDING** (*$ millions*) ▬▬▬ $19,831 · · · $30,276	**2**	**3**
F-35C Joint Strike Fighter Inventory: **28** Fleet age: **2** Date: **2019** The C-variant is the Navy's fifth-generation aircraft, bringing radar-evading technology to the carrier deck for the first time. The F-35C performs a variety of missions to include air-to-air combat, air-to-ground strikes, and ISR missions.	**5**	**4**	**F/A-18 Super Hornet** The Navy plans to buy 108 Block III Super Hornets by 2024 and modernize most of its existing Super Hornets to Block II standards. All of Block III Super Hornets will have a lifespan of 10,000 flight hours, which is 50 percent greater than that of earlier F/A-18E/F aircraft.		

NOTES: See Methodology for descriptions of scores. Fleet age is the average age of platform since commissioning. The date for ships is the year of commissioning. Inventory for aircraft is estimated based on the number of squadrons. The date for aircraft is the year of initial operational capability. The timeline for ships is from the year of first commissioning to the year of last delivery. The timeline for aircraft is from the year of first year of delivery to the last year of delivery. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E). The total program dollar value reflects the full F–35 joint program, including engine procurement. The Navy is also procuring 67 F-35Cs for the Marine Corps. Age of fleet is calculated from date of commissioning to January 2016.

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Endnotes

1. The Honorable Thomas B. Modly, Acting Secretary of the Navy; Admiral Michael M. Gilday, Chief of Naval Operations; and General David H. Berger, Commandant of the U.S. Marine Corps, statement "On Fiscal Year 2021 Department of the Navy Budget" before the Committee on Armed Services, U.S. Senate, March 5, 2020, p. 21, https://www.armed-services.senate.gov/imo/media/doc/Modly--Gilday--Berger_03-05-20.pdf (accessed July 13, 2020). Emphasis in original. See also stenographic transcript of Hearing to Receive Testimony on Posture of the Navy in Review of the Defense Authorization Request for Fiscal Year 2021 and the Future Years Defense Program, Committee on Armed Services, U.S. Senate, March 5, 2020, https://www.armed-services.senate.gov/imo/media/doc/20-14_03-05-2020.pdf (accessed July 13, 2020).

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3. Modly, Gilday, and Berger, statement "On Fiscal Year 2021 Department of the Navy Budget," March 5, 2020, p. 22.

4. *National Security Strategy of the United States of America*, The White House, December 2017, https://www.whitehouse.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf (accessed July 13, 2020).

5. James Mattis, Secretary of Defense, *Summary of the 2018 National Defense Strategy of the United States of America: Sharpening the American Military's Competitive Edge*, U.S. Department of Defense, January 2018, https://dod.defense.gov/Portals/1/Documents/pubs/2018-National-Defense-Strategy-Summary.pdf (accessed July 13 2020).

6. The Global Force Management Allocation Plan (GFMAP) is a classified document that specifies forces to be provided by the services for use by operational commanders. It is an extension of a reference manual maintained by the Joint Staff, *Global Force Management Allocation Policies and Procedures* (CJCSM 3130.06B), which is also a classified publication. See U.S. Department of Defense, Joint Chiefs of Staff, "Adaptive Planning and Execution Overview and Policy Framework," unclassified Chairman of the Joint Chiefs of Staff Guide 3130, March 5, 2019, p. B-2, https://www.jcs.mil/Portals/36/Documents/Library/Handbooks/CJCS%20GUIDE%203130.pdf?ver=2019-03-18-122038-003 (accessed July 13, 2020).

7. Admiral M. M. Gilday, Chief of Naval Operations, "FRAGO 01/2019: A Design for Maintaining Maritime Superiority," December 2019, https://www.navy.mil/cno/docs/CNO%20FRAGO%20012019.pdf (accessed July 13, 2020).

8. Modly, Gilday, and Berger, statement "On Fiscal Year 2021 Department of the Navy Budget," March 5, 2020, p. 8.

9. U.S. Navy, Office of the Chief of Naval Operations, Deputy Chief of Naval Operations (Warfare System Requirements—OPNAV N9), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels for Fiscal Year 2020*, March 2019, p. 5, https://www.secnav.navy.mil/fmc/fmb/Documents/20pres/PB20%2030-year%20Shipbuilding%20Plan%20Final.pdf (accessed July 13, 2020). Emphasis in original.

10. On March 2, 2020, the CNO announced work on a forthcoming maritime strategy that will bring together the Navy, Marine Corps, and Coast Guard. This new strategy harkens back to 2007's "A Cooperative Strategy for 21st Century Seapower" and its 2015 update, and when it is released in late 2020, it will replace the current FRAGO as the Navy's strategy. While synchronizing the naval services for a more effective economy of force, however, it must not ignore the Navy's specific challenges as articulated in the FRAGO.

11. Gilday, "FRAGO 01/2019: A Design for Maintaining Maritime Superiority," p. 1.

12. Davidson, statement before the Senate Armed Services Committee, February 12, 2019, pp. 13 and 14.

13. A leading concept is Multi-Domain and Distributed Operations, which seeks to enable U.S. forces to outmaneuver adversaries physically and cognitively, advancing the 20th century concept of combined arms into the 21st century's requirement to operate across all domains at all times. In 2018, USINDOPACOM successfully demonstrated Multi-Domain and Distributed Operations in a major exercise, progressing the concept from experimentation to validation. For the Navy's part, new concepts that emphasize a diffuse fleet presence are being developed and field tested. Principally, Distributed Maritime Operations (DMO), which aims to complicate an adversary's targeting by disaggregating the fleet, is supported in turn by the concept of Distributed Lethality, which masses fires at range from a diverse family of platforms, weapons, and axis of attack. At the same time, new Marine Corps operational concepts such Littoral Operations in a Contested Environment (LOCE) and Expeditionary Advanced Base Operations (EABO) call for smaller and more dispersed Marine units conducting missions ranging from intelligence, surveillance, and reconnaissance (ISR) to coastal defense to forward arming and refueling points (FARPs) for F-35B operations. Such dispersed expeditionary operations imply a larger number of smaller amphibious ships than the current LHA and LPD programs, possibly ranging in size from an Expeditionary Fast Transport Ship (T-EPF) to an Expeditionary Sea Base (ESB).

14. U.S. Department of Defense, Department of the Navy, Office of the Secretary, "General Guidance for the Classification of Naval Vessels and Battle Force Ship Counting Procedures," SECNAV Instruction 5030.8C, June 14, 2016, pp. 1–2, http://www.nvr.navy.mil/5030.8C.pdf (accessed July 13, 2020).

15. The full array of aircraft comprising a carrier air wing also includes one EA-18G Growler electronic attack squadron, one E-2D Hawkeye airborne early warning squadron, two SH-60 Seahawk helicopter squadrons, and one C-2 Greyhound logistics support squadron.

16. U.S. Navy, "Executive Summary: 2016 Navy Force Structure Assessment (FSA)," December 15, 2016, p. 2, http://static.politico.com/b9/99/0ad9f79847bf8e8f6549c445f980/2016-navy-force-structure-assessment-fsa-executive-summary.pdf (accessed July 13, 2020). The full FSA was not released to the public. Importantly, in July 2019, the Marine Corps cancelled the 38-amphibious ship requirement as a formal force-sizing demand for the Navy. General David H. Berger, Commandant of the Marine Corps, stated his belief that future naval warfare, and the Marine Corps' role in it, against a peer-competitor will require new types of smaller vessels that will be harder for an enemy to find and target, as well as better able to support an evolving concept of distributed naval warfare, and that can be purchased in greater quantity at a lower price per vessel. Nevertheless, the long-standing 38-ship requirement has informed Navy shipbuilding plans and remains a central factor in current ship acquisition contracts. See U.S. Department of the Navy, U.S. Marine Corps, "Commandant's Planning Guidance, 38th Commandant of the Marine Corps," p. 4, https://www.hqmc.marines.mil/Portals/142/Docs/%2038th%20Commandant%27s%20Planning%20Guidance_2019.pdf?ver=2019-07-16-200152-700 (accessed July 13, 2020).

17. Thomas Callender, *The Nation Needs a 400-Ship Navy*, Heritage Foundation *Special Report* No. 205, October 26, 2018, https://www.heritage.org/defense/report/the-nation-needs-a-400-ship-navy.

18. Ronald O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, June 3, 2020, pp. 3 and 43, https://crsreports.congress.gov/product/pdf/RL/RL32665 (accessed July 13, 2020).

19. U.S. Navy, "Executive Summary: 2016 Navy Force Structure Assessment (FSA)," p. 1.

20. Ibid., pp. 1–2.

21. The Honorable James F. Geurts, Assistant Secretary of the Navy for Research, Development and Acquisition ASN(RD&A); Vice Admiral William R. Merz, Deputy Chief of Naval Operations for Warfare Systems (OPNAV N9), and Lieutenant General David H. Berger, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, statement on "The Department of the Navy Fiscal Year 2020 Budget Request for Seapower and Projection Services" before the Subcommittee on Seapower and Projection Forces, Committee on Armed Services, U.S. House of Representatives, March 26, 2019, pp. 2–3, https://armedservices.house.gov/_cache/files/9/1/919f5faa-95da-41d8-88b9-395b063c36ee/C72CB2C30F9989D64E8C8BF8F1A18801.hhrg-116-as28-wstate-geurtsj-20190326.pdf (accessed July 13, 2020).

22. Modly, Gilday, and Berger, statement "On Fiscal Year 2021 Department of the Navy Budget," March 5, 2020, p. 9.

23. O'Rourke, "Navy Force Structure and Shipbuilding Plans," p. 8.

24. Mattis, *Summary of the 2018 National Defense Strategy of the United States of America*, p. 1.

25. Modly, Gilday, and Berger, statement "On Fiscal Year 2021 Department of the Navy Budget," March 5, 2020, p. 2.

26. The Honorable James F. Geurts, Assistant Secretary of the Navy, Research, Development and Acquisition ASN(RD&A); Vice Admiral James W. Kilby, Deputy Chief of Naval Operations, Warfighting Requirements and Capabilities (OPNAV N9); and Lieutenant General Eric Smith, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, statement on "The Department of the Navy Fiscal Year 2021 Budget Request for Seapower and Projection Forces" before the Subcommittee on Seapower and Projection Forces, Committee on Armed Services, U.S. House of Representatives, March 4, 2020, p. 3, https://www.congress.gov/116/meeting/house/110637/witnesses/HHRG-116-AS28-Wstate-GeurtsJ-20200304.pdf (accessed July 14, 2020).

27. Modly, Gilday, and Berger, statement "On Fiscal Year 2021 Department of the Navy Budget," March 5, 2020, p. 30.

28. Ibid.

29. Joe Gould, David B. Larter, and Valerie Insinna; "DoD Asks Congress for a Two-Sub Columbia-Class Buy," *Defense News*, May 13, 2020, https://www.defensenews.com/congress/2020/05/13/dod-asks-congress-for-columbia-submarine-block-buy/ (accessed July 13, 2020).

30. Geurts, Merz, and Berger, statement on "The Department of the Navy Fiscal Year 2020 Budget Request for Seapower and Projection Services," March 26, 2019, p. 3.

31. Modly, Gilday, and Berger, statement "On Fiscal Year 2021 Department of the Navy Budget," March 5, 2020, pp. 23–24.

32. The Navy's FY 2020 30-year shipbuilding plan identified opportunities to build three additional *Virginia*-class submarines over the next six years and an additional nine next-generation SSNs between FY 2037 and FY 2049. The Navy's FY 2020 budget requested three *Virginia*-class SSNs. This is the first time in over 20 years that the Navy has procured three SSNs in one fiscal year. Since the advance procurement for the third *Virginia* SSN was not included in the Navy's FY 2019 budget, construction of this third submarine will most likely not commence until FY 2023. Critical parts and equipment for this additional submarine above the planned 10-submarine block buy have not been purchased yet, and the shipyards (Electric Boat and Huntington Ingalls Industries Newport News Shipbuilding) have not planned for this submarine as part of their *Virginia*-class construction.

33. Section 123, "Sense of Congress on Accelerated Production of Aircraft Carriers," in H.R. 5515, John S. McCain National Defense Authorization Act for Fiscal Year 2019, Public Law 115-232, 115th Cong., August 13, 2018, https://www.congress.gov/115/plaws/publ232/PLAW-115publ232.pdf (accessed July 14, 2020).

34. Ronald O'Rourke, "Navy Ford (CVN-78) Class Aircraft Carrier Program: Background and Issues for Congress," Congressional Research Service *Report for Members and Committees of Congress*, updated January 21, 2020, p. 2, https://crsreports.congress.gov/product/pdf/RS/RS20643/220 (accessed July 13, 2020).

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U.S. Air Force

John Venable

The U.S. Air Force (USAF), originally part of the Army Signal Corps, became a separate service in 1947, and its mission has expanded significantly over the years. Initially, operations were divided among four major components—Strategic Air Command, Tactical Air Command, Air Defense Command, and Military Air Transport Service—that collectively reflected the Air Force's "fly, fight, and win" nature. Space's rise to prominence in the early 1950s brought a host of faculties that would expand the service's portfolio and increase its capabilities in the mission areas of intelligence, surveillance, and reconnaissance (ISR) and command and control (C2). The addition of the Space Force as the fifth uniformed service within the Department of Defense (DOD) and the global SARS-CoV-2 (COVID-19) pandemic have had a notable impact on the Air Force in the year since the *2020 Index of Military Strength* was published.

With the birth of the Space Force in December 2019,[1] the Air Force began to move its space portfolio of assets and personnel to the new service. This change will affect at least three mission areas: air and space superiority, ISR, and C2. Each of these mission areas was born from air-breathing assets, and while the loss of the space portfolio will reduce the service's inherent capabilities, they will remain within the Department of the Air Force (DOAF) and allow the Air Force to focus the weight of its efforts on the core missions within the air and cyber domains.

Today's Air Force has five principal missions:

- Air superiority (Space superiority is now the responsibility of the Space Force);

- Intelligence, surveillance, and reconnaissance;

- Mobility and lift;

- Global strike; and

- Command and control.

The summer of 2020 finds the Air Force, like the rest of DOD, dealing with and supporting national efforts to mitigate the effects of COVID-19. The pandemic has had several different and at times offsetting impacts on the service. As of August 2, 2020, the total number of COVID-19 cases in the Department of the Air Force (military, civilian, dependent, and contractor) was 7,187, and this number will certainly grow.[2] Air Force recruiting and other training pipelines like pilot training have slowed, and this has affected Air Force accessions. However, the pandemic's impact on the economy has reduced external hiring opportunities, and this should increase retention of the most experienced airmen over the next several months if not years.[3]

Day-to-day training opportunities and major exercises designed to hone readiness and deployment faculties have been reduced. DEFENDER-Europe 20, for example, which was scheduled to be the largest deployment and employment exercise in Europe since

the end of the Cold War, was truncated.[4] Sortie rates and flying hours likewise have been reduced. And all of this comes on the heels of reductions in force size and a drought in readiness from which the Air Force has been trying to recover for the past several years.

Unlike some of the other services, the Air Force did not grow larger during the post-9/11 buildup. Instead, it grew smaller as acquisitions of new aircraft failed to offset programmed retirements of older aircraft. Following the sequestration debacle in 2012, the Air Force began to trade size for quality.[5] Presidential defense budgets from 2012 through 2017 during the Obama Administration proved merely aspirational, and as the service sustained the war on terrorism, it struggled to sustain the type of readiness required to employ in a major regional contingency (MRC) against a near-peer threat.

The Air Force was forced to make strategic trades in capability, capacity, and readiness to meet the operational demands of the war on terrorism and develop the force it needed for the future. The collective effects left the Air Force of 2016 with just 55 total force fighter squadrons, and the readiness levels within those organizations was very low. Just four of the Air Force's 32 active-duty fighter squadrons were ready for conflict with a near-peer competitor, and just 14 others were considered ready even for low-threat combat operations.[6]

During a series of speeches in 2018, Air Force Secretary Heather Wilson and Air Force Chief of Staff General David Goldfein referenced a series of statistics and an in-depth study, "The Air Force We Need" (TAFWN), to convey the message that the service's capacity, capability, and readiness levels were below the requirements outlined by the 2018 National Defense Strategy (NDS).[7] TAFWN stated that the service needed to grow by 25 percent, from 312 to 386 squadrons, and its most senior leaders conveyed the need for more time in the air for its aircrews,[8] all of which required a bigger budget. The funding the service needed to acquire those weapons systems and increase readiness arrived with

the Trump Administration, which has significantly increased the DOAF's budget over the past four years.[9] Unfortunately, the Air Force has not increased aircraft acquisition in line with that funding surge, nor has it made significant or even proportional improvements in its capability or readiness levels.

Capacity

At the height of the Cold War buildup in 1987, the active-duty Air Force had an inventory of 3,082 fighter, 331 bomber, 576 air refueling, and 331 strategic airlift platforms. When the strategic reserve assets within the Air National Guard (Guard) and Air Force Reserve (Reserve) are added, the 1987 totals were 4,468 fighter, 331 bomber, 704 Air refueling, and 362 strategic airlift platforms. Following the fall of the Iron Curtain, the United States shifted from a force-sizing construct centered on great-power competition to one capable of winning two simultaneous or nearly simultaneous major regional contingencies (MRCs).

Fifteen years of trading capacity for readiness funding to further modernization has led to serious reductions in the bottom-line number of available fighter, bomber, tanker, and airlift platforms. It is projected that the active-duty Air Force will have 1,481 fighter, 122 bomber, 243 tanker, and 182 strategic airlift platforms at the end of 2020. When the strategic reserve is added, the Air Force will have a total force of 2,141 fighters, 140 bombers, 493 tankers, and 274 airlift platforms,[10] which equates to 47 percent of the fighter and bomber assets and 72 percent of the tanker and airlift assets that it possessed the last time the United States was prepared to fight a peer competitor.

Recognizing the threat from a rising China and resurgent Russia, the 2018 National Defense Strategy directed the services to prepare for a large-scale, high-intensity conventional conflict with a peer adversary. Later that same year, the Air Force released TAFWN, which conveyed the capacity and capabilities it would need to execute the NDS. Based on thousands of war-game simulations, the study assessed that the service needed, among other things,

CHART 7

Air Force Budgets, 2016–2021

IN BILLIONS OF U.S. DOLLARS

Legend (top to bottom):
- Military Construction
- Overseas Contingency Operations
- Procurement
- Research, Development, Test and Evaluation
- Military Personnel
- Operation & Maintenance

	FY 2016	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Total	$128.5	$132.2	$146.3	$155.3	$165.1	$169.1
Military Construction	$1.6	$1.8	$2.4	$1.8	$2.3	$1.4
Overseas Contingency Operations	$10	$12.3	$13.9	$14.8	$14.3	$12.7
Procurement	$25.1	$22.4	$24.7	$26	$26.8	$25.4
Research, Development, Test and Evaluation	$17.3	$19.6	$25.4	$30.9	$35.2	$37.3
Military Personnel	$28.5	$29.2	$30.7	$31.9	$34.1	$36.6
Operation & Maintenance	$46	$46.9	$49.2	$49.9	$52.4	$55.7

NOTE: FY 2021 figures are proposed.
SOURCE: Extracted from U.S. Air Force budget summaries for the years 2017 through 2021. For example: Table 1, "Air Force Budget Highlights Summary," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force Fiscal Year 2018 Budget Overview*, May 2017, p. 15, http://www.saffm.hq.af.mil/LinkClick. aspx?fileticket=m3vZOmfR368%3d&portalid=84 (accessed August 1, 2020), and Table 1, "Department of the Air Force Budget Summary," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *United States Air Force FY 2021 Budget Overview*, February 2020, p. 2, https://www.saffm.hq.af.mil/Portals/84/documents/FY21/SUPPORT_/ FY21%20Budget%20Overview_1.pdf?ver=2020-02-10-152806-743 (accessed August 1, 2020).

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one additional airlift squadron and seven additional fighter, five additional bomber, and 14 additional tanker squadrons to execute the NDS. That equates to an additional 182 fighter, 50 bomber, 210 air refueling, and 15 airlift platforms,[11] as well as $80 billion in funding to procure those platforms.[12]

Considering the shortfall conveyed in TAFWN, and assuming that funding was made available, one would expect the Air Force to increase its procurement budget and accelerate acquisition of fifth-generation offensive platforms and next-generation tanker aircraft throughout the Future Years Defense Program (FYDP) by a substantial margin. In 2017, for the first time in more than 26 years, the Department of the Air Force began to enjoy real budget growth that was not associated with a contingency.[13] Assuming the President's budget request for fiscal year (FY) 2021 is approved as submitted, the DOAF's funding will have increased by 31 percent since 2016, making this an excellent opportunity to refresh and actually increase the Air Force aircraft fleet.[14]

Since the end of FY 2018 when TAFWN was announced, however, funding for aircraft procurement has grown from $24.8 billion in FY 2019 to just $25.4 billion in FY 2021—a growth rate of 2 percent that has not even kept up with inflation. In spite of the need to recapitalize and grow the fleet, the Air Force is holding acquisition of the KC-46 steady at an average of 15 aircraft a year and actually decreasing procurement of the F-35 by 12 jets each year to compensate for the acquisition of the F15EX over the same five-year period.

The research, development, test, and evaluation (RDT&E) budget, on the other hand, has gone from 17 percent of total obligational authority in FY 2018 to 22 percent in FY 2021, rising by $10.7 billion to $37.3 billion.[15] Much of that funding is being used to develop and field the digital backbone for the Airborne Battle Management System (ABMS). The ABMS is envisioned as relying on a common digital architecture and a heavy dose of artificial intelligence to help move information, process targets, and optimize their engagement. The cost, however, has been high: The Air Force has had to forgo significant recapitalization of its fleet and hope that Congress will provide enough supplemental funding to field the capacity and capability that the service needs to execute the 2018 NDS.

To paraphrase General David Goldfein, there is no congressional lobby, no constituency for a digital highway, but there are plenty in Congress who will support Air Force weapons systems that will use it.[16] Congress, for example, added 14 F-35As to the Air Force's programmed acquisition of 48 in 2019 for a total of 62 fifth-generation fighters.[17]

A belief that congressional "adds" will overcome pending aircraft retirements[18] to field TAFWN ignores the reality of an ever-expanding political divide in Congress and extraordinary levels of national debt that will only grow worse with the COVID-19 pandemic. The idea that aircraft production lines will somehow surge to come to the rescue in a peer-level crisis may seem plausible to some, but even if Congress throws an unlimited

amount of cash at them, there would not likely be enough time to bring those weapons systems into the force to meet the scenario and timing requirements within the 2018 NDS.[19]

That said, the reduction in programmed fourth-generation fighter retirement rates, coupled with the arrival of F-35As on Air Force flight lines in Florida, Arizona, Utah, Alaska, and Vermont, has allowed the service to increase its total aircraft inventory for the second year in a row.[20] The Air Force added 53 aircraft to its roster for a projected total of 5,504 at the end of FY 2020.[21]

Previous editions of the *Index of U.S. Military Strength* have used "combat-coded" fighter aircraft within the active component of the U.S. Air Force to assess capacity. Combat-coded aircraft and related squadrons are aircraft and units with an assigned wartime mission, which means that those numbers exclude units and aircraft assigned to training, operational test and evaluation (OT&E), and other missions.

The software and munitions carriage and delivery capability of aircraft in noncombat-coded units renders them incompatible with and/or less survivable than combat-coded versions of the same aircraft. For example, all F-35As may appear to be ready for combat, but training wings and test and evaluation jets have hardware and software limitations that would severely curtail their utility and effectiveness in combat. While those jets could be slated for upgrades, hardware updates sideline jets for several months, and training wings and certain test organizations are generally the last to receive those upgrades.

Of the 5,504 manned and unmanned aircraft projected to be in the USAF's inventory at the end of FY 2020, 1,428 are active-duty fighters, and 1,011 of those are combat-coded aircraft.[22] This number includes all active-duty backup inventory aircraft as well as attrition reserve spares.[23]

The number of fighters and fighter squadrons available for deployment to contingency operations affects more than wartime readiness; it also affects retention. The constant churn of overseas deployments and stateside

TABLE 5

Precision-Guided Munitions Expenditures and Programmed Acquisitions

TOTAL MUNITIONS EXPENDED OR ACQUIRED PER YEAR

	EXPENDITURES			ACQUISITIONS			
	FY 2017	FY 2018	FY 2019	FY 2018	FY 2019	FY 2020	FY 2021*
JDAM	30,664	5,462	7,354	35,106	36,000	25,000	16,800
HELLFIRE	1,536	2,110	2,449	3,629	3,734	3,859	2,497
SDB-I/II	4,507	749	1,289	7,312	6,254	8,253	3,595
APKWS	Unknown	Unknown	Unknown	10,621	6879	3,927	10,200
JASSM–ER	360	19	16	360	360	390	400
LGB	276	373	106	0	0	0	0
TOTALS	**38,092**	**9,462**	**11,963**	**57,777**	**53,976**	**42,178**	**34,241**

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temporary duty (TDY) assignments is one of the primary reasons cited by pilots for separating from the service. This problem can be solved in two ways: by decreasing operational tempo, which is not at the discretion of the Air Force, and/or by increasing capacity. Although the Air Force has made a string of budgetary decisions *not* to increase the rate at which it builds additional capacity, it continually highlights the need to do so.[24]

Capacity also relies on the stockpile of available munitions and the production capacity of the munitions industry. The actual number of munitions within the U.S. stockpile is classified, but there are indicators that make it possible to assess the overall health of this vital area. The inventory for precision-guided munitions (PGM) was severely stressed by nearly 18 years of sustained combat operations and budget actions that limited the service's ability to procure replacements and increase stockpiles.

During the past three years, however, funding for munitions has improved significantly, and the preferred munitions inventory is starting to recover to pre-war levels.

In an effort to continue rebuilding the PGM stockpile, the Air Force will purchase 34,241 precision-guided munitions and guidance kits in FY 2021. Typically, there is a delay of 24–36 months between conclusion of a contract and delivery of these weapons, which means that munitions are often replaced three years after they were expended. (See Table 5.)

Capability

The risk assumed with capacity has placed an ever-growing burden on the capability of Air Force assets. The ensuing capability-over-capacity strategy centers on the idea of developing and maintaining a *more*-capable force that can win against the advanced fighters and surface-to-air missile systems now being

developed by top-tier potential adversaries like China and Russia, which are also increasing their capacity.

Any assessment of capability includes not only the incorporation of advanced technologies, but also the overall health of the inventory. Most aircraft have programmed life spans of 20 to 30 years based on a programmed level of annual flying hours. The bending and flexing of airframes over time in the air generates predictable levels of stress and fatigue on everything from metal airframe structures to electrical wiring harnesses.

The average age of Air Force aircraft is 30 years, and some fleets, such as the B-52 bomber, average 59 years. In addition, KC-135s comprise 87 percent of the Air Force's tankers and are over 58 years old on average. The average age of the F-15C fleet is over 36 years, leaving less than 4 percent of its useful service life remaining,[25] and that fleet comprises 56 percent of USAF air superiority platforms.[26]

The planes in the fleet of F-16Cs are almost 30 years old on average,[27] and the service has used up nearly 85 percent of their expected life span. In 2018, the Air Force announced its intent to extend the service lives of 300 F-16s through a major service life extension program (SLEP) that will allow those jets to continue to fly through 2050.[28] SLEPs lengthen the useful life of airframes, and these F-16 modifications also include programmed funding for the modernization of avionics within those airframes. However, these modifications are costly, and the added expense consumes available funding, reducing the amount the service has to invest in modernization, which is critical to ensuring future capability. Even with a SLEP, there is a direct correlation between aircraft age and the maintainability of those platforms. (See Table 6.)

The Air Force's ISR and lift capabilities face similar problems in specific areas that affect both capability and capacity. The majority of the Air Force's ISR aircraft are now unmanned aerial vehicles (UAVs). The Air Force intends to add 46 MQ-9s to its inventory by the end of 2021 for a total of 31 Reapers.[29] The service

lost an RQ-4 in 2019 and intends to reduce its inventory of these strategic reconnaissance platforms from 31 to eight in FY 2021. With an average age of 38 years, the U-2, a manned high-altitude reconnaissance aircraft, is still very much in demand and currently has no scheduled retirement date.[30]

The E-8 Joint Surveillance Target Attack Radar System (J-STARS) and the RC-135 Rivet Joint are critical ISR platforms. Each was built on the Boeing 707 platform, and the last one came off the production line 41 years ago. The FY 2020 National Defense Authorization Act directed the Air Force not to retire the E-8 until a replacement system is available. In its stead, the Air Force is working on an incremental approach for a J-STARS replacement that focuses on advanced and disaggregated sensors (a system of systems) that will require enhanced and hardened communications links. Known as the Advanced Battle Management System (ABMS),[31] it is envisioned as an all-encompassing approach to both airborne and ground Battle Management Command and Control (BMC2) that will allow the Air Force to fight and support joint and coalition partners in high-end engagements.[32]

With respect to air combat, the Active Air Force has just 105 F-15Cs left in its fleet, and concerns about what platform will fill this role when the F-15C is retired are fully justified. The Department of Defense planned to purchase 750 F-22A stealth air superiority fighters to replace the F-15C, but draconian cuts in the program of record reduced the acquisition to a total of just 183 F-22As for the Active, Guard, and Reserve force.[33]

The ability to fulfill the operational need for air superiority fighters will be further strained in the near term because of the F-22's low availability rates and a retrofit that always causes some portion of those jets to be unavailable for operational use. The retrofit is a mix of structural alterations that are required for the airframe to reach its promised service life, and the process takes six F-22s off the flight line at any given time. The retrofit is forecasted to continue through 2021.[34]

U.S. Air Force Total Aircraft Inventory (Page 1 of 3)

INCLUDES ALL ACTIVE DUTY, AIR NATIONAL GUARD, AND AIR FORCE RESERVE AIRCRAFT

Type	FY 2020					MISSION CAPABLE (MC)				FY 2021		
	Active Duty	Air National Guard	Air Force Reserve	Total Active, Guard and Reserve	Average Age in Years	MC Rate FY 2018	MC Rate FY 2019	Change	Average Daily MC Aircraft, FY 2020	Programmed Retirements	Programmed Acquistions	Estimated Total Aircraft Inventory
A010C	143	85	55	283	38	73%	71%	-1.80%	201	-44	–	239
AC130J	34	0	0	34	3	87%	86%	-0.88%	29	–	3	37
AC130U	7	0	0	7	29	87%	86%	-1.38%	6	-3	–	4
B-1B	61	0	0	61	32	52%	46%	-5.58%	28	-17	–	44
B-2A	20	0	0	20	25	61%	60%	-0.53%	12	–	–	20
B-52H	58	0	18	76	58	69%	66%	-3.27%	50	–	–	76
C-130H	2	127	42	171	29	68%	66%	-2.49%	112	-24	–	147
C-130J	109	16	10	135	10	77%	77%	0.02%	104	–	11	146
C-17A	146	50	26	222	16	83%	82%	-0.77%	183	–	–	222
CV022B	51	0	0	51	7	59%	53%	-5.55%	27	–	–	51
E003B	10	0	0	10	41	69%	74%	5.41%	7	–	–	10
E003C	1	0	0	1	36	70%	73%	3.19%	1	–	–	1
E003G	20	0	0	20	39	66%	74%	8.36%	15	–	–	20
E008C	0	16	0	16	19	67%	67%	0.36%	11	–	–	16
EC130H	11	0	0	11	46	73%	73%	0.19%	8	-1	–	10
EC130J	0	7	0	7	19	66%	57%	-8.62%	4	–	–	7
F015C	88	123	0	211	35	71%	70%	-0.95%	148	–	–	211
F015D	9	14	0	23	35	69%	72%	3.45%	17	–	–	23
F015E	218	0	0	218	27	71%	71%	0.29%	155	–	–	218

TABLE 6

U.S. Air Force Total Aircraft Inventory (Page 2 of 3)

INCLUDES ALL ACTIVE DUTY, AIR NATIONAL GUARD, AND AIR FORCE RESERVE AIRCRAFT

Type	FY 2020					MISSION CAPABLE (MC)				FY 2021		
	Active Duty	Air National Guard	Air Force Reserve	Total Active, Guard and Reserve	Average Age in Years	MC Rate FY 2018	MC Rate FY 2019	Change	Average Daily MC Aircraft, FY 2020	Programmed Retirements	Programmed Acquistions	Estimated Total Aircraft Inventory
F016C	443	288	52	783	29	70%	73%	2.97%	571	–3	–	780
F016D	104	45	2	151	29	66%	70%	4.37%	106	–	–	151
F022A	166	20	0	186	12	52%	51%	-1.43%	94	–	–	186
F035A	250	20	0	270	4	50%	62%	11.60%	166	–	56	326
HC130J	19	12	0	31	5	81%	80%	-1.19%	25	–	3	34
HC130N	0	3	0	3	25	61%	68%	7.13%	2	–	–	3
HH060G	60	23	15	98	29	71%	66%	-4.80%	65	-27	–	71
HH060W	0	0	0	0	0	–	–	–	–	–	7	7
KC010A	59	0	0	59	35	80%	79%	-0.90%	47	-16	–	43
KC046A	40	12	0	52	1	n/a	63%	0.00%	33	–	16	68
KC135R	116	140	74	330	58	73%	73%	-0.50%	239	-13	–	317
KC135T	25	24		49	59	74%	71%	-2.89%	35	–	–	49
LC130H	0	10	0	10	34	45%	40%	-4.72%	4	–	–	10
MC012W	29	0	0	29	9	100%	100%	0.00%	29	–	–	29
MC130H	16	0	0	16	31	68%	69%	0.65%	11	–	–	16
MC130J	46	0	0	46	5	79%	78%	-1.46%	36	–	4	50
MQ001B	7	0	0	7	12	92%	100%	7.52%	7	–	–	7
MQ009A	245	24	0	269	6	90%	89%	-0.68%	240	–	46	315
OC135B	2	0	0	2	57	65%	82%	17.46%	2	–	–	2

TABLE 6

U.S. Air Force Total Aircraft Inventory (Page 3 of 3)

INCLUDES ALL ACTIVE DUTY, AIR NATIONAL GUARD, AND AIR FORCE RESERVE AIRCRAFT

| | FY 2020 | | | | | MISSION CAPABLE (MC) | | | | FY 2021 | | |
Type	Active Duty	Air National Guard	Air Force Reserve	Total Active, Guard and Reserve	Average Age in Years	MC Rate FY 2018	MC Rate FY 2019	Change	Average Daily MC Aircraft, FY 2020	Programmed Retirements	Programmed Acquisitions	Estimated Total Aircraft Inventory
RC135S	3	0	0	3	57	79%	90%	11.39%	3	–	–	3
RC135U	2	0	0	2	54	83%	91%	8.07%	2	–	–	2
RC135V	8	0	0	8	55	71%	74%	3.10%	6	–	–	8
RC135W	12	0	0	12	56	60%	69%	9.49%	8	–	–	12
RQ004B	31	0	0	31	8	74%	76%	1.75%	23	–20	–	11
T001A	178	0	0	178	25	59%	61%	1.51%	108	–	–	178
T038A	53	0	0	53	53	73%	74%	1.48%	39	–	–	53
T038C	442	0	0	442	52	61%	63%	2.05%	279	–	–	442
U2	31	0	0	31	28	77%	78%	1.00%	24	–	–	31

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 1, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/June2020_FullIssue5.pdf (accessed August 1, 2020).

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The Air Force's number-one acquisition priority remains the F-35A, the next-generation fighter scheduled to replace all legacy multirole and close air support aircraft. The jet's full operating capability (FOC) was delivered in early 2018.[35] The rationale for the Air Force's planned acquisition of 1,763 aircraft is to replace every F-117, F-16, and A-10 aircraft on a one-for-one basis.[36] The F-35A's multirole design favors the air-to-ground mission, but its fifth-generation faculties will also be dominant in an air-to-air role, allowing it to augment the F-22A in many scenarios.[37] Heritage analysis has identified a requirement for a total of 1,260 F-35s, and the Air Force should reduce the program to that level and accelerate the rate at which it acquires those platforms.[38]

A second top acquisition priority is the KC-46A air refueling tanker. The KC-46 has experienced a series of delays, the most recent of which involves the air refueling system that currently cannot refuel operational fighters. The Air Force will have 52 KC-46s (40 active and 12 in the Guard) by the end of FY 2020 and will receive 16 more in FY 2021 for a total of 68 on the ramp by the end of FY 2021.[39] The plan is to acquire the remaining 111 tankers for a total of 179 by the end of FY 2028. The KC-46 will replace less than half of the current tanker fleet and will leave the Air Force with over 200 aging KC-135s (already averaging 58 years old) that still need to be recapitalized.[40]

The third major USAF acquisition priority is the B-21 Raider, formerly called the Long-Range Strike Bomber (LRSB). The USAF awarded Northrop Grumman the B-21 contract to build the Engineering and Manufacturing Development (EMD) phase, which includes associated training and support systems and initial production lots. The program completed an Integrated Baseline Review for the overall B-21 development effort as well as the jet's Preliminary Design Review. The Air Force is committed to a minimum of 100 B-21s at an average cost of $564 million per plane.[41]

With the budget deal that was reached for FY 2018 and FY 2019, the Secretary of the Air Force announced the service's intent to retire all B-1s and B-2s and sustain a fleet comprised of 100 B-21s and 71 B-52s.[42] The B-21 is programmed to begin replacing portions of the B-52 and B-1B fleets by the mid-2020s.[43] In the interim, the Air Force continues to execute a SLEP on the remaining fleet of B-1s in the inventory to restore the bomber's engines to their original specifications. The Air Force currently has 61 B-1s, but the current state of repair of 17 of those jets is so poor that the Air Force has conveyed its intent to retire them in FY 2021.[44] The Air Force plans to modernize the B-2's Defense Management System, Stores Management Operational Flight Program, and Common Very-Low-Frequency/Low Frequency Receiver Program to ensure that this penetrating bomber remains viable in highly contested environments, keeping it fully mission capable until it is replaced by the B-21.

Modernization efforts for the B-52 are also underway. The jet was designed in the 1950s, and the current fleet entered service in the 1960s. The FY 2018 budget funded the re-engineering of this fleet, and the aircraft will remain in the inventory through 2050.

When the Secretary of the Air Force and the Chief of Staff rolled out the Air Force's plan to expand the number of squadrons from 312 to 386, one of the stated elements of that campaign was to fill the ranks of those new squadrons with only the newest generation of aircraft—F-35s, B-21s, and KC-46s—because of the capabilities that those platforms bring to bear.[45] Curiously, the Air Force is now acquiring the fourth-generation F-15EX, based primarily on projected operating cost savings, to increase fighter capacity.[46] Although the service will certainly increase its numbers with that approach, the capability of the F-15X system will not be survivable in the high-threat environment in which deployed assets will be required to fight by the time that fielding has been completed. Thus, the Air Force is using precious acquisition dollars to buy an aircraft of rather limited utility.

Readiness

The 2018 National Defense Strategy's focus on peer-level war was designed to bring a clear and rapid paradigm shift away from the tiered levels of readiness the Air Force had adopted because of years of relentless deployments and funding shortfalls. In a move that would refine the service's focus on great-power competition as spelled out by the new NDS, Secretary of Defense James Mattis directed the Air Force to increase the mission-capable rates of the F-16, F-22, and F-35 aircraft to 80 percent by the end of September 2019.[47] The move was designed to make more of an all-too-small fleet of combat aircraft available to deploy in numbers required to deter or defeat a peer adversary.

Early in 2019, General Goldfein stated that the service would likely not meet the 80 percent mission-capable (MC) threshold directive until 2020, and in the spring of 2020, he made it clear that the threshold was no longer a focus for the Air Force. MC rates are a measure of how much of a certain fleet is "ready to go" at a given time, and the general stated in clear terms that he felt they were an inaccurate portrayal of the service's overall health. Instead of using that historic marker for readiness, the service wants to highlight how deployable the fleet is within a short period of time.[48]

The service is focusing on the number of "force elements"— fighters, bombers, and tankers—that it has across all of the Air Force and how quickly those forces need to be ready. One of the examples that Goldfein used was the rapid deployment of a "task force" of four B-52s to the Middle East in May 2019.[49] The bombers, from Barksdale Air Force Base, Louisiana, had two days to deploy and immediately began to fly combat missions even though the B-52 fleet had a mission-capable rate of 65.73 percent at the time. While the ability to prepare and then deploy four of 58 bombers rapidly is a capability, it may be more in line with responding to a regional contingency than it is with the capacity requirements spelled out in the 2018 NDS.

In the USAF's official FY 2020 posture statement, Secretary Wilson and Chief of Staff Goldfein said that more than 90 percent of the "lead force packages" within the service's 204 "pacing squadrons" are "ready to 'fight tonight.'" They went on to say that those "pacing squadrons are on track to reach 80% readiness before the end of Fiscal Year 2020."[50] They were unable to declare that pacing squadrons had actually achieved that level of readiness, saying only that pacing squadron mission-capable rates had increased and that the Air Force was continuing its efforts to improve MC rates across the entire fleet.[51]

The definitions for "pacing unit" and "pacing squadrons" are somewhat elusive. Assuming that a pacing squadron is an operational unit that is fully qualified and ready to execute its primary wartime mission (C1), one is still left wondering what the "lead force packages" within those 204 pacing/mission-ready units are and what the limits on the remaining portions of those units might be. Taken together, these statements imply that only portions of the Air Force's combat-coded squadrons are currently qualified to execute the unit's primary wartime mission.

In 2017, the Secretary of the Air Force and the Chief of Staff informed Congress that "[w]e are at our lowest state of full spectrum readiness in our history."[52] In the three years since their testimony, DOD has stifled open conversation or testimony about readiness, limiting the Air Force's ability to be forthcoming with open-source readiness indicators. While this makes any assessment of readiness difficult, there are three areas that can support an assessment: MC rates, aircrew training, and deployability.

MC rates are defined as the percentage of aircraft possessed by a unit that are capable of executing the unit's mission set. Several factors drive MC rates, but two are common to mature systems: manning and operations and maintenance (O&M) funding. Taken together, they dictate the number of sorties and flight hours that units have available for aircrew training. Multiplying the MC rates by the actual number

TABLE 7

Maintenance Manning

Skill Level	2018	2019
Apprentice: 3-level	117%	118%
Journeyman: 5-level	91%	96%
Craftsman: 7-level	97%	101%
Leadership: 9-level	99%	99%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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of aircraft within a particular fleet yields the actual operational capacity of that capability.

There are 186 F-22As in the Total Aircraft Inventory (TAI), but 28 are dedicated trainers, and 16 are primary development aircraft inventory (used for testing new equipment). In 2019, the F-22A had an MC rate of 50.57 percent, which means that there were just 71 F-22As that could be committed to combat at any given time.[53] The last time the United States was prepared to fight a peer competitor, the Air Force had more than 700 F-15C air superiority fighters with an MC rate of more than 80 percent for that fleet. If just 500 of them were combat coded, more than 400 mission-capable jets were ready to fight the Soviet Union. While the F-22A is an incredibly capable fighter and 71 F-22s would be a formidable capability against a regional threat, numbers are critical to winning a peer fight, particularly for offensive platforms, and 71 would not be sufficient for a peer-level fight.

There are 36 operational B-1s in the Lancer fleet,[54] and with an MC rate of 46 percent, 17 are available for combat at any given time during the year. The small size of the B-2 fleet, coupled with its 60 percent MC rate, means that, on average, just 12 are combat capable. If the B-52 operational fleet and its mission-capable rate of 66 percent are added, there were just 68 bombers in the Air Force inventory that were capable of executing combat missions on any given day in 2019.

Maintenance manning is now healthy across the board (see Table 7), but the pilot shortage shows no signs of abatement. In March 2017, Lieutenant General Gina M. Grosso, Air Force Deputy Chief of Staff for Manpower, Personnel, and Services, testified that at the end of FY 2016, the Air Force had a shortfall of 1,555 pilots across all mission areas (608 Active, 653 Air National Guard, and 294 Reserve). Of that total, the Air Force was short 1,211 fighter pilots (873 Active, 272 Air National Guard, and 66 Reserve).[55]

The numbers continued to fall, and at the end of FY 2017, the Air Force was short more than 2,000 pilots. Today, the total Air Force has a shortfall of 2,100 pilots (950 Active, 650 Air National Guard, and 500 Reserve) of a total requirement of 20,850 pilots.[56] The ability of the Air Force to recover from that shortfall will depend on how well the service addresses several major issues, especially the available number of pilot training slots, an area in which it appears that some progress is being made.

In FY 2018, the Air Force graduated 1,200 pilots; it added 1,279 in FY 2019 and projects that it will graduate 1,200 in 2020 (down from 1,480 because of the impact of COVID-19).

TABLE 8

Mission-Capable Combat-Coded Fighters in the Active-Duty Air Force

	Combat-Coded Fighters	Average Age	FY 2019 Mission-Capable Rate	Mission-Capable Combat-Coded Fighters
A-10C	116	37	0.71	82
F-15C	105	35	0.70	74
F-15E	158	27	0.71	112
F-16C	406	29	0.72	292
F-22A	133	13	0.51	68
F-35A	94	4	0.62	58
TOTALS	**1,011**			**679**

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 2, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept. 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/June2020_Fullissue5.pdf (accessed August 2, 2020).

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Those projected numbers rely on a graduation rate of nearly 100 percent for every pilot training class, and the service is already close to that mark.

Near-perfect graduation rates imply one or more of three things:

- The course of instruction is sufficiently easy that all students are able to pass;

- All students are so good that they are able to pass even when the standards demanded by air combat in the modern age are very high; or

- Because the service needs pilots, some students are graduated even if they have not met standard.

In 2016, the graduation rate was 93 percent; in 2017, it was 98 percent; and in 2018, it was 97 percent.[57] The expectation of high graduation rates during years of significant pilot shortfalls runs the risk of compromising quality for quantity. It is hard to fathom how the pilot production pipeline is going to ensure that all of those who earn their wings will be as competent and capable as they need to be in the years ahead. The graduation rate fell to a "more healthy" 93.5 percent in 2019, but the rationale for that number was not released.[58]

Throughout the pilot shortage, the Air Force has done an excellent job of emphasizing operational manning instead of placing experienced fighter pilots at staffs and schools, but the currency and qualifications of the pilots in operational units are at least as important as manning levels. Although the quality of sorties is admittedly subjective, a healthy rate of three sorties a week and flying hours averaging more than 200 hours a year have been established as "sufficient" over more than six decades of fighter pilot training. In the words of General Bill Creech, "Higher sortie rates mean increased

proficiency for our combat aircrews,"[59] and given the right number of sorties and quality flight time, it takes seven years beyond mission qualification in a fighter for an individual to maximize his potential as a fighter pilot.[60]

As the Air Force recovers from an 18-year drought in training for combat with a near-peer competitor, it will take even highly experienced fighter pilots another year of training to master the skill sets required to dominate the air against a near-peer competitor in a high-threat environment. Because squadrons have a mix of experience and talent levels, it will take several more years of robust training for the roster of operational fighter squadrons to be fully ready for a high-end fight.

While the Air Force has made significant strides in sortie production since 2014, low fighter mission-capable rates still prevent pilots from meeting the thresholds of three sorties a week and 200 hours a year per pilot. Moreover, to the extent that the Air Force lacks available aircraft, it will remain unable to train pilots to those thresholds. (For a summary of the mission-capable rates for combat-coded (operational) aircraft of the five fighter weapons systems, see Table 8.)

As noted, the primary drivers for mission-capable rates are maintenance manning and O&M funding. Maintenance manning has been healthy for more than three years, and O&M funding has risen by 16 percent since 2017, but flying hours across the fleet of fighters have increased by just 9 percent over that same period. USAF leadership has not increased the flying hour budget for FY 2021 because of an assessment that the Air Force is flying at the maximum executable levels.[61] This calls into question how well maintenance is organized to generate those sorties.

The sortie production recovery that took place at the end of the hollow-force days of the Carter Administration happened while levels of maintenance experience and inventories of spare parts were still low and well before the Reagan Administration's increase in defense spending.[62] The maintenance organization that created that turnaround was changed in 1989 to "save money by reducing maintenance staffing, equipment and base level support,"[63] which may help to explain the lackluster performance. No matter what the rationale may be, even with robust manpower and funding, flying hours and sortie rates are still short of the levels required for a rapid increase in readiness levels across the fighter force.

Flying hours for the average Air Force fighter pilot have increased by 8 percent since 2017 even though overall funding has increased by over 30 percent. Fighter pilots received an average of 13.0 hours per month in 2017, 12.9 hours per month in 2018, and 14.1 hours per month in 2019.[64] (See Table 9.)

The average combat mission-ready (CMR) pilot assigned to a combat-coded (operational) unit received just 14.6 hours and 7.5 sorties a month in 2019,[65] which is down from 2018. While there have been no indications that COVID-19 adversely affected flying hours, sortie rates, or readiness during the first five months of 2020, many months of weathering this virus lie ahead. (See Table 10.)

Deployability. Because of limitations on support equipment and aircraft availability due to long-term inspections and depot-level work, it takes three active-duty squadrons to deploy two squadrons forward. For that reason, up until the end of the Cold War, the Air Force organizational structure was based on a three-squadron wing. On any given day, units have several aircraft that are not flyable because of long-term inspections, deep maintenance, or the need for spare parts. By using aircraft from one of the three squadrons to "plus up" the others, the wing could immediately deploy two full-strength units into combat. The handful of fully flyable jets and pilots left at the home station were then used to train new and inbound pilots up to mission-ready status so that, among other things, they could replace pilots that were lost during combat.[66]

Normal fighter squadron manning levels are based on a ratio of 1.25 aircrew members for every aircraft,[67] which means that a unit with 24 assigned aircraft should have 30 line pilots and five supervisor pilots who are

TABLE 9

Average Hours All Fighter Pilots Received a Month

FLYING HOUR AVERAGES INCLUDE LINE PILOTS AND SUPERVISORS IN ALL
OPERATIONAL, TRAINING, AND TEST & EVALUATION SQUADRONS

	2017	2018	2019	Change, 2018 to 2019
F-22	10.8	10.8	10.7	−1%
F-35A	10.4	10.4	14.7	41%
F-15C	10.5	10.5	11.8	13%
F-16C	12.2	12.2	12.2	0%
F-15E	18.3	18.3	20.6	13%
A-10	15.1	15.1	16.5	9%
All Jets	13.0	12.9	14.1	10%
Average Hours/Year	155.4	154.6	169.4	10%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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TABLE 10

Average Flying Hours All Fighter Line Pilots Received a Month

FLYING HOUR AVERAGES INCLUDE LINE PILOTS (ONLY) IN ALL OPERATIONAL,
TRAINING, AND TEST & EVALUATION SQUADRONS

	2017	2018	2019	Change, 2018–2019
F-22	11.7	12.8	10.9	−15%
F-35A	10.6	12.4	15.0	21%
F-15C	10.5	13.1	11.8	−10%
F-16C	11.9	15.5	12.5	−19%
F-15E	19.1	20.3	21.3	5%
A-10	16.7	23.0	16.9	−27%
All Jets	13.2	16.1	14.6	−9%
Average Hours/Year	159	193	175	−9%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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TABLE 11

Average Sorties All Fighter Pilots Received a Month

FOR LINE PILOTS AND SUPERVISORS IN ALL OPERATIONAL, TRAINING, AND TEST AND EVALUATION SQUADRONS

	2017	**2018**	**2019**	**Change, 2018–2019**
F-22	6.4	6.4	7.2	12%
F-35A	6.6	6.6	6.5	–1%
F-15C	7.0	7.0	6.7	–5%
F-16C	7.4	7.4	7.4	0%
F-15E	7.9	7.9	7.7	–3%
A-10	7.1	7.1	7.5	6%
All Jets	7.2	7.2	7.2	1%
Average Sorties/Year	86.5	86.2	87.0	1%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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TABLE 12

Average Flying Hours and Sorties Line Combat Mission Ready Fighter Pilots Received a Month in 2019

HOUR AND SORTIE AVERAGES INCLUDE LINE PILOTS (ONLY) IN OPERATIONAL SQUADRONS (ONLY)

	Hours	**Sorties**
F-22	11.0	7.4
F-35A	15.4	6.7
F-15C	11.9	6.8
F-16C	12.7	7.6
F-15E	21.7	8.0
A-10	16.9	7.7
All Jets	14.6	7.5
Average Sorties/Year	174.7	89.9

NOTE: This is the first year the Air Force has provided Line operational fighter pilot hours and sorties.
SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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TABLE 13

Average Sorties All Line Fighter Pilots Received a Month by Aircraft

	2017	2018	2019	Change, 2018–2019
F-22	6.3	4.5	7.3	62%
F-35A	6.5	7.5	6.6	−12%
F-15C	7.2	8.4	6.7	−20%
F-16C	7.3	9.3	7.5	−19%
F-15E	8.0	8.5	7.9	−7%
A-10	7.2	9.7	7.7	−21%
All Jets	7.2	8.3	7.4	−11%
Average Sorties/Year	86	100	89	−11%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

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combat mission ready.[68] Flight times, sortie rates, mission planning teams, and flight supervision requirements are significantly higher in combat, and to cover those requirements, the manning ratio normally increases to 1.50 pilots per aircraft, or 36 line pilots per squadron. In other words, every squadron deployed to fight requires six more pilots than it has on its roster.[69] Pilots from the "donor" squadron can fill those slots for the deploying units.

With the downsizing that has taken place since the end of the Cold War and the reduction in the number of fighter squadrons, the Air Force has reduced the number of fighter squadrons to two or even one in many wings, significantly complicating the math behind the number of deployable active-duty fighter squadrons. At best, the deployable and therefore employable capacity of the Air Force will likely be limited to just two out of every three combat-coded squadrons, equating to just 21 active-duty fighter squadrons.

Guard and Reserve units face the same challenges, except that the vast majority of those units have just one fighter squadron per wing,

further straining their ability to muster the airframes and manning to meet an emergency deployment.[70] Planning for low-threat, low-intensity deployments to Operation Iraqi Freedom and Operation Enduring Freedom took this into consideration by mapping deployments out months (often years) in advance of the required movement. That allowed pilots to deconflict their civilian work schedules not just for the deployment, but also to get the training and time in the air that they needed to employ successfully in those low-threat combat operations.[71] Nevertheless, it was common for Guard units to pull pilots from other units in order to fulfill manning requirements for "rainbow" fighter squadrons.[72]

Calculating the number of deployable Guard and Reserve squadrons that could be made available to meet an order for emergency deployment to a high-threat environment is at best an exercise in guesswork, but given the readiness and manning issues that have been addressed, two Air National Guard (ANG) squadrons would likely enable one to deploy forward.[73] Of the 54 operational fighter

FIGURE 3

Air Force Active Duty Combat-Coded Fighter Squadrons (31 Total)

| **F-16**
11 squadrons | **F-15E**
5 squadrons | **F-15C**
4 squadrons | **F-22**
4 squadrons | **F-35**
3 squadrons | **A-10**
4 squadrons |

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 2, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept. 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/June2020_Fullissue5.pdf (accessed August 2, 2020).

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squadrons on the Air Force roster, 31 are active duty and 23 are Guard or Reserve Units. (See Figures 3 and 4, which present the number of active, Guard, and Reserve squadrons by type of platform.) By itself, the airframe disposition of each wing would allow just 20 active-duty fighter squadron equivalents (24 fighter aircraft each) to deploy to a fight, equating to 480 active-duty fighters that could deploy to meet a crisis situation—less than the fighter requirement for one full major regional contingency.

The average ANG and Reserve fighter squadron has one-third fewer jets than similar active-duty units. By rainbowing units with similar aircraft, they could muster 12

squadrons as a strategic reserve, equating to 288 fighters that could deploy sometime later. Those numbers are based on airframes alone, but other factors such as manning levels would also limit the number of sorties and the amount of combat power that those fighters could continually generate in a high-end confrontation with a peer competitor.

The declaration in Air Force posture statements for FY 2020 and FY 2021 that lead force packages within the service's 204 pacing squadrons are ready to fight also conveys the fact that only portions of its most capable squadrons have enough mission-capable aircraft and mission-ready aircrews to respond

Air National Guard and Air Force Reserve Combat-Coded Fighter Squadrons (23 Total)

F-16	**F-15C**	**F-22**	**A-10**
12 squadrons	5 squadrons	1 squadron	5 squadrons

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020; Brian W. Everstine, "Breaking Down USAF's 70-Percent Overall Mission Capable Rate," *Air Force Magazine*, May 19, 2020, https://www.airforcemag.com/breaking-down-usafs-70-percent-overall-mission-capable-rate/ (accessed August 2, 2020); and table, "Aircraft Total Active Inventory (TAI) (As of Sept 30, 2019)," in "Air Force & Space Force Almanac," *Air Force Magazine*, Vol. 103, No. 6 (June 2020), p. 63, https://www.airforcemag.com/app/uploads/2020/06/June2020_Fullissue5.pdf (accessed August 2, 2020).

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readily to a crisis. Because of the pilot shortage, actual unit manning levels in fighter squadrons are below peacetime requirements (if only slightly), and those manning thresholds are not enough to meet the significantly increased tempo required for combat operations.

The service has already moved the majority of pilots who were in staff or other non-flying billets back to the cockpit in an effort to relieve the manning shortfall. This means that the only way units will meet wartime manning requirements is by pulling pilots from other "donor" squadrons. The complications that this involves are significant and call into

question the idea that the portions of the 54 fighter squadrons that are unable to deploy immediately in a crisis could be combined to create more combat power. The vast majority of aircraft that are left would be used for homeland defense and to train replacement pilots or as replacement aircraft that are lost through combat attrition.

The current state of overall Air Force readiness includes many intangibles, but the factors that can be measured, such as mission-capable rates, aircrew training, and deployability, all point to a readiness level that did not visibly increase between 2018 and 2019.

Scoring the U.S. Air Force

Capacity Score: Marginal

One of the key elements of combat power in the U.S. Air Force is its fleet of fighter aircraft. In responding to major combat engagements since World War II, the Air Force has deployed an average of 28 fighter squadrons, based on an average of 18 aircraft per squadron. That equates to a requirement of 500 active component fighter aircraft to execute one MRC. Based on government force-sizing documents that count fighter aircraft, squadrons, or wings, an average of 55 squadrons (990 aircraft) is required to field a force capable of executing two MRCs (rounded up to 1,000 fighter aircraft to simplify the numbers).

As part of its overall assessment of capacity, the *2021 Index* looks for 1,200 active-duty fighter aircraft to account for the 20 percent reserve necessary when considering availability for deployment and the risk involved in employing 100 percent of fighters at any one time. It also incorporates the requirements stated in the 2018 TAFWN study.

- **Two-MRC Level:** 1,200 combat-coded fighter aircraft.

- **Actual 2019 Level:** 1,011 combat-coded fighter aircraft.

Based on a pure count of combat-coded fighter/attack platforms that have achieved initial operating capability (IOC), the USAF currently is at 84 percent of the capacity required to meet a two-MRC benchmark. However, the disposition of those assets (one to two squadrons for the majority of wings and Combat Air Force–wide manning levels) limits its ability to deploy rapidly to a crisis region and win a single MRC. While the active fighter and bomber assets available would likely prove adequate to fight and win a single regional conflict, when coupled with the low mission capability rates of those aircraft (see Table 8), the global sourcing needed to field the required combat fighter force assets would leave the rest of the world uncovered. Nevertheless, the capacity level is well within the methodology's range of "marginal." This score is now trending upward.

Capability Score: Marginal

The Air Force's capability score is "marginal," the result of being scored "strong" in "Size of Modernization Program," "marginal" for "Age of Equipment" and "Health of Modernization Programs," but "weak" for "Capability of Equipment." These assessments are the same as those in the *2020 Index*. However, new F-35 and KC-46 aircraft continue to roll off their respective production lines, this score is now trending upward.

Readiness Score: Marginal

The Air Force scores "marginal" in readiness in the *2021 Index*, the same grade it received in the *2020 Index*. The USAF's sustained pilot deficit and systemically low sortie rates and flying hours certainly contribute to this assessment, but its stagnant mission-capable rates and the lack of a systemic increase in operational fighter training reflect a service that is content with being ready to respond to a regional contingency rather than building the readiness levels required to meet the 2018 NDS.[74] The Air Force should be prepared to respond quickly to an emergent crisis not with a "task force" of four bombers, but with the speed and capacity required to stop a peer competitor in its tracks. With the significant curtailment of deployments in support of the global war on terrorism, the Air Force should be much farther along in its full-spectrum readiness than we have witnessed to date.

Fighter pilots should receive an average of three or more sorties a week and 200 hours per year to develop the skill sets needed to survive in combat. Even with greatly improved maintenance manning and experience levels and increased funding, average monthly sorties and flying hours have not reached those thresholds.

Whether they can or will be sustained for the length of time it will take to recover from the ongoing readiness shortfall is therefore open to question.

Overall U.S. Air Force Score: Marginal

This is an unweighted average of the USAF's capacity score of "marginal," capability score of "marginal," and readiness score of "marginal." The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the amount and quality of combat air power that would be needed to meet wartime requirements. Although it could eventually win a single major regional contingency in any theater, if the Air Force had to go to war today with a peer competitor, both the time needed to win that battle and the attendant rates of attrition would be much higher than they would be if the service had moved aggressively to increase high-end training and acquire the fifth-generation weapon systems required to dominate such a fight.

U.S. Military Power: Air Force

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✔		
Capability			✔		
Readiness			✔		
OVERALL			✔		

AIR FORCE SCORES

Strategic Bomber

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
B-52 Stratofortress Inventory: **76** Fleet age: **57.8** Date: **1961** The B-52, the oldest of the bombers, provides global strike capabilities with conventional or nuclear payloads. Programmed upgrades for B-52 include new communications, avionics, and Multi-Functional Color Displays. The Air Force plans to use this aircraft through the 2050s.	①		The B-21 is an advanced stealth bomber that will replace all B-1s and B-2s within the Air Force bomber fleet. Flight testing is scheduled for 2021. Procurement is expected to begin FY22.		
B-1 Lancer Inventory: **62** Fleet age: **32.4** Date: **1986** The B-1B is a supersonic all-weather conventional bomber. It was modified in the mid–1990s to disable its nuclear weapon delivery capability. Block 16 upgrades to be completed by 2020 include a fully integrated data link, navigation, radar, and diagnostic upgrades. B-1B phase-out is scheduled for 2032.	②	②			
B-2 Spirit Inventory: **20** Fleet age: **24.2** Date: **1997** The B-2 bomber provides the USAF with global strike capabilities for both nuclear and conventional payloads. The stealth bomber's communication suite is currently being upgraded. The current plan is to begin phasing out the B-2 in 2032.	③	④			

NOTE: See page 438 for details on dates, timelines, and procurement spending.

AIR FORCE SCORES

Ground Attack/Multi-Role Aircraft

PLATFORM	Age Score	Capability Score
A-10 Thunderbolt II Inventory: **281** Fleet age: **36.8** Date: **1977** The A-10 is the only USAF platform designed specifically for close-air support missions using both self-designated precision-guided munitions and an internal 30mm cannon. The retirement of the A-10 has been discussed for years, but it now appears it will keep flying through 2040. **F-16C Falcon** Inventory: **783** Fleet age: **26.7** Date: **1980** The F-16 is a multirole aircraft capable of tactical nuclear delivery, all-weather strike, and Suppression of Enemy Air Defenses (SEAD). An ongoing Service Life Extension Program (SLEP) will keep this jet in the inventory through the late 2040s.	2	2
F-35A Lightning Inventory: **203** Fleet age: **3.7** Date: **2016** The F-35 is a multirole stealth fighter that became operational in 2016. The Air Force has received more than 200 of a planned purchase of 1,763 aircraft.	5	5
F-15E Strike Eagle Inventory: **218** Fleet age: **27.4** Date: **1989** The F-15E is a multirole aircraft capable of all-weather, deep interdiction/attack, and tactical nuclear weapons delivery. Upgrades include an AESA radar, EPAWSS self-defense suite, a new central computer, and cockpit displays.	2	2

REPLACEMENT PROGRAM	Size Score	Health Score
F-35A Timeline: **2016–TBD**	5	3

The F-35A "Lightning" is a multirole stealth fighter that became IOC on August 2, 2016. The Air Force plans to acquire 48 F-35As a year across the Future Years Defense Program, however the Senate markup of the 2021 NDAA contains funding for the acquisition of 12 more F-35As in FY 2021.

PROCUREMENT	SPENDING *($ millions)*
338 1,425	$45,485 $186,382

NOTE: See page 438 for details on dates, timelines, and procurement spending.

1 2 3 4 5
Weakest ←——→ Strongest

Procurement and Spending ■ Through FY 2020 ☐ Pending

Fighter Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
F-15C/D Eagle Inventory: **234** Fleet age: **29.1** Date: **1975** The F-15C/D is an air-superiority fighter that has been in service since the late 1970s. The jet is receiving upgrades including a new AESA radar and self-defenses needed to survive and fight in contested airspace. Discussions are underway to retire the F-15C in late 2020s.	**1**	**2**	The F-15EX will be based on the two-seat F-15QA (Qatar) configuration upgraded with USAF-only capabilities, including the Eagle Passive Active Warning and Survivability System (EPAWSS) and advanced Operational Flight Program (OFP) software. The President's Budget for FY 2020 will acquire 8 F-15EXs in FY 2020 and a total of 80 over the Future Years Defense Program.		
F-22A Raptor Inventory: **186** Fleet age: **13.2** Date: **2005** The F-22 is the preeminent air superiority stealth fighter aircraft, modified to enable delivery of precision-guided weapons delivery. The jet is currently undergoing a modification called RAAMP that will improve reliability, maintainability, and performance.	**4**	**5**			

NOTE: See page 438 for details on dates, timelines, and procurement spending.

AIR FORCE SCORES

Tanker

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
KC-10 Extender Inventory: **59** Fleet age: **34.7** Date: **1981** The KC-10 is a multirole tanker and airlift platform that can refuel both boom- and drogue-compatible fighters on the same mission. Recent modifications have enabled a service life extension through 2045. The Air Force planned to retire the KC-10 by 2024, but with a shortfall of refueling platforms, and slow acquisition of the KC-46, that appears unlikely.	**2**	**5**	**KC-46** Timeline: **2019–2017** The KC-46 Pegasus will replace portions of the KC-135 tanker fleet. The program entered low-rate initial production in August 2016, and the Air Force accepted the first Pegasus on January 10, 2019. The tanker has had several deficiencies and is currently unable to refuel aircraft due to problems with its remote visual system. The Air Force is still accepting approximately 15 aircraft a year despite the Pegasus being unable to perform its primary mission.	**3**	**3**
KC-135 Stratotanker Inventory: **379** Fleet age: **58.7** Date: **1957** The KC-135 is a multirole tanker/airlift platform. The aircraft has undergone several modifications, mainly engine upgrades to improve performance and reliability. Part of the fleet will be replaced with the KC-46, with the remainder scheduled to be in service through 2040.	**1**				
KC-46 Pegasus Inventory: **21** Fleet age: **0.1** Date: **2020** This Pegasus is a multirole tanker/airlift platform that can refuel both boom- and drogue-compatible fighters on the same mission. The Air Force accepted the first of 179 programmed aircraft in 2019. The program has had significant problems, but deliveries will continue at a rate of 15 aircraft a year.	**5**	**1**			

PROCUREMENT

79   99

SPENDING *($ millions)*

$21,210 $22,392

NOTE: See page 438 for details on dates, timelines, and procurement spending.

AIR FORCE SCORES

Heavy Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C–5M Galaxy Inventory: **52** Fleet age: **32.4** Date: **1970** The C-5 is the USAF's largest mobility aircraft. It can transport 270,000 pounds of cargo over intercontinental ranges and is air refuelable. The "M" models are heavily modified C-5A/Bs that have new engines, avionics, and structural/reliability fixes. Ongoing modifications include a new weather radar and mission computer, and improved Large Aircraft IR Countermeasures (LAIRCM).	②	⑤	None		
C-17 Globemaster III Inventory: **222** Fleet age: **17** Date: **1995** The C-17 is a large, air-refuellable transport aircraft that is capable of operating on small airfields (3,500 feet by 90 feet). Ongoing modifications include next-generation Large Aircraft Infrared Countermeasures (LAIRCM), and structural, safety, and sustainment modifications.	④				

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C-130J Super Hercules Inventory: **132** Fleet age: **9.3** Date: **2006** The C-130J is an improved tactical airlift platform that can operate from small, austere airfields, and provide inter-theater airlift and airdrop and humanitarian support. The Air Force active component completed transition to the C-130J in October 2017.	⑤	⑤	**C-130J** Timeline: **2006–2022** An upgraded medium-lift capability with multiple variants including the C-130J-30, AC-130J gunship, and HC-130 rescue/air refueling platform. The C-130J-30 can carry 92 airborne troops and lift over 40,000 pounds of cargo. The Air Force currently has two multi-year contracts underway with Lockheed Martin to procure 16 C-130Js per year through FY 2023, and to procure an additional 24 H/MC-130 aircraft from 2021 to 2025. **PROCUREMENT** 176 **SPENDING** (*$ millions*) $14,016.4 $ 141.7	⑤	⑤

NOTE: See page 438 for details on dates, timelines, and procurement spending.

AIR FORCE SCORES

1 **2** **3** **4** **5**
Weakest ⟵ ⟶ Strongest

Procurement and Spending ■ Through FY 2020 ▪ Pending

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
RQ-4 Global Hawk Inventory: **35** Fleet age: **9.5** Date: **2011** The RQ-4 is an unmanned aerial vehicle (UAV). Unlike the MQ-9, the RQ-4 is a high-altitude, long-endurance (HALE) UAV, which in addition to higher altitude has a longer range than medium-altitude, long-endurance (MALE) UAVs.	**4**	**3**	None		
MQ-9 A/B Reaper Inventory: **269** Fleet age: **5.5** Date: **2007** The MQ-9 is a hunter/killer Remotely Piloted Aircraft (RPA) with EO/IR and SAR targeting capabilities, and is capable of station times in excess of 24 hours. The Extended Range modification adds external fuel tanks, a four-bladed propeller, engine alcohol/water injection, heavyweight landing gear, longer wings, and tail surfaces.	**5**	**2**	**MQ-9** Timeline: **2007–2017** The MQ-9 "Reaper" is a proven hunter/killer unmanned Aerial Vehicle (UAV). The Air Force FY 2020 budget funds the procurement of 24 Reapers, but the proposed President's Budget for 2021 unexpectedly ends MQ-9 acquisition. However, both the House (16 aircraft) and Senate ($170.6m) markups of the 2021 NDAA contain funding for the acquisition of additional MQ-9 UAS.	**5**	**5**
RC-135 Rivet Joint Inventory: **20** Fleet age: **55.8** Date: **1972** The RC-135 is a manned ISR platform that collects electronic and signals intelligence with real-time analysis and dissemination for tactical forces, combatant commanders, and National Command Authorities. Ongoing upgrades include new direction finding COMINT, precision ELINT/SIGINT system integration, wideband SATCOMS, enhanced near real-time data dissemination, and new steerable beam antenna.	**1**	**4**	None		
U-2 Dragon Lady Inventory: **27** Fleet age: **36.7** Date: **1956** The U-2 is a manned strategic high-altitude, long-endurance ISR platform. Capable of SIGINT, IMINT and MASINT collection, it can carry a variety of advanced optical, multispectral, EO/IR, SAR, SIGINT, and other payloads simultaneously. No other aircraft in the U.S. inventory has this capability, which will indefinitely delay the U-2's retirement.	**1**				

MQ-9 Procurement and Spending:

PROCUREMENT		SPENDING ($ millions)	
48	16	$10,706	$1,932

NOTE: See page 438 for details on dates, timelines, and procurement spending.

1 2 3 4 5

Weakest ⟵⟶ Strongest

Procurement and Spending ▮ Through FY 2020 ▫ Pending

Command and Control

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
E-3 AWACS Inventory: **31** Fleet age: **38.2** Date: **1977** The E-3 is an airborne warning and control system (AWACS) that delivers all-weather, air and maritime surveillance, command and control, battle management, target, threat, and emitter detection, classification, and tracking. Ongoing upgrades include an urgent operational requirement to shorten kill-chains on time-sensitive targets, modernizing airborne moving-target indication, and adding high-speed jam-resistant Link 16. The E-3 is scheduled to stay in service through the 2040s. **E-8 JSTARS** Inventory: **16** Fleet age: **17.8** Date: **2010** The E-8 is a ground moving-target indication (GMTI), airborne battlefield management/command and control platform. Its primary mission is providing theater commanders with ground surveillance data to support tactical operations. The Air Force plans to retire this platform in the mid-2020s.	**1**	**2**	None		

NOTES: See Methodology for descriptions of scores. The date is the year the platform reached initial operational capability. The timeline is from year the platform reached initial operational capability until its final procurement. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E).

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10. Appendix, "Department of the Air Force Total Aircraft Inventory (TAI)," in U.S. Department of Defense, Secretary of the Air Force, Office of Financial Management and Budget (SAF/FMB), *Department of the Air Force FY 2021 Budget Overview*, p. 42.

11. "The Air Force We Need" calls for one additional airlift squadron and five additional bomber, seven additional fighter, and 14 additional tanker squadrons. While the number of aircraft in any one of those categories varies from unit to unit, there are approximately 30 fighters, 10 bombers, 15 tankers, and 15 strategic airlift aircraft in each squadron. Mathematically, "The Air Force We Need" calls for 182 more fighters, 50 more bombers, 210 more refuelers, and 15 more airlift aircraft than the Air Force currently has in its inventory. U.S. Air Force, "The Air Force We Need: 386 Operational Squadrons."

12. $80 billion is a rough estimate based on the need for 182 more F-35s (seven squadrons, 26 fighters per squadron, $80 million each); 50 more B-21 bombers (five squadrons, 10 bombers per squadron, $564 million each); 210 more KC-46s (14 squadrons, 15 tankers per squadron, $169 million each); and 15 additional C-17s (one squadron, 15 aircraft per squadron, no longer in production but an average of $262 million each in FY 2020 dollars). See, respectively, Marcus Weisgerber, "Price Drop: Lockheed Pitches $80M F-35A to Pentagon," *Defense One*, May 7, 2019, https://www.defenseone.com/business/2019/05/price-drop-lockheed-pitches-80m-f-35a-pentagon/156825/ (accessed August 5, 2020); Jeremiah Gertler, "Air Force B-21 Raider Long-Range Strike Bomber," Congressional Research Service *Report for Members and Committees of Congress*, updated November 13, 2019, p. 4, https://fas.org/sgp/crs/weapons/R44463.pdf (accessed August 5, 2020); U.S. Department of the Air Force, *Department of Defense Fiscal Year (FY) 2020 Budget Estimates, Air Force, Justification Book Volume 1 of 2: Aircraft Procurement, Air Force Vol-1*, March 2019, p. 25, https://www.saffm.hq.af.mil/Portals/84/documents/FY20/PROCURE, Air MENT/FY20_PB_3010_Aircraft_Vol-1.pdf?ver=2019-03-18-152821-713 (accessed August 5, 2020); and Fact Sheet, "C-17 Globemaster III," U.S. Air Force, May 14, 2018, https://www.af.mil/About-Us/Fact-Sheets/Display/Article/1529726/c-17-globemaster-iii/ (accessed August 5, 2020).

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14. See note 9, *supra*.

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aircraft associated with Weapons Instructor Course Squadrons, Adversary Tactics, Test, OT&E, and other units are not standard/determinable and could not be assessed. The associated error is minimized by totaling all like fighter aircraft (F-16, F-15C, etc.); dividing them by the total number of squadrons flying those aircraft; and spreading the error equally across all combat-coded fighter and training units. The total number of fighters associated with non–Fighter Training Unit (FTU) squadrons was counted as "combat-coded."

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55. Lieutenant General Gina M. Grosso, Deputy Chief of Staff, Manpower, Personnel and Services, United States Air Force, statement on "Military Pilot Shortage" before the Subcommittee on Personnel, Committee on Armed Services, U.S. House of Representatives, March 29, 2017, p. 2, http://docs.house.gov/meetings/AS/AS02/20170329/105795/HHRG-115-AS02-Wstate-GrossoG-20170329.pdf (accessed August 5, 2020).

56. Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

57. Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, April 9, 2019.

58. Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020.

59. James C. Slife, *Creech Blue: Gen Bill Creech and the Reformation of the Tactical Air Forces, 1978–1984* (Maxwell Air Force Base: Air University Press, October 2004), p. 92, https://www.airuniversity.af.edu/Portals/10/AUPress/Books/B_0095_SLIFE_CREECH_BLUE.pdf (accessed August 10, 2020).

60. John Venable, "A Plan for Keeping the U.S. Air Force's Best Pilots in Service," Heritage Foundation *Commentary*, November 14, 2017, https://www.heritage.org/defense/commentary/plan-keeping-the-us-air-forces-best-pilots-service.

61. Telephone conversation with senior Air Force leader, April 24, 2020.

62. Slife, *Creech Blue*, pp. 92–95.

63. U.S. General Accounting Office, *Air Force Maintenance: Two Level Maintenance Program Assessment*, GAO/NSAID-96-86, March 1996, p. 1, https://www.gao.gov/assets/230/222350.pdf (accessed August 4, 2020).

64. Averages for sorties and hours are based on weighted fighter manning levels for each of the five major weapons systems provided in Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force manning levels, July 24, 2020. The numbers were weighted based on aircraft numbers as explained in note 22, *supra*, as well as standard aircrew ratios established in Figure A8.1, "Air Force Single Flying Hour Model F-16C Example," in U.S. Air Force, "Flying Operations: Flying Hour Program Management," Air Force Instruction 11-102, August 30, 2011, p 17, https://static.e-publishing.af.mil/production/1/af_a3_5/publication/afi11-102/afi11-102.pdf (accessed August 5, 2020).

65. See note 64.

66. Author's experience through 26 years of Air Force operations, coupled with senior leader engagements from 2018–2019.

67. Albert A. Robbert, Anthony D. Rosello, Clarence R. Anderegg, John A. Ausink, James H. Bigelow, William W. Taylor, and James Pita, *Reducing Air Force Fighter Pilot Shortages* (Santa Monica, CA: RAND Corporation, 2015), p. 33, https://www.rand.org/content/dam/rand/pubs/research_reports/RR1100/RR1113/RAND_RR1113.pdf (accessed August 4, 2020).

68. Even though active-duty fighter squadrons have an average of 30 aircraft per squadron, that number includes maintenance spares and attrition reserve platforms. Manning is based on Primary Assigned Aircraft (PAA), which is 24 aircraft for active-duty fighter squadrons.

69. Based on a squadron with 24 Primary Assigned Aircraft. For units with 18 PAA, four additional pilots are required.

70. The very premise of these units is that they are manned with citizen soldiers whose main source of income is full-time civilian jobs and who are committed to travel and temporary duty locations that make them unavailable for days or weeks at a time. Those units would likely require several days to assemble the manpower required to deploy, and once an assessment of their real mission currency was made, they would need some period of intense training before a responsible senior leader could employ them in a fight with a peer competitor.

71. "Deployments most suited to the ARC are those in which there is long lead time (six months or more), and in which the operation is of short duration (six days or less), requiring a small force package (12 aircraft or less), and in which the scheduling is flexible." John T. Correll, "Future Total Force," *Air Force Magazine*, Vol. 82, No. 7 (July 1999), p. 32, https://www.airforcemag.com/PDF/MagazineArchive/Documents/1999/July%201999/0799total.pdf (accessed August 4, 2020).

72. The author commanded the 349th Expeditionary Combat Group at Al Udeid, Qatar, from 2004–2005. During that time, he flew with seven different Air National Guard F-16 squadrons. Every one of those units had some level of rainbow manning, and each performed admirably.

73. Interview with senior Air National Guard leader, November 20, 2019.

74. See Venable, "Independent Capability Assessment of U.S. Air Force Reveals Readiness Level Below Carter Administration Hollow Force."

U.S. Marine Corps

Dakota L. Wood

The U.S. Marine Corps (USMC) is the nation's expeditionary armed force, positioned and ready to respond to crises around the world. Marine units assigned aboard ships ("soldiers of the sea") or at bases abroad stand ready to project U.S. power into crisis areas. Marines also serve in a range of unique missions, from combat defense of U.S. embassies under attack abroad to operating the President's helicopter fleet.

Although Marines have a wide variety of individual assignments, the focus of every Marine is on combat: Every Marine is first a rifleman. Over the past several decades, the Marine Corps has positioned itself for crisis response, but while sustaining its historical, institutional, and much of its doctrinal focus on its historical connection to operations in maritime environments, the majority of its operational experience over the past 20 years has been in sustained land operations. This has led to a dramatic decline in the familiarity of most Marines with conventional amphibious operations and other types of employment within a distinctly maritime setting. Recognizing this shortfall, the Corps' leadership has initiated efforts to reorient the service toward enabling and supporting the projection of naval power in heavily contested littoral environments with a particular focus on the Indo–Pacific region.

As reported in February 2020, the Corps had 36,100 Marines deployed to remain "engaged in joint, integrated operations around the globe, providing immediate response options, assuring allies and deterring our adversaries."

This included approximately one-third of the Corps' operational forces deployed to 60 countries and 11,000 Marines serving aboard ships.[1] During the year preceding its fiscal year (FY) 2021 budget request, "[T]he Marine Corps executed 249 operations, nine amphibious operations, [and] 151 theater security cooperation events, and participated in 68 exercises." Among these involvements were support for operations Inherent Resolve (Iraq and Syria) and Freedom's Sentinel (Afghanistan); operations across Africa and Latin America; and major exercises with many partner countries in Asia and Europe.[2]

Pursuant to the National Defense Strategy (NDS),[3] maintaining the Corps' crisis-response capability is critical. Thus, given the fiscal constraints imposed by the budget environment of the past several years, the Marines have prioritized near-term readiness at the expense of other areas such as capacity, capability, modernization, home station readiness, and infrastructure. Over the past two to three years, however, additional funding provided by Congress has enabled the Corps to make advances in readiness and turn to modernization at what USMC Commandant General David H. Berger has called "a significant scale."[4] As stated in DOD's FY 2019 *Defense Budget Overview*, the service elevated modernization as a means to improve readiness for combat.[5] This is consistent with and central to its readiness-recovery efforts and represents a shift to a longer-term perspective. Recapitalization and repair of legacy systems are no longer sufficient to sustain

current operational requirements. New equipment is necessary.

In general for the Joint Force, this *Index* focuses on the forces required to win two major wars as the baseline force-sizing metric for the Army, Navy, and Air Force, but it adopts a different paradigm—one war plus crisis response—for the Marine Corps. While the three large services are sized for global action in more than one theater at a time, the Marines, by virtue of overall size and most recently by direction of the Commandant, focus on one major conflict while ensuring that all Fleet Marine Forces are globally deployable for short-notice, smaller-scale actions.

In previous editions of the *Index,* the capacity of the Marine Corps was assessed against a two-war requirement of 36 battalions: a historical average of 15 battalions for a major conflict (30 for two major conflicts) and a 20 percent buffer, bringing the total to 36. The Corps has consistently maintained that it is a one-war force and has no intention of growing to the size needed to fight two wars. Its annual budget requests and top-level planning documents reflect this position.

Having assessed that the Indo-Pacific region will continue to be of central importance to the U.S., and noting that China is a more worrisome "pacing threat" than any other competitor and that the Joint Force lacks the ability to operate within the range of intensely weaponized, layered defenses featuring large numbers of precision-guided munitions, the Corps is reshaping itself to optimize its capabilities and organizational structures for this challenge. This *Index* concurs with this effort but assesses that the Corps will still need greater capacity to succeed in war in the very circumstances for which the Marines believe they must prepare.

Capacity

The measures of Marine Corps capacity in this *Index* are similar to those used to assess the Army's: end strength and units (battalions for the Marines and brigades for the Army). The Marine Corps' basic combat unit is the infantry battalion, which is composed of approximately 900 Marines and includes three rifle companies, a weapons company, and a headquarters and service company.[6]

In 2011, the Marine Corps maintained 27 infantry battalions in its active component at an authorized end strength of 202,100.[7] As budgets declined, the Corps prioritized readiness through managed reductions in capacity, including a drawdown of forces, and delays or reductions in planned procurement levels. After the Marine Corps fell to a low of 23 active component infantry battalions in FY 2015,[8] Congress began to fund gradual increases in end strength, returning the Corps to 24 infantry battalions.

The Corps operated with 186,200 Marines in FY 2020,[9] perhaps a high point for the foreseeable future as the service plans to shrink to 184,100 in FY 2021 to free funding so that it can be reapplied to experimentation, retooling, and reorganization as described in "Force Design 2030."[10] The current size allows for 24 infantry battalions, but future plans will likely see the number shrink to 21 battalions.[11]

One impact of reduced capacity is a strain on Marines' dwell time. Cuts in capacity—the number of units and individual Marines—enabled the Corps to disperse the resources it did receive among fewer units, thus maintaining higher readiness levels throughout a smaller force. However, without a corresponding decrease in operational requirements, demand for Marine Corps units and assets has resulted in grueling deployment rates, a situation largely unchanged since 2018.[12] High deployment frequency exacerbates the degradation of readiness as people and equipment are used more frequently with less time to recover between deployments.

The stated ideal deployment-to-dwell (D2D) time ratio is 1:3 (seven months deployed for every 21 months at home).[13] This leaves more time available for training and recovery and provides support for a ready bench, without which readiness investments are immediately consumed. The Corps is currently sustaining a 1:2 D2D ratio while working toward the more desirable 1:3 ratio.[14]

Infantry battalions serve as a surrogate measure for the Corps' total force. As the first to respond to many contingencies, the Marine Corps requires a large degree of flexibility and self-sufficiency, and this drives its approach to organization and deployment of operational formations that, although typically centered on infantry units, are composed of ground, air, and logistics elements. Each of these assets and capabilities is critical to effective deployment of the force, and any one of them can be a limiting factor in the conduct of training and operations.

Aviation. Despite being stressed consistently by insufficient funding, the Marine Corps has made significant progress in achieving its objective of 80 percent aviation readiness in FY 2020.[15] However, even though operational requirements have not decreased, fewer Marine aircraft have been available for tasking or training. For example, according to its *2019 Marine Corps Aviation Plan*, the USMC currently fields 16 tactical fighter squadrons,[16] compared to 19 in 2017[17] and around 28 during Desert Storm.[18] Though availability of legacy aircraft has slowly improved—the result of increased funding for spare parts and implementation of recommendations from independent readiness reviews—the Marine Corps "is still challenged with low readiness rates in specific communities" such as F/A-18 squadrons.[19]

While the Corps is introducing the F-35 platform into the fleet, F/A-18 Hornets remain "the primary bridging platform to F-35B/C" and will remain in the force until 2030.[20] This primary TACAIR capability has to be carefully managed as it is no longer in production. The Navy completed its divestment of F/A-18 A-D models during FY 2019, making them available to the Marines and thereby enabling the Marine Corps to replace its older aircraft with planes that are less old.[21] To further mitigate the aging of its fleet until full transition to the F-35, the Corps is also looking to acquire F/A-18s from other countries as opportunities arise.[22] The Corps will maintain five squadrons of AV-8B Harriers, introduced in 1985, until FY 2022.[23]

In its heavy-lift rotary-wing fleet, the Corps began a reset of the CH-53E in 2016 to bridge the procurement gap to the CH-53K and aimed to "reset...the entire 143-aircraft fleet by FY20,"[24] but recent reporting indicates that the Corps is only one-third of the way through the process.[25] Even when the reset is complete, the service will still be 57 aircraft short of the stated heavy-lift requirement of 200 airframes and will not have enough helicopters to meet its heavy-lift requirement without the transition to the CH-53K.[26]

According to the *2019 Marine Corps Aviation Plan*, the Corps completed its transition from the CH-46E to the MV-22 Osprey in 2019, with 18 fully operational squadrons in the active component.[27] However, the procurement objective could increase to 380 aircraft pending the results of an ongoing requirements-based analysis.[28] The Osprey has been called "our most in-demand aircraft,"[29] which means the Marine Corps has to reconcile high operational tempos (OPTEMPOs) with the objective of maintaining the platform in inventory "for at least the next 40 years."[30] The Corps has committed to funding its Common Configuration–Readiness and Modernization (CC–RAM) and Nacelle Improvement (NI) programs to increase aircraft availability by 15 percent.[31]

Although amphibious ships are assessed as part of the Navy's fleet capacity, Marines operate and train aboard naval vessels, making "the shortage of amphibious ships...the quintessential challenge to amphibious training."[32] As of July 28, 2020, the Navy was operating only 33 amphibious ships,[33] and it is projected to continue operating short of the 38 ships the Marine Corps held as the minimum requirement for many years,[34] thus limiting what the Corps can do in operational, training, and experimentation settings.[35]

Because of this chronic shortfall in amphibious ships, the USMC has relied partially on land-based Special Purpose Marine Air-Ground Task Forces (SPMAGTFs), but while SPMAGTFs have enabled the Corps to meet Joint Force requirements, land-based

locations "lack the full capability, capacity and strategic and operational agility that results when Marine Air-Ground Task Forces (MAGTFs) are embarked aboard Navy amphibious ships."[36] The lack of variety in amphibious shipping, especially as the Corps considers the implications of evolving enemy capabilities, has combined with the service's concerns about the shortage of amphibious lift in general to increase its sense of urgency to explore alternatives with the Navy.[37]

The USMC continues to invest in the recapitalization of legacy platforms in order to extend platform service life and keep aircraft and amphibious vehicles in the fleet, but as these platforms age, they also become less relevant to the evolving modern operating environment. Thus, although they do help to maintain capacity, programs to extend service life do not provide the capability enhancements that modernization programs provide. The result is an older, less-capable fleet of equipment that costs more to maintain.

Capability

The nature of the Marine Corps' crisis-response role requires capabilities that span all domains. The USMC ship requirement is managed by the Navy and is covered in the Navy's section of the *Index*. The Marine Corps is focusing on modernization and emphasizing programs such as the Amphibious Combat Vehicle (ACV) and F-35 JSF programs, its top two priorities.[38] The Corps has doubled its investment in modernization as a percentage of its budget from 14 percent in FY 2019 to 30 percent for FY 2020.[39] That a focus on readiness and planning for future operations continues to be a priority is seen in the service's budget requests for FY 2021. The Department of the Navy decreased spending on procurement overall by 8.3 percent in order to increase funding for research and development and protect gains made in readiness over the past few years.[40]

Of the Marine Corps' current fleet of vehicles, its amphibious vehicles—specifically, the Assault Amphibious Vehicle (AAV-7A1) and Light Armored Vehicle (LAV)—are the oldest,

with the AAV-7A1 averaging over 41 years old and the LAV averaging 27 years old.[41] The Corps had moved to extend the service life of the AAV but abandoned that program as progress with the ACV accelerated.[42] The Corps has stated that:

> We continue to make strategic choices in the divestiture of certain programs to reallocate funds toward building a more lethal, modern, multi-domain, expeditionary force. This has included accepting near-term capacity risk by reducing depot level maintenance for the legacy Amphibious Assault Vehicle (AAV) as we transition to the Amphibious Combat Vehicle (ACV).[43]

In addition, it decreased funding for maintenance of combat vehicles by 28 percent, or $56 million, in FY 2020 compared with the preceding year.[44]

Though it is not yet in development, service testimony notes that the Marine Corps is "beginning to look at a replacement" for the LAV, which will "help accelerate movement to the acquisition phase within the next four to five years."[45] As noted, the average age of the LAV is 27 years. Comparatively, the Corps' M1A1 Abrams inventory is 28 years old with an estimated 33-year life span,[46] and the newest High Mobility Multi-Purpose Wheeled Vehicle (HMMWV) variant has already consumed half of a projected 15-year service life.[47] In short, the Corps' fleet of vehicles is old.

All of the Corps' main combat vehicles entered service in the 1970s and 1980s, and while service life extensions, upgrades, and new generations of designs have allowed the platforms to remain in service, these vehicles are quickly becoming poorly suited to the changing threat environment.[48] The FY 2020 budget provided $2.99 billion for modernization of ground-related combat and combat-related systems that will extend the service utility of aging primary ground combat platforms.[49]

The age profiles of the Corps' aircraft are similar to those of the Navy's. In 2018, the

USMC had 251 F/A-18A-Ds (including one reserve squadron) and six EA-6Bs in its primary mission aircraft inventory,[50] and both aircraft had already surpassed their originally intended life spans. The Marine Corps completed retirement of its EA-6B squadrons in FY 2019.[51]

Unlike the Navy, the Corps did not acquire the newer F/A-18 E/F Super Hornets; thus, some of the older F/A-18 Hornets are going through a service life extension program to extend their life span to 10,000 flight hours from the original 6,000 hours.[52] This is intended to bridge the gap until the F-35Bs and F-35Cs enter service to replace the Harriers and most of the Hornets.

As the Navy accelerated its transition to the Super Hornet, it transferred its "best of breed" aircraft from its F/A-18A-D inventory to the Marine Corps and scrapped the remaining for parts to help maintain the Corps' legacy fleet through FY 2030.[53] The AV-8B Harrier, designed to take off from the LHA and LHD amphibious assault ships, will be retired from Marine Corps service by 2026.[54] The AV-8B received near-term capability upgrades in 2015, and they continued in 2017 in order to maintain its lethality and interoperability until the F-35 transition is completed in FY 2022.[55]

The Corps declared its first F-35B squadron operationally capable on July 31, 2015, after it passed an "Operational Readiness Inspection" test and has reported that the aircraft reached full operational capability in late 2018.[56] During FY 2019, VMFA-211, composed of F-35Bs, made the first full operational deployment with a Marine Expeditionary Unit (MEU) when it sailed with the 13th MEU from September 2018 to February 2019, supporting combat operations in Afghanistan, Iraq, and Syria.[57] To date, at least 174 aircraft (151 F-35Bs and at least 23 F-35Cs) have been procured.[58] In January 2020, Marine Fighter Attack Squadron 314 (VMFA-314) became the first USMC squadron to be equipped with the F-35C.[59]

The Marine Corps has two Major Defense Acquisition (MDAP) vehicle programs: the Joint Light Tactical Vehicle (JLTV) and Amphibious Combat Vehicle (ACV).[60] The JLTV is a joint program with the Army to acquire a more survivable light tactical vehicle, originally intended to replace a percentage of the older HMMWV fleet, introduced in 1985, although that objective changed in 2019. The Army retains overall responsibility for JLTV development through its Joint Program Office.[61]

Following FY 2015 plans for the JLTV, the program awarded a low-rate initial production contract, which included a future option of producing JLTVs for the Marine Corps, to defense contractor Oshkosh.[62] As of June 2017, despite a delay in the program's full-rate production decision and reduced procurement quantities in FY 2016 and FY 2017, the Corps expected to complete its prior acquisition objective of 5,500 by FY 2023.[63] In mid-August 2019, the Corps announced that it would increase its procurement of JLTVs to around 15,000, essentially enabling it to replace its HMMWV fleet of 15,390 vehicles.[64] In FY 2020, the Corps procured 1,264 vehicles at a cost of $556 million.[65]

After restructuring its ground modernization portfolio, the Marine Corps determined that it would combine its efforts by upgrading 392 of its legacy AAVs and continuing development of the ACV to replace part of the existing fleet and complement its AAVs.[66] This would help the Corps to meet its requirement of armored lift for 10 battalions of infantry.[67] In June 2018, BAE Systems won the contract award to build the ACV 1.1.[68] It delivered the first 30 vehicles during 2019. The Corps purchased 56 in FY 2020 and plans to buy another 72 in FY 2021.[69] The Marine Corps plans to field 204 vehicles in the first increment—enough to support lift requirements for two infantry battalions.[70]

The ACV 1.1 platform is notable because it is an amphibious wheeled vehicle instead of a tracked vehicle capable of traversing open water only with the assistance of Navy shore connectors (landing craft) such as Landing Craft, Air Cushion Vehicles (LCAC), that carry the ACV from ship to shore. Development and procurement of the ACV program are phased so that the new platforms are fielded

incrementally alongside a number of modernized AAVs.[71] Plans call for a 694-vehicle program of record (a combination of upgraded AAVs and ACVs), with the first battalion to reach initial operating capability (IOC) in FY 2020, and modernization of enough of the current AAV fleet to outfit six additional battalions, two in the first increment and four in the second. To this end, the Corps was allocated $301 million in its FY 2020 budget to fund the "first full-rate production lot of 72 [ACV] vehicles (16 more than FY 2020)."[72] This is significantly higher than the almost $167 million the Corps received for ACV in FY 2019, and substantially less than the almost $479 million it has requested for FY 2021 to purchase an additional 72 vehicles.[73]

With regard to aviation, Lieutenant General Brian Beaudreault, then Marine Corps Deputy Commandant for Plans, Policies, and Operations, testified in 2018 that "[t]he single most effective way to meet our NDS responsibilities, improve overall readiness, and gain the competitive advantage required for combat against state threats is through the modernization of our aviation platforms."[74] The F-35B remained the Marine Corps' largest investment program in FY 2020. Total procurement will consist of 420 F-35s (353 F-35Bs and 67 F-35Cs), of which at least 174 have been acquired.[75] AV-8Bs and F/A-18A-Ds continue to receive interoperability and lethality enhancements in order to extend their useful service lives during the transition to the F-35.

Today, the USMC MV-22 Osprey program is operating with few problems and nearing completion of the full acquisition objective of 360 aircraft.[76] The Marine Corps now has 16 fully operational MV-22 squadrons in the active component.[77] The MV-22's capabilities are in high demand from the Combatant Commanders (COCOMS), and the Corps is adding such capabilities as fuel delivery and use of precision-guided munitions to the MV-22 to enhance its value to the COCOMs.

The Corps has struggled with sustainment challenges in the Osprey fleet. In the years since procurement of the first MV-22 in 1999,

the fleet has developed more than 70 different configurations.[78] This has resulted in increased logistical requirements as maintainers had to be trained to each configuration and spare parts were not all shared. The Marine Corps has developed its Common Configuration–Reliability and Modernization program to consolidate the inventory to a common configuration at a rate of "2–23 aircraft installs per year." The program was initiated in FY 2018.[79]

The USMC's heavy-lift replacement program, the CH-53K, conducted its first flight on October 27, 2015.[80] The CH-53K will replace the Corps' CH-53E, which is now 30 years old. Although "unexpected redesigns to critical components" delayed a low-rate initial production decision,[81] the program achieved Milestone C in April 2017. The Corps received $1 billion in 2019 to purchase seven aircraft and continued this effort by purchasing another six in FY 2020 for $848 million.[82] The helicopter is forecast to reach IOC in FY 2021.[83] This is of increasing concern because the Marine Corps maintains only 138 CH-53Es and will not have enough helicopters to meet its heavy-lift requirement of 220 aircraft without the transition to the CH-53K, which even when fully implemented will still fall short by 20 aircraft.[84]

Readiness

The Marine Corps' first priority is to be the crisis-response force for the military, which is why investment in immediate readiness has been prioritized over capacity and capability.[85] Although this is sustainable for a short time, issues about which concerns were expressed when the Budget Control Act was passed in 2011 have proved to be impediments to achieving and sustaining readiness at desired levels. That said, however, the Corps has reported notable increases in readiness over the past two to three years as a result of increased funding.

With respect to training, the Marine Corps continues to prioritize training for deploying and next-to-deploy units. Marine operating forces as a whole continue to average a 1:2 deployment-to-dwell ratio.[86]

Marine Corps guidance identifies multiple levels of readiness that can affect the ability to conduct operations:

> Readiness is the synthesis of two distinct but interrelated levels. a. unit readiness— The ability to provide capabilities required by the combatant commanders to execute their assigned missions. This is derived from the ability of each unit to deliver the outputs for which it was designed. b. joint readiness—The combatant commander's ability to integrate and synchronize ready combat and support forces to execute his or her assigned missions.[87]

As previously mentioned, the availability of amphibious ships, although funded through the Navy budget, has a direct impact on the Marine Corps' joint readiness. For example, while shore-based MAGTFs can maintain unit-level readiness and conduct training for local contingencies, a shortfall in amphibious lift capabilities leaves these units without "the strategic flexibility and responsiveness of afloat forces and…constrained by host nation permissions."[88]

In December 2017, a U.S. Government Accountability Office (GAO) official testified that while deploying units completed all necessary predeployment training for amphibious operations, the Marine Corps was "unable to fully accomplish…home-station unit training to support contingency requirements, service-level exercises, and experimentation and concept development for amphibious operations."[89] A shortage of available amphibious ships was identified as the primary factor in training limitations. Of the 32 amphibious ships currently in the U.S. fleet, only 16 were considered "available to support current or contingency operations" at that time.[90] Although infantry battalions can maintain unit-level readiness requirements, their utility depends equally on their ability to deploy in defense of U.S. interests.

Marine aviation in particular has experienced significant readiness shortfalls, but the Marines have reported better rates as a result of sustained funding for readiness in recent years. The *2018 Marine Aviation Plan* found that "[a]cross all of Marine aviation, readiness is below steady state requirements."[91] However, in testimony before the House Armed Services Committee, General Berger reported that readiness for fixed-wing aviation had met the 80 percent goal established by former Secretary of Defense James N. Mattis in 2018.[92]

The Marines Corps' Ground Equipment Reset Strategy, developed to recover from the strain of years of sustained operations in Iraq and Afghanistan, has had a positive impact after being delayed from the end of FY 2017 to FY 2019. During 2019, the Marine Corps reset approximately 99 percent of its ground equipment and "returned 72% of [its] ground equipment to the operating forces."[93] Reconstituting equipment and ensuring that the Corps' inventory can meet operational requirements are critical aspects of readiness.

Scoring the U.S. Marine Corps

Capacity Score: Marginal

Based on the deployment of Marines across major engagements since the Korean War, the Corps requires roughly 15 battalions for one major regional contingency (MRC).[94] This translates to a force of approximately 30 battalions to fight two MRCs simultaneously if we were to retain the metric used in previous *Indexes*. The government force-sizing documents that discuss Marine Corps composition support the larger measure. Though the documents that make such a recommendation count the Marines by divisions, not battalions, they are consistent in arguing for three Active Marine Corps divisions, which in turn requires roughly 30 battalions.

With a 20 percent strategic reserve, the ideal USMC capacity for a two-MRC force-sizing construct is 36 battalions. However, the Corps has repeatedly made the case that it is a one-war force that must also have the ability to serve as the nation's crisis-response force.[95] It has just as consistently resisted growing in end strength even during the years of high operational demand associated with peak activities in Operation Iraqi Freedom (Iraq) and Operation Enduring Freedom (Afghanistan). Most recently, General Berger has stated flatly that the Corps will trade manpower for modernization and that he intends to shrink the Corps from its current 24 infantry battalions to 21 battalions in order both to free resources so that they can be applied to new formations and to maintain capability investments in other areas such as Marine Special Operations Command.[96]

Manpower is by far the biggest expense for the Marines. As allocated for the Corps' FY 2020 budget, the military personnel account was approximately $14.2 billion,[97] dwarfing both the almost $9.4 billion allocated for operation and maintenance[98] and the $2.99 billion allocated for the procurement of new equipment.[99] Nevertheless, the historical record of the use of Marine Corps forces in a major contingency argues for the larger number. More than 33,000 Marines, for example, were deployed in Korea, and more than 44,000 were deployed in Vietnam. In the Persian Gulf, one of the largest Marine Corps missions in U.S. history, some 90,000 Marines were deployed, and approximately 66,000 were deployed for Operation Iraqi Freedom.

One could reasonably presume that in a war with China, the demand for forces would be similar to the demands in these historical instances of Marine Corps employment. China is the pacing threat for the Corps. It is developing new tools and operational concepts that will likely require that Marine Corps forces be distributed across a large, contested littoral battlespace. But because the Corps has not yet determined, much less revealed, what its envisioned formations will require,

we can only assess the service's current status against historical demand. Consequently, even a one-major-war Marine Corps should possess a larger end strength and more tactical units (infantry battalions as the surrogate measure for the total Corps) than it currently has.

As a one-war force that also needs the ability to provide crisis-response forces, to sustain operations in the face of combat losses, and to sustain its support to efforts that are not USMC-specific such as its service component contribution to U.S. Special Operations Command, the Corps should have a minimum of 30 battalions.

- **One-MRC-Plus Level:** 30 battalions.

- **Actual 2020 Level:** 24 battalions.

The Corps is operating with 80 percent of the number of battalions it should have relative to the revised benchmark set by this *Index* and has stated its intent to shrink from its current 24 battalions to 21 battalions. Marine Corps capacity is therefore scored as "marginal," an improvement from its *2020 Index* score of "weak" but only because the bar has been lowered. Reducing operational strength by three battalions, or 12.5 percent, would drive the Corps' capacity score down to "weak" again.

Capability Score: Marginal

The Corps receives scores of "weak" for "Capability of Equipment," "marginal" for "Age of Equipment" and "Health of Modernization Programs," but "strong" for "Size of Modernization Program." Therefore, the aggregate score for Marine Corps capability is "marginal."

Readiness Score: Marginal

As in previous years, the Marine Corps again prioritized next-to-deploy units during FY 2020. As the nation's crisis-response force, the Corps requires that all units, whether deployed or non-deployed, must be ready. However, since most Marine Corps ground units are meeting readiness requirements only immediately before deployment and the Corps' "ready

bench" would "not be as capable as necessary" if deployed on short notice, USMC readiness is sufficient to meet ongoing commitments only at reported deployment-to-dwell ratios of 1:2. This means that only a third of the force—the deployed force—could be considered fully ready. In testimony provided to various committees of the House and Senate and in its publicly available program documents, the Marine Corps has made gains in aviation unit readiness, but even 80 percent means four out of five planes are ready for action on its best day.

Marine Corps officials have emphasized a positive upward trend in general force readiness as a consequence of additional funding provided by Congress since FY 2018. The lack of a "ready bench" in depth (too few units and shortages of personnel in key maintenance fields) and lingering challenges in readiness levels among the USMC aircraft fleet perhaps offset some of the gains made by increased effort, funding, and focus, but the *2021 Index* assesses Marine Corps readiness levels as "marginal," an improvement over the *2019* score of "weak" and a reflection of the fact that the gains acknowledged in the *2020 Index* have been preserved.

Overall U.S. Marine Corps Score: Marginal

Marine Corps congressional testimony during FY 2020 was generally optimistic. Continued funding for readiness and an emphasis on modernization give strong support to the Corps' readiness-recovery efforts, but it will take time for their effects to materialize across the force, especially in light of the Corps' plans to shift its organizational and operational posture. Hence the need for continued attention and support from the Administration and Congress. Gains have been made and maintained over the past few years, and as a result, the Marine Corps has maintained its overall score of "marginal" in the *2021 Index*, which is in line with its sister services and a welcome return from its overall assessment of "weak" in 2018 and 2019.

U.S. Military Power: Marine Corps

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✔		
Capability			✔		
Readiness			✔		
OVERALL			✔		

MARINE CORPS SCORES

Procurement and Spending ■ Through FY 2020 ▪ Pending

Main Battle Tank

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
M1A1 Abrams Inventory: **447** Fleet age: **17** Date: **1990** The M1A1 Abrams is the main battle tank and provides the Marine Corps with heavy-armor direct fire capabilities. It is expected to remain in service beyond 2028. In FY 2020, the Commandant of the Marine Corps directed the service to divest its tank capability. The Corps began disestablishing its tank units in July 2020. All main battle tanks will be retired from the service by the end of FY 2021, transferred to the U.S. Army for future use.	③	④	None		

Light Wheeled Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
HMMWV Inventory: **15,390** Fleet age: **22** Date: **1983** The HMMWV is a light-wheeled vehicle used to transport troops with some protection against light arms, blast, and fragmentation. The expected life span of the HMMWV is 15 years. Some HMMWVs will be replaced by the Joint Light Tactical Vehicle (JLTV).	②	①	**Joint Light Tactical Vehicle (JLTV)** Timeline: **2017–2022** The JLTV is a vehicle program meant to replace all of the HMMWVs and improve reliability, survivability, and strategic and operational transportability. This is a joint program with the Army. Full-rate production is scheduled for early 2019. JLTVs should be at full operational capability in FY 2022. The first set of JLTVs were fielded in March 2019. IOC was achieved in mid-summer 2019 with fielding at Camp Lejeune, N.C. **PROCUREMENT** 3,779 11,221 **SPENDING** (*$ millions*) $1,531 $5,586	⑤	⑤

NOTES: See page 457 for details on ages, dates, timelines, and procurement spending. JLTV spending figures reflect the full joint program spending.

1 **2** **3** **4** **5**

Weakest ⟶ Strongest

Procurement and Spending ■ Through FY 2020   ■ Pending

Amphibious Assault Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
AAV Inventory: **1,200** Fleet age: **42** Date: **1972** The Amphibious Assault Vehicle transports troops and cargo from ship to shore. In September 2018, the USMC cancelled a survivability upgrade for this platform.	**1**		**Amphibious Combat Vehicle (ACV)** Timeline: **2018–2021** The ACV is intended to replace the aging AAV. The first ACVs are expected to be fielded in 2020. Full operational capability is scheduled for 2023.	**3**	**5**
LAV-25 Inventory: **695** Fleet age: **38** Date: **1983** The LAV is a wheeled light armor vehicle with modest amphibious capability used for armored reconnaissance and highly mobile fire support. It has undergone several service life extensions (most recently in 2012) and will be in service until 2035.	**2**	**1**	PROCUREMENT SPENDING ($ millions) 112 524 $624 $3,034		

Attack Helicopters

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
AH-1W Super Cobra Inventory: **20** Fleet age: **25** Date: **1986** The Super Cobra is an attack helicopter that provides the Marines with close air support and armed reconnaissance. The Super Cobra will remain in service until 2021. It is being replaced by the AH-1Z.	**1**	**2**	**AH-1Z** Timeline: **2014–2022** The new AH-1Z Viper program is part of a larger modification program to the H-1 platform. Replacing the AH-1W, the Z-Variant will serve as the next generation of attack aircraft. The new H-1 rotorcraft will have upgraded avionics, rotor blades, transmissions, landing gear, and structural modifications to enhance speed, maneuverability, and payload. It is scheduled for full operational capability in 2021.	**5**	**5**
AH-1Z Viper Inventory: **125** Fleet age: **7** Date: **2010** The AH-1Z Viper is the follow-on to the AH-1W Cobra attack helicopter. The Viper has greater speed, payload, and range, as well as a more advanced cockpit. It is gradually replacing the Cobra-variant and should do so fully by 2021. The expected operational life span of the Viper is 30 years.	**5**	**5**	PROCUREMENT SPENDING ($ millions) 189 $6,012 $7		

NOTE: See page 457 for details on ages, dates, timelines, and procurement spending.

① ② ③ ④ ⑤
Weakest ⟵⟶ Strongest

Procurement and Spending ■ Through FY 2020 ■ Pending

Airborne Electronic Attack Aircraft/ Ground Attack Aircraft

PLATFORM	Age Score	Capability Score
AV-8B Inventory: **109** Fleet age: **29** Date: **1985** The Harrier is a vertical/short takeoff and landing aircraft designed to fly from LHA/LHDs. It provides strike and reconnaissance capabilities. The aircraft is being replaced by the F-35B and will be fully retired around 2024.	⑤	①
F-35B Inventory: **83** Fleet age: **4** Date: **2015** The F-35B is the Marine Corps' short takeoff and vertical landing variant replacing the AV-8B Harrier. Despite some development problems, the F-35B achieved IOC in July 2015.	⑤	⑤
F/A-18 A-D Inventory: **224** Fleet age: **30** Date: **1978** Many aircraft in the F/A-18 fleet have logged about 8,000 hours compared with the originally intended 6,000. However, the fleet life has been extended until 2030. This is necessary to bridge the gap to when the F-35Bs and F-35Cs are available.	②	②

REPLACEMENT PROGRAM	Size Score	Health Score
F-35B/C Timeline: **2007–2031**	④	④

The Marine Corps is purchasing 353 F-35Bs and 67 F-35Cs. The F-35B is the USMC version of the Joint Strike Fighter program. It is meant to replace the AV-8B Harrier, completing transition by 2030. The B-Variant achieved initial operational capability in July 2015. Full operational capability for both variants is expected in the late 2020s. The F-35C is the version built for employment on aircraft carriers. It is primarily for the U.S. Navy, but the Marines augment carrier operations and will use the F-35C for this purpose.

PROCUREMENT

124   245

SPENDING *($ millions)*

$16,821 $27,853

NOTE: See page 457 for details on ages, dates, timelines, and procurement spending.

MARINE CORPS SCORES

1 **2** **3** **4** **5**
Weakest ⟵ ⟶ Strongest

Procurement and Spending ■ Through FY 2020 ▪ Pending

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
MV-22 Inventory: **309** Fleet age: **14** Date: **2007** The Osprey is a vertical takeoff and landing tilt-rotor platform designed to support expeditionary assault, cargo lift, and raid operations. The program is still in production. The life expectancy of the MV-22 is 23 years.	**4**	**5**	**MV-22B** Timeline: **2007–2019** Fielding of the Osprey was completed in 2019 with the MV-22 replacing the CH-46E helicopter, and the platform is meeting performance requirements. The modernization program is not facing any serious issues.	**5**	**5**

PROCUREMENT 349 / 11

SPENDING (*$ millions*) $30,782 / $3,087

Heavy Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
CH-53E Super Stallion Inventory: **138** Fleet age: **29** Date: **1981** The CH-53E is a heavy-lift rotorcraft. The aircraft will be replaced by the CH-53K, which will have a greater lift capacity. The program life of the CH-53E is 41 years.	**2**	**1**	**CH-53K** Timeline: **2017–2029** The program is in development. It is meant to replace the CH-53E and provide increased range, survivability, and payload. The program still has not fully developed the critical technology necessary. The helicopter is scheduled to complete initial testing in 2021 and be fielded as early as 2023.	**5**	**3**

PROCUREMENT 20 / 176

SPENDING (*$ millions*) $3,030 / $18,026

Tanker

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
KC-130J Inventory: **45** Fleet age: **9** Date: **2005** The KC-130J is both a tanker and transport aircraft. It can transport troops, provide imagery reconnaissance, and perform tactical aerial refueling. This platform is currently in production. The airframe is expected to last 38 years.	**4**	**5**	**KC-130J** Timeline: **2005–2031** The KC-130J is both a tanker and transport aircraft. The procurement program for the KC-130J is not facing acquisition problems.	**4**	**4**

PROCUREMENT 68 / 43

SPENDING (*$ millions*) $4,676 / $5,111

NOTES: See Methodology for descriptions of scores. Fleet age is the average between the last year of procurement and the first year of initial operational capability. The date is when the platform reached initial operational capability. The timeline is from start of the platform's program to its budgetary conclusion. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E). The total program dollar value reflects the full F–35 joint program, including engine procurement. As part of the F–35 program, the Navy is purchasing 67 F-35Cs for the U.S. Marine Corps that are included here. The MV-22B program also includes some costs from U.S. Air Force procurement. AH–1Z costs include costs of UH–1 procurement.

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31. Geurts, Rudder, and Conn, statement on "Department of the Navy Aviation Programs," April 10, 2019, p. 8.

32. Lieutenant General Brian D. Beaudreault, Deputy Commandant, Plans, Policies, and Operations, U.S. Marine Corps, statement on "Amphibious Warfare Readiness and Training—Interoperability, Shortfalls, and the Way Ahead" before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, December 1, 2017, p. 3, https://docs.house.gov/meetings/AS/AS03/20171201/106681/HHRG-115-AS03-Wstate-BeaudreaultB-20171201.pdf (accessed July 30, 2020).

33. Naval Sea Systems Command, "Naval Vessel Register," last updated July 28, 2020, https://www.nvr.navy.mil/NVRSHIPS/FLEETSIZE.HTML (accessed July 30, 2020).

34. On July 11, 2019, General David Berger assumed command of the U.S. Marine Corps as 38th Commandant. A short five days later, he issued his "Commandant's Planning Guidance" to announce his priorities for the service. Parting with years of practice, General Berger stated that the Corps would "no longer use a '2.0 MEB requirement' as the foundation for our arguments regarding amphibious ship building" and would "no longer reference the 38-ship requirement memo from 2009, or the 2016 Force Structure Assessment, as the basis for" USMC force structure naval amphibious support requirements. U.S. Marine Corps, "Commandant's Planning Guidance: 38th Commandant of the Marine Corps," p. 4, https://www.hqmc.marines.mil/Portals/142/Docs/%2038th%20Commandant%27s%20Planning%20Guidance_2019.pdf?ver=2019-07-16-200152-700 (accessed July 30, 2020).

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36. General Glenn Walters, Assistant Commandant of the Marine Corps, statement on "Marine Corps Readiness" before the Subcommittee on Readiness, Committee on Armed Services, U.S. Senate, February 8, 2017, p. 5, https://www.armed-services.senate.gov/imo/media/doc/Walters_02-08-17.pdf (accessed July 30, 2020).

37. U.S. Marine Corps, "Commandant's Planning Guidance, 38th Commandant of the Marine Corps," p. 4.

38. General John Paxton, Assistant Commandant, United States Marine Corps, statement on Marine Corps readiness and FY 2016 budget request before the Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate, March 25, 2015, pp. 10–11, http://www.armed-services.senate.gov/imo/media/doc/Paxton_03-25-15.pdf (accessed July 30, 2020). The Corps' emphasis on acquiring the ACV was revalidated during recent congressional testimony. See The Honorable James F. Geurts, Assistant Secretary of the Navy for Research, Development and Acquisition ASN(RD&A), and Lieutenant General David H. Berger, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat

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39. U.S. Department of the Navy, *Department of the Navy FY 2019 President's Budget*, p. 8, and General Robert B. Neller, Commandant of the Marine Corps, statement on "The Posture of the United States Marine Corps" before the Subcommittee on Defense, Committee on Appropriations, U.S. Senate, May 1, 2019, p. [9], https://www.appropriations.senate.gov/imo/media/doc/05.01.19--Neller%20Testimony.pdf (accessed July 30, 2020).

40. U.S. Department of the Navy, Office of Budget, *Highlights of the Department of the Navy FY 2021 Budget*, p. 1-7.

41. As of March 2018, "Our AAVs [were] now more than four decades old. Additionally, the average age of LAV's within our inventory [was] 26 years." Lieutenant General Michael Dana, Deputy Commandant, Installations and Logistics, statement on "Marine Corps Readiness" before the Subcommittee on Readiness, Committee on Armed Services, U.S. House of Representatives, March 6, 2018, p. 3, https://docs.house.gov/meetings/AS/AS03/20180306/106942/HHRG-115-AS03-Wstate-DanaM-20180306.pdf (accessed July 31, 2020). Ages reported at that time have been increased to account for the passage of time.

42. Megan Eckstein, "Marine Corps Cancels AAV Survivability Upgrade," U.S. Naval Institute News, September 25, 2018, https://news.usni.org/2018/09/25/marine-corps-cancels-aav-survivability-upgrade (accessed July 31, 2020).

43. U.S. Department of the Navy, Office of Budget, *Highlights of the Department of the Navy FY 2021 Budget*, p. 3-14.

44. Figure 3.12, "Marine Corps Expeditionary Equipment Depot," in ibid., p. 3-15.

45. Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration, and Commanding General, Marine Corps Combat Development Command, and Brigadier General Joseph Shrader, Commander, Marine Corps Systems Command, statement on "Fiscal Year 2019 Ground Forces Modernization Programs" in hearing, *Ground Force Modernization Budget Request for Fiscal Year 2019*, Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, U.S. House of Representatives, 115th Cong., 2nd Sess., April 18, 2018, p. 52, https://www.hsdl.org/?view&did=829617 (accessed August 4, 2020).

46. The average age of the M1A1 in 2016 was 26 years. Paxton, statement on "U.S. Marine Corps Readiness," March 15, 2016, p. 15. No new M1A1 Abrams have been commissioned since that time, so the average age is estimated as 28 years in 2018.

47. Chart, "Ground Equipment Age," in U.S. Marine Corps, *Concepts and Programs*, 2014, p. 261, https://www.candp.marines.mil/Portals/216/documents/CNP%20Publications/CNP_2014.pdf?ver=2018-03-08-090028-247 (accessed July 31, 2020).

48. In March 2020, USMC Commandant General David H. Berger directed the service to divest its M1A1 Abrams main battle tanks and related support capabilities (such as its heavy bridging assets), noting their lack of relevance to the future operating environment for which he envisioned the Corps needed to prepare. In July 2020, the Corps began to disestablish its tanks units in a process that is likely to be completed by the end of FY 2021. See Berger, "Force Design 2030," U.S. Marine Corps. pp. 7–9, and Chad Garland, "A Farewell to Armor: Marine Corps Shuts Down Tank Units, Hauls Away M1A1s," *Stars and Stripes*, July 30, 2020, https://www.stripes.com/news/marine-corps/a-farewell-to-armor-marine-corps-shuts-down-tank-units-hauls-away-m1a1s-1.639355 (accessed October 12, 2020).

49. Exhibit P-1, "FY 2021 President's Budget, Total Obligational Authority," in U.S. Department of the Navy, Office of Budget, *Department of the Navy FY 2021 Budget: Supporting Exhibits (M-1, O-1, P-1, R-1 & C-1)*, January 22, 2020, p. N-1A, https://www.secnav.navy.mil/fmc/fmb/Documents/21pres/Supp_Book.pdf (accessed August 4, 2020), and Exhibit P-1, "FY 2021 President's Budget, Total Obligational Authority," in U.S. Department of the Navy, *Department of Defense Fiscal Year (FY) 2021 Budget Estimates, Navy, Justification Book Volume 1 of 1: Procurement, Marine Corps*, February 2020, p. viii, https://www.secnav.navy.mil/fmc/fmb/Documents/21pres/PMC_Book.pdf (accessed August 4, 2020).

50. International Institute for Strategic Studies, *The Military Balance 2018: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2017) p. 53, and U.S. Marine Corps, *2018 Marine Aviation Plan*, p. 45.

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52. Geurts, Rudder, and Conn, statement on "Department of the Navy Aviation Programs," April 10, 2019, p. 4.

53. Ibid., p. 3.

54. U.S. Marine Corps, *2018 Marine Aviation Plan*, p. 56.

55. Vice Admiral Paul Grosklags, Representing Assistant Secretary of the Navy (Research, Development and Acquisition); Lieutenant General Jon Davis, Deputy Commandant for Aviation; and Rear Admiral Michael C. Manazir, Director Air Warfare, statement on "Department of the Navy's Aviation Programs" before the Subcommittee on Seapower, Committee on Armed Services, U.S. Senate, April 20, 2016, p. 3, http://www.armed-services.senate.gov/imo/media/doc/Grosklags-Davis-Manazir_04-20-16.pdf (accessed July 31, 2020), and U.S. Marine Corps, *2018 Marine Aviation Plan*, p. 35.

56. Megan Eckstein, "Marines Declare Initial Operational Capability on F-35B Joint Strike Fighter," U.S. Naval Institute News, July 31, 2015, https://news.usni.org/2015/07/31/marines-declare-initial-operational-capability-on-f-35b-joint-strike-fighter (accessed July 31, 2020), and U.S. Marine Corps, 2019 Marine Corps Aviation Plan, p. 36.

57. Gina Harkins, "Marine F-35s Dropped a Bunch of Bombs on ISIS During 1st Middle East Deployment," Military.com, February 25, 2019, https://www.military.com/daily-news/2019/02/25/marine-f-35s-dropped-bunch-bombs-isis-during-1st-middle-east-deployment.html (accessed July 31, 2020).

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96.	Berger, "Force Design 2030," pp. 2, 7, 8, and 11.

97.	Table, "Military Personnel, Marine Corps," in U.S. Department of the Navy, Office of Budget, *Highlights of the Department of the Navy FY 2021 Budget*, p. A-2.

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U.S. Space Force

John Venable

The U.S. Space Force (USSF) was created with enactment of the fiscal year (FY) 2020 National Defense Authorization Act (NDAA) on December 20, 2019.[1] Established as the fifth uniformed service within the Department of Defense and the second service within the Department of the Air Force (DOAF), the service will reside under the direction and leadership of the Secretary of the Air Force. The Act specifies that a four-star general will serve as Chief of Space Operations (CSO) and a full member of the Joint Chiefs of Staff.

The mission of this newest service is to organize, train, and equip forces "to protect U.S. and allied interests in space and to provide space capabilities to the joint force." Its responsibilities include "developing military space professionals, acquiring military space systems, maturing the military doctrine for space power, and organizing space forces to present to our Combatant Commands."[2]

Background

More than any other nation, America has enjoyed the technological advantages of space, and we now rely on it for nearly every aspect of our lives. Banking, commerce, travel, entertainment, the functions of government, and our military all depend on our assets in space.[3]

The importance of space has been recognized by every U.S. President since Dwight Eisenhower in the mid-1950s. While no service had the lead for developing capabilities in this new domain, the Air Force "claimed" defense-support space missions such as communications,

reconnaissance, and navigation as inherently part of airpower. It also saw real potential in on-orbit anti-satellite and anti-missile systems and wanted to pursue those capabilities. President Eisenhower fully embraced defense-support missions but moved to preserve the domain for commerce and exploration by establishing a policy of "space for peaceful purposes."[4]

In 1961, the Air Force was named executive agent for space research and development, but at that point, the Army and Navy already had well-established programs.[5] By the end of the Eisenhower Administration, the splintering of space command and control within the Defense Department had taken hold, as had the President's policy of "space for peaceful purposes." Those two predilections would be sustained by every Administration for the next six decades, shaping (often unwittingly) every aspect of space policy and effectively preventing DOD from even recognizing this critical arena as a warfighting domain.

The effectiveness of the DOD's space support missions was put on full display during Operation Desert Storm,[6] and adversary nations did much more than take note. They recognized the growing U.S. dependence on space and began to position themselves to move against it. As early as 2001, a congressionally mandated report warned of our growing dependence on space and the vulnerability of U.S. assets in that domain and ultimately recommended establishing a Space Corps within the DOAF.[7] Those recommendations were set aside following the terrorist attacks of

September 11, 2001, and by the mid-2010s, the command and control of space had fragmented across at least 60 different DOD offices.[8] All the while, U.S. reliance on GPS for air, land, and sea maneuver, targeting, and engagement has grown to the point of being nearly universal, exposing a critical vulnerability that our adversaries have moved to exploit.

Both China and Russia have developed doctrine, organizations, and capabilities to challenge U.S. access to and operations in the space domain. Concurrently, their use of space is expanding significantly. Both nations regard space access and denial as critical components of their national and military strategies[9] and are investing heavily in ground-based anti-satellite (ASAT) missiles and orbital ASAT programs that may deliver a kinetic strike capability,[10] as well as co-orbital robotic interference that can alter signals and mask denial efforts, or even pull adversary satellites necessary for surveillance, navigation, and targeting out of orbit.[11] These nations have demonstrated the capability to put American space assets at risk, and until very recently, the United States had not taken steps to protect those systems, much less to develop its own warfighting capability in that domain.

The 2017 NDAA mandated that DOD conduct a review of the organization and command and control of space assets within the department. Shortly after the passage of the NDAA, President Donald Trump directed that a Space Force be established within the DOAF.[12] The final report from the DOD study was issued in August of 2018 and recommended a two-phased approach to put DOD on the right path to dominate space. The first phase outlined three actions the Administration could take using its inherent authority:

- Establishing the Space Development Agency (SDA);

- Identifying the space professionals in each of the four armed services; and

- Creating a new combatant command for space.

Those elements were deemed critical to developing a credible warfighting capability and the uniformed service that would be formed to sustain it. The second phase required Congress to draft legislation creating the new service.

Space Development Agency (SDA). Equipping America's military for space operations has been a challenge for several decades because of the fragmentation and overlap in the organizations that define the requirements and control the acquisition process.[13] Six different organizations managed requirements, and eight others dealt with acquisition with no single entity or individual in charge of either process. The associated dysfunction contributed to program delays, cost increases, and even system cancellations.[14] The Administration established the SDA to deal with those issues.

The SDA's "charge is to create and sustain lethal, resilient, threat-driven, and affordable military space capabilities that provide persistent, resilient, global, low-latency surveillance to deter or defeat adversaries."[15] The SDA currently reports to the Under Secretary of Defense for Research and Engineering but will be realigned under the U.S. Space Force as the service gains more traction.[16]

Identifying the Pool of Space Personnel and Assets. As a key step in standing up the Space Force, the services were required to identify the uniformed and civilian personnel from which the new service could draw to build a space cadre capable of dominating that domain. The Administration directed each of the services, the National Guard, and Reserve to identify their military and civilian space professionals for placement in a pool known as the Space Operations Force. Although the forces will remain in their respective parent organizations, this directive required that they be managed as one community.

United States Space Command (USSPACECOM)

The President completed the third step of the first phase on December 18, 2019, by amending the Unified Command Plan (UCP) to reestablish U.S. Space Command as the 11th

combatant command within the Department of Defense.[17] As a geographic combatant command, USSPACECOM is now responsible for the region from 100 kilometers above sea level and beyond.[18]

USSPACECOM's mission is to conduct "operations in, from, and to space to deter conflict and, if necessary, defeat aggression." It will defend U.S. vital interests and integrate as seamlessly as possible with the other Combatant Commanders by delivering space combat power to the Joint Force and National Command Authorities. Currently headquartered at Peterson Air Force Base, Colorado, USSPACECOM is commanded by General Jay Raymond.[19]

USSPACECOM has two principal subordinate organizations: the Combined Force Space Component Command (CFSCC) and Joint Task Force–Space Defense (JTF–SD).

Combined Force Space Component Command. CFSCC is located at Vandenberg Air Force Base, California, and its mission is "to plan, integrate, conduct, and assess global space operations in order to deliver combat relevant space capabilities to Combatant Commanders, Coalition partners, the Joint Force, and the Nation." CFSCC plans and executes space operations through four operations centers:

- The Combined Space Operations Center (CSpOC) at Vandenberg Air Force Base, California;

- The Missile Warning Center (MWC) at Cheyenne Mountain Air Force Station, Colorado;

- The Joint Overhead Persistent Infrared Planning Center (JOPC) at Buckley Air Force Base, Colorado; and

- The Joint Navigation Warfare Center (JNWC) at Kirtland Air Force Base, New Mexico.

It also "executes tactical control over globally dispersed Air Force, Army, and Navy space units that command ground-based space capabilities and satellites in every orbital regime.[20]

Joint Task Force–Space Defense. In the words of its commander, Army Brigadier General Thomas James, JTF–SD's mission is "space superiority operations."[21] JTF–SD will protect and defend space assets from threats that are both terrestrial-based and in orbit. In that role, it is to organize and align the efforts of the Defense Department, the intelligence community, and the commercial sector to address threats in space and unify plans and efforts for related activities in orbit.[22] One of the many challenges associated with hostile actions or intent is to identify, characterize, and be able to attribute those threats or actions to specific entities, actors, and/or nation-states to enable decisive responses to deal with those threats. JTF–SD has that mission.

JTF–SD is comprised of "the National Space Defense Center [NSDC], space situational awareness units and emerging space defense units."[23] The NSDC was previously known as the Joint Interagency Combined Space Operations Center (JICSpOC) and is located at Schriever Air Force Base, Colorado.

The USSPACECOM commander executes his peacetime and wartime roles with equipment and personnel provided by the Army, Navy, Air Force, and Marines. Those four services were established within DOD by Title 10 of the U.S. Code to organize, train, and equip for missions in each of their respective domains, and all have developed their own standards, organizations, equipment, and personnel for their respective missions.

Despite the fact that the space mission has been ongoing for several decades, there has been no force provider to the space warfighting command specifically focused on doctrine, threats, strategy, tactics, or standards as there is for the other domains. The Air Force has maintained the preponderance of space systems and assets, but all four services have space professionals as well as assets, disparate units, and organizations that are critical enablers for the mission in the space domain.

By establishing Space Command, the SDA, and the Space Operational Force, the Administration set the stage for Congress to execute the second phase of the plan by reorganizing DOD's space assets into the Space Force. Congress included the legislation establishing the U.S. Space Force as the second service within the Department of the Air Force in the FY 2020 NDAA. The law formally amends Title 10 of the U.S. Code to include the Space Force as the sixth of the nation's armed forces.[24]

U.S. Space Force Organization

The USSF Headquarters and Office of the Chief of Space Operations (OCSO) are located in the Pentagon. During its first year of existence, the OCSO is focused on establishing a fully functioning headquarters; preparing to execute the full scope of its organize, train, and equip responsibilities; and, in conjunction with the U.S. Air Force, developing a detailed plan to transfer forces into the U.S. Space Force.

With the redesignation of Air Force Space Command (AFSPC) as U.S. Space Force, "about 16,000 Air Force active duty and civilian personnel" were assigned to support this new service,[25] but only a handful have officially transferred to the Space Force. Most are still wearing the same uniforms and holding the same seats in the same offices they occupied a year ago.[26]

In an effort to reduce cost and avoid duplication, the OCSO is leveraging the DOAF for the vast majority of its support functions. These functions include logistics, base operating support, civilian personnel management, business systems, information technology support, and audit agencies, adding up to approximately 75 percent of its support requirements.[27]

When Congress authorized the Space Force, it limited the scope of the new service to Air Force personnel and assets, equating to a total workforce of 27,300[28] comprised of personnel and organizations on five major installations:

- The 21st Space Wing at Peterson Air Force Base, Colorado;

- The 30th Space Wing at Vandenberg Air Force Base, California;

- The 45th Space Wing at Patrick Air Force Base, Florida;

- The 50th Space Wing at Schriever Air Force Base, Colorado; and

- The 460th Space Wing at Buckley Air Force Base, Colorado.[29]

Methodically expanding the Space Force to include all DOAF military and civilian personnel at those locations will likely take at least another full year.

But even when combined with the new geographic combatant command for space, a service formed just from Air Force assets will not remedy the dysfunctional oversight or command and control issues that the Space Force initiative was intended to resolve.[30] For that to happen, a significant portion of the remaining 21,200 space professionals in the Army and Navy[31] need to be incorporated into the Space Force. The Army Space and Missile Defense Headquarters at Redstone Arsenal, Alabama, should be considered for incorporation into the Space Force, at least in part.[32] The naval organizations and assets that should be considered for transfer include components of the Naval Warfare Systems Command, formerly the Space and Naval Warfare Systems Command (SPAWAR), San Diego, California,[33] and the Navy Satellite Operations Center (NAS), Point Mugu, California.[34]

The FY 2020 NDAA also included space acquisition reform. The act established an Assistant Secretary of the Air Force for Space Acquisition and Integration (ASAF/SP) to serve as the senior space architect within the DOAF and directed that the SDA, Space Rapid Capabilities Office, and Space and Missile Systems Center be consolidated under the ASAF/SP's control.

On May 20, 2020, the DOAF delivered a report to Congress on a new plan for space acquisition. The report proposes nine specific

actions to increase the speed of space acquisition capabilities, but the plan does not recommend establishing an additional service acquisition executive for space.[35]

Funding

The President's FY 2020 budget request included more than $72 million to get the new service up and running,[36] but by the time the Defense Department appropriations bill was signed in December, Congress had budgeted little more than half of that amount: Just $40 million was enacted.[37] While seemingly paltry on the surface, the $72 million was an estimate based on the assumption that Congress would establish a space force but with no certainty about when funding would arrive, how big the new service would become, or how fast it could grow to that level.

Of the approximately $72 million total, $53.8 million was budgeted for operations and maintenance (O&M) and for studies to determine, among other things, the new service's "future manpower and resource requirements."[38] That amount was based on a full year of spending, not a budget that would be approved three months into the fiscal year.[39] As it turns out, nine months of a 12-month $72 million budget equates to $39.75 million, and Congress actually appropriated $250,000 above that amount for O&M.[40]

In addition, $19 million of the President's FY 2020 budget was set aside to fund manning for the Space Force, including 160 new civilian billets to establish the service's headquarters.[41] With respect to compensation, several technical challenges arose within the DOAF military personnel system that would prevent the new service from readily paying its own personnel. For the time being, that task and its associated funding will remain with and be paid to Space Force personnel by the Air Force. Once an integrated DOAF pay system is fully operational, funding for personnel will be shifted directly to the new service.

The President's budget request for FY 2021 lays out a robust level of funding for every aspect of the new service's mission set. The budget for O&M is $2.5 billion; the budget for research, development, test, and evaluation (RDT&E) is $10.3 billion; and procurement adds another $2.4 billion for a total of $15.2 billion. Assuming that the President's budget is fully funded, Space Force end strength will be authorized up to 9,979 military and civilian personnel. The combination of robust funding and manpower levels will allow the OCSO to continue to focus on building a strong organizational foundation and filling critical billets with the right people.

Capacity and Capability

The classified nature of deployed space assets makes listing specific capacity levels within the Space Force portfolio—much less attempting to assess the service's capability to execute its mission—a challenging exercise. There is little question that the constellation of U.S. intelligence, surveillance, and reconnaissance (ISR), navigation, and communication satellites is unrivaled by that of any other nation-state. That array of assets allows the Space Force and its sister services to find, fix, and target virtually any terrestrial or sea-based threat anywhere on the surface of the Earth.

The capacity of the Space Force can be discussed in terms of the USSF's ability to meet persistent ISR, command and control, communications, weather forecasting, and navigation requirements through its satellite constellations and ground stations, as well as its capability to repair or expand that capacity with a robust and reliable launch capacity.

Satellite Constellations

The Space Force mission is conducted through a network of satellites, ground-based radar, ground stations, and situational awareness nodes. In 2018, the Secretary of the Air Force stated that "the Air Force operates 77 satellites vital to national security that provide communications, command and control, missile warning, nuclear detonation detection, weather and GPS for the world."[42] These satellite capabilities now reside within the Space Force.

Global Positioning System (31 Satellites). Perhaps the best-known constellation of satellites under Space Force control is the global positioning system (GPS). This system provides timing, velocity, and precise navigation for millions of simultaneous users around the world. It takes 24 of these satellites to provide seamless global coverage, and 31 (seven of which provide backup capability) are currently on station. GPS III is the latest upgrade to the platform and incorporates a more robust anti-jamming capability. In addition, its interoperability with other Global Navigation Satellite Systems (GNSS) such as the European Galileo network and the Japanese Quazi-Zenith Satellite System adds an impressive level of resiliency.[43]

Space-Based Infra-Red System (Six Satellites). The Space-based Infrared System (SBIRS) is an integrated constellation of satellites designed to deliver early missile warning and provide intercept cues for missile defenses. This surveillance network was designed to incorporate three satellites in high elliptical orbit (HEO) and eight others in geosynchronous orbit (GEO), each working in concert with ground-based data processing and command and control centers.

SBIRS HEO is a retaskable orbit, which means that these satellites can be moved to more optimum orbits/viewpoints as mission requirements dictate. These platforms include a scanning sensor array composed of short-wave and mid-wave infrared radars that can detect infrared activity close to the ground. Development began in 1996, and the first SBIRS HEO payload (HEO-1) was delivered in June 2006, followed in March 2008 by HEO-2,[44] putting sensor packages with sensitivity that exceeded the program's specifications on orbit.[45] HEO-3 and HEO-4 were put in orbit on December 13, 2014, and September 24, 2017, respectively.[46]

Sometime after the first HEO orbit was established, several cost, schedule, and performance issues arose, and the Air Force determined that it was better to stay on schedule and reduce the number of SIBRS GEO satellites in the constellation.[47] In 2017, the Air Force decided to remove funding for GEO vehicles 7 and 8, bringing an early end to SBIRS production. To date, four SBIRS GEO satellites have been placed in orbit, with the final two vehicles (GEO-5 and GEO-6), expected to launch in 2021 and 2022, respectively.[48]

The funding that was removed from SBIRS shifted to a new program, Next Generation Overhead Persistent Infrared (Next-Gen OPIR), which will include a new ground-control system. The objectives of the program are to deliver resilient detection and tracking capability through a contested environment that includes emerging advances in adversary rocket propulsion technology. It is expected that fielding of a strategically survivable constellation of satellites to provide missile warning will begin sometime in FY 2023.[49]

Defense Support Program (Five Satellites). Defense Support Program (DSP) satellites were designed to detect launches of intercontinental ballistic missiles or Submarine Launched Ballistic Missiles (SLBMs) against the U.S. and its allies. Its secondary missions include the detection of space launch missions or nuclear weapons testing/detonations. The DSP constellation is in GEO orbit and uses infrared sensors to pick up the heat from booster plumes against the Earth's background.

Phase 1 placed four satellites in orbit from 1970–1973[50] and was followed by Phase 2, which placed nine satellites in orbit from 1975–1987,[51] and Phase 3, which consisted of 10 DSP satellites launched from 1989–2007.[52] While Phase 3 DSP satellites have long exceeded their design lifetimes, reliability has exceeded expectations, and at least five[53] and as many as eight are still providing reliable data and are now integrated with or controlled by the SBIRS program ground station.[54]

Space Based Surveillance System (One Satellite). The Space Force maintains situational awareness of space objects through the space-based surveillance system (SBSS). The SBSS program began with a single Advanced Concept Technology Demonstration satellite known as the Midcourse Space Experiment

(MSX) satellite, which experimented with several systems including the Space Infrared Imaging Telescope (SPIRIT III); Ultraviolet and Visible Imagers and Spectrographic Imagers (UVISI); Space-Based Visible instrument (SBV); and On-board Signal and Data Processor (OSDP) systems. MSX ceased operations in June 2008 following the failure of the SBV.[55]

The follow-on satellite (SBSS 1) was launched on September 26, 2010.[56] SBSS 1 operates continually without the limitations of ground-based sensors that are constrained by weather, time of day, and atmosphere conditions in addition to tracking man-made orbiting objects and debris fields associated with those operations through a variety of sensors at an orbit altitude of 390 miles.[57]

Space Tracking and Surveillance System Advanced Technology Risk Reduction (One Satellite). The Space Tracking and Surveillance System Advanced Technology Risk Reduction (STSS-ATR) is an RDT&E program/satellite placed in orbit on May 5, 2009, by the Missile Defense Agency. This satellite was intended as a test platform to explore different capabilities and technology for missile defense.[58]

Geosynchronous Space Situational Awareness Program (Four Satellites). The Geosynchronous Space Situational Awareness Program (GSSAP) is a classified space surveillance constellation quietly developed by the Air Force and Orbital Sciences. Its mission is to deliver a Space Surveillance Network (SSN) for accurate tracking and characterization of man-made orbiting objects to U.S. Strategic Command.[59] GSSAP satellites employ electro-optical sensors to collect information on satellites and other objects in the GEO-belt region. This constellation of satellites is in near-geosynchronous orbit, and each satellite is maneuverable, which allows it to perform Rendezvous and Proximity Operations (RPO), or "maneuver near a resident space object of interest."[60]

Launched in pairs, the first two GSSAP spacecraft were put in orbit on July 28, 2014, followed by the second two on August 19, 2016. While these systems and their launch details

are classified, a third pair is scheduled for launch during the second half of 2020, which would increase this constellation to six satellites before year's end.[61]

Weather (Two Satellites). Defense weather satellites have been collecting weather data and providing forecasts for U.S. military operations since 1962 through the Defense Meteorological Satellite Program (DMSP).[62]

Currently, two operational DMSP satellites are in Low Earth Orbit (LEO) at an altitude of approximately 450 nautical miles. The main sensors for these weather satellites are optical, and each provides continuous visual and infrared imagery of cloud cover over an area approximately 1,600 nautical miles wide. Complete global coverage of weather features is accomplished every 14 hours.[63] That program is now managed by the Space Force, but the National Oceanographic and Atmospheric Administration (NOAA) has managed maintenance and operational control since 1998.

The National Polar-orbiting Operational Environmental Satellite System (NPOESS) has advanced microwave imagery-sounding data products that deliver improved prediction of ocean surface wind speed and direction, a major factor in predicting weather. NPOES 1 was launched in 2013, and NPOES 2 was launched in 2016; NPOES 3 and NPOES 4 are scheduled to launch in 2023 and 2026, respectively. Eventually, three NPOESS satellites moving in three orbital planes will replace the two-satellite DMSP constellation.[64] Four Geostationary Operational Environmental Satellites (GOES) operated by NOAA also feed terrestrial and space weather data to the National Weather Service on North, Central, and South America as well as the Atlantic and Pacific Oceans.[65]

The Space Force will field the next-generation weather satellite, the Weather System Follow-on Microwave (WSF-M) Satellite, in 2021. WSF-M will be an LEO satellite with a passive microwave imaging capability to map terrestrial weather and another device to monitor space weather.[66] The WSF-M is designed to cover ocean surface vector winds, tropical cyclone intensity, and "energetic charged

TABLE 14

U.S. Satellites Under Control of the U.S. Space Force

System	Function	Satellites
GPS	Navigation	31
WGS	Communications	10
DSCS	Communications	7
SBIRS	Missile warning	6
AEHF	Communications	5
DSP	Missile warning	5
Milstar	Communications	5
GSSAP	Space object tracking	4
DMSP	Weather	2
SBSS	Space surveillance	1
STSS-ATR	Missile defense	1
Total in Orbit		**77**

SOURCES: GPS.gov, "Space Segment: Current and Future Satellite Generations," last modified June 30, 2020, https://www.gps.gov/systems/gps/space/ (accessed August 19, 2020); Fact Sheet, "GPS III," Los Angeles Air Force Base, current as of April 2018, https://www.losangeles.af.mil/About-Us/Fact-Sheets/Article/343728/gps-iii/ (accessed August 19, 2020); Gunter's Space Page, "WGS 1, 2, 3 (WGS Block 1)," last update March 19, 2020, https://space.skyrocket.de/doc_sdat/wgs-1.htm (accessed August 19, 2020); Gunter's Space Page, "WGS 4, 5, 6, 7 (WGS Block 2)," last update March 19, 2020, https://space.skyrocket.de/doc_sdat/wgs-4.htm (accessed August 19, 2020); Gunter's Space Page, "WGS 8, 9, 10 (WGS Block 2 Follow-On)," last update April 27, 2020, https://space.skyrocket.de/doc_sdat/wgs-8.htm (accessed August 19, 2020); Fact Sheet, "Defense Satellite Communications System," U.S. Air Force, current as of November 2015, https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104555/defense-satellite-communications-system/ (accessed August 19, 2020); Gunter's Space Page, "Trumpet 4, 5 / SBIRS HEO-1, 2," last update August 14, 2020, https://space.skyrocket.de/doc_sdat/trumpet-fo.htm (accessed August 19, 2020); Gunter's Space Page, "Trumpet 6, 7 / SBIRS HEO-3, 4," last update August 14, 2020, https://space.skyrocket.de/doc_sdat/trumpet-fo-2.htm (accessed August 19, 2020); Center for Strategic and International Studies, Missile Defense Project, "Space Tracking and Surveillance System (STSS)," Missile Threat, last updated June 15, 2018, https://missile-threat.csis.org/defsys/stss/ (accessed August 19, 2020); Fact Sheet, "Advanced Extremely High Frequency System," U.S. Air Force Space Command, current as of July 2019, https://www.afspc.af.mil/About-Us/Fact-Sheets/Display/Article/249024/advanced-extreme-ly-high-frequency-system/ (accessed August 19, 2020); Table, "Spacecraft in Service over Time," in "Air Force & Space Force Almanac 2020," Air Force Magazine, Vol. 103, No. 6 (June 2020), p. 67, https://www.airforcemag.com/app/uploads/2020/06/June2020_Fullis-sue5.pdf (accessed August 19, 2020); Fact Sheet, "Defense Satellite Communications System," U.S. Air Force, current as of November 2015, https://www.af.mil/About-Us/Fact-Sheets/Display/Article/104555/defense-satellite-communications-system/ (accessed August 19, 2020); Gunter's Space Page, "GSSAP 1, 2, 3, 4, 5, 6 (Hornet 1, 2, 3, 4, 5, 6)," last update March 19, 2020, https://space.skyrocket.de/doc_sdat/gssap-1.htm (accessed August 19, 2020); Fact Sheet, "Defense Meteorological Satellite Program," U.S. Air Force Space Command, current as of July 2019, https://www.afspc.af.mil/About-Us/Fact-Sheets/Article/249019/defense-meteorological-satel-lite-program/ (accessed August 19, 2020); Gunter's Space Page, "MSX," last update December 11, 2017, https://space.skyrocket.de/doc_sdat/msx.htm (accessed August 19, 2020); Gunter's Space Page, "SBSS 1," last update December 11, 2017, https://space.skyrocket.de/doc_sdat/sbss-1.htm (accessed August 19, 2020); and Gunter's Space Page, "STSS-ATRR," last update July 21, 2019, https://space.skyrocket.de/doc_sdat/stss-atrr.htm (accessed August 19, 2020).
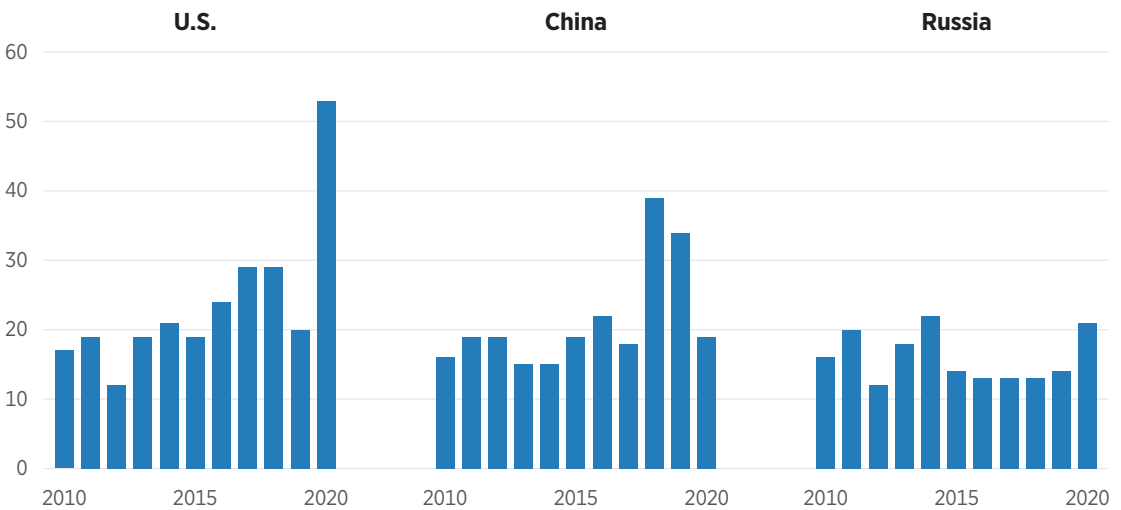
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particles" in LEO—three gaps in DOD's current weather monitoring capability.[67] The number of satellites that will be included in this constellation has yet to be defined, but the first satellite is currently scheduled to launch in 2023 and will be operated by the Space Force.

Communications (20 Satellites). Milstar is a satellite communications (SATCOM)

CHART 8

U.S., Chinese, and Russian Space Launches

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system designed in the 1980s to provide the National Command Authorities assured, survivable global communications with a low probability of intercept or detection. The technology built into this five-satellite constellation was crafted to overcome enemy jamming and nuclear effects and was considered the most robust and reliable SATCOM system within the Defense department when it was fielded.

The follow-on to Milstar is the Advanced Extremely High Frequency System (AEHF). This system is a network of satellites operated by the Space Force for the Joint Force that allows the Defense Department to sustain secure, jam-resistant communications and command and control (C2) for high-priority military ground, sea, and air assets located anywhere in the world. The current AEHF Constellation includes five satellites in GEO, with a sixth scheduled to launch in 2020.[68]

The Defense Satellite Communications System (DSCS) has seven operational satellites that provide nuclear-hardened, global communications to the Defense Department,

the Department of State, and the National Command Authorities. The system is capable of high data rates and provides anti-jamming capabilities.

Wideband Global SATCOM (10 Satellites). Wideband Global SATCOM (WGS) is a joint-service program funded by the U.S. Air Force and U.S. Army, along with international partners Australia and Canada, and is used by all DOD services as well as National Command Authorities. Once known as the Wideband Gapfiller Satellite,[69] WGS provides Super High Frequency (SHF) wideband communications, which uses direct broadcast satellite technology to provide C2 for U.S. and allied forces. This system has solid capabilities that include phased array antennas and digital signal processing technology, delivering a flexible architecture with a satellite life span of up to 14 years.

Each WGS satellite is capable of covering 19 independent areas within its field of view, and the constellation as a whole can serve warfighters between 65 degrees North and 65

CHART 9

Total U.S. Launches by Organization

Space X

2 · 2 · 3 · 5 · 7 · 10 · 18 · 20 · 13 · 31

2010 — 2015 — 2020

United Launch Alliance

10 · 12 · 9 · 11 · 14 · 12 · 12 · 8 · 7 · 4 · 13

2010 — 2015 — 2020

Northrup Grumman

2 · 4 · 1 · 5 · 2 · 2 · 3 · 2 · 3 · 5

2010 — 2015 — 2020

Rocket Lab, Ltd.

2

2010 — 2015 — 2020

Astra Space Launch Co.

1

2010 — 2015 — 2020

Firefly Aerospace

1

2010 — 2015 — 2020

NASA

3 · 3

2010 — 2015 — 2020
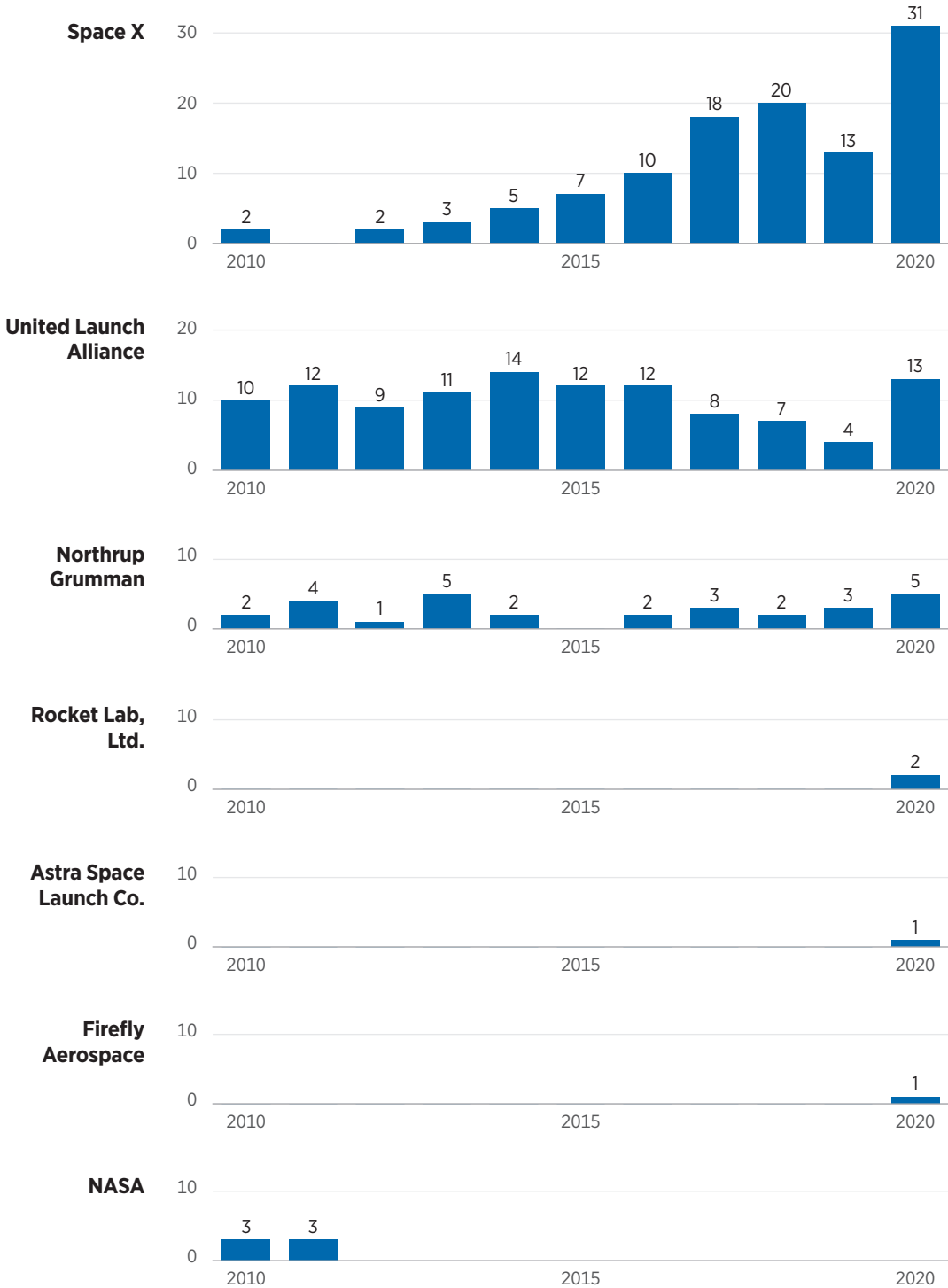
SOURCE: Rocket Launch Schedule, "Space Launch Schedule: Historic,"
https://www.spacelaunchschedule.com/launch-schedule/ (accessed August 19, 2020).

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degrees South latitude (within 90 miles of the Arctic and Antarctic Circles). Each satellite includes eight steerable and shapeable X-band beams formed by separate transmit-and-receive phased arrays, 10 steerable Ka band beams served by independently steerable dish antennas, and one X-band Earth coverage beam. The system allows any user to talk to any other user through nearly 1,900 independently routable subchannels.

The first WGS Block 1 satellite was placed in orbit on November 10, 2007, and was followed by a second and third on April 4, 2009, and June 12, 2009, respectively. Four more satellites were launched as part of WGS Block 2 from early 2012 through July 2015 and were followed by three more launches that took place in 2016, 2017, and 2019. Each of the 10 WGS satellites has an estimated life span of 14 years.[70]

Reconnaissance and Imagining (Unknown). While the history of the Air Force is steeped in these reconnaissance systems, the operational details of each constellation are classified. In the late 1990s and early 2000s, the Air Force moved to develop and field a constellation of Spaced Based Radar satellites. That program (known as Lacrosse/ Onyx) launched five satellites, each carrying a synthetic aperture radar (SAR) as its prime imaging sensor. SAR systems can see through clouds with high resolution, offering the potential to provide a capability from which it is hard to hide.[71] The challenges that Lacrosse likely faced with computer processing speeds, data rates, and the ability to relay time-critical images have likely been resolved over the years, expanding both the capability and operational impact of such a system.

Radar imaging, coupled with space-borne Signals Intelligence (SIGINT); Electronic Intelligence (ELINT); and Measurement and Signature Intelligence (MASINT) and the ability to provide that real-time intelligence to warfighters anywhere in the world, gives the United States a significant competitive advantage. The number of satellites the Space Force has dedicated to those missions would exceed the 77 that the DOAF has publicly acknowledged. Although the capabilities associated with the satellites currently in orbit may not fully cover the capacity and capability requirements needed to support all combatant commands, it is complemented by a growing space launch capability that will enable the service to fill any shortfalls and has the potential to replace combat losses with a nearly on-demand capability.

Space Launch Capacity. The Space Force manages the National Security Space Launch (NSSL) program, which is a Major Defense Acquisition Program that acquires launch services from private companies to deliver national security satellites into orbit. Currently, the NSSL uses the Atlas V and Delta IV Heavy launch vehicles from United Launch Alliance and the Falcon 9 and Falcon Heavy from SpaceX to launch national security payloads. In 2018, the Air Force awarded three launch services agreements to space launch companies to develop their launch vehicles for a second phase of the NSSL. The Space Force will award two Launch Services Procurement contracts later in 2020, and the two vendors who win that competition will provide space launch services for the Space Force through 2027.[72]

In 2010, four organizations, including NASA, were involved in launching manned and unmanned systems into space. Collectively they conducted 17 launches, including three space shuttle missions, compared with the Russian and Chinese governments, each of which launched 16 missions into space.[73]

Today, six private corporations are actively engaged in placing satellites into orbit, twice the number that had launched systems into orbit in 2019.[74] In 2020, SpaceX alone will more than double the total number of scheduled launches into space from the United States in a single year with 31 Falcon 9 scheduled launches, including the first manned rocket that launched on May 30, 2020 (the first from U.S. soil since 2011).[75] In 2020, U.S. companies are scheduled to launch 53 missions into space, while China and Russia are scheduled to conduct 22 and 21 launches, respectively.[76]

America has turned the corner on this vital capability, and the access these private companies give the U.S. to space will be critical to dominating the great-power competition that lies ahead.

Offensive Systems

The United States faces a variety of threats, and the Space Force will have to deal with kinetic anti-satellite weapons (ASATs); high-powered lasers; laser dazzling or blinding; and high-powered microwave systems.[77] Defensive measures are being developed to ensure access to critical space resources through redundancy, interoperability with other nations' assets (GPS III), and maneuverability. However, no known U.S. ASAT programs of record are reported in open-source literature.

The Space Force was established to regain the upper hand in this domain.

Assessment

The Space Force was established at the end of 2019, and significant progress was made in organizing America's space capabilities more effectively in the relatively brief period before publication of this *Index*. However, it is not at all clear how one would assess the Space Force's role in contributing to the projection of "hard combat power," which is the focus of this publication. There are as yet no viable metrics by which to measure the service's capacity, capability, or readiness. Consequently, this edition of the *Index* does not assess the U.S. Space Force.

U.S. Military Power: Space (not assessed this year)

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity					
Capability			n/a		
Readiness					
OVERALL			n/a		

Endnotes

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U.S. Nuclear Weapons Capability

Patty-Jane Geller

Assessing the state of U.S. nuclear weapons capabilities presents at least three serious challenges.

First, the United States is not taking full advantage of technologically available developments to field modern warheads (often incorrectly termed "new" warheads) that could be designed to be safer, more secure, and more effective and could give the United States better options for strengthening a credible deterrent. Instead, the U.S. has largely elected to maintain aging nuclear warheads based on designs from the 1960s, 1970s, and 1980s that were in the stockpile when the Cold War ended.

Second, the lack of detailed publicly available data about the readiness of nuclear forces, their capabilities, and the reliability of their weapons makes analysis difficult.

Third, the U.S. nuclear enterprise has many components, some of which are also involved in supporting other military (e.g., conventional) and extended deterrence missions. For example, dual-capable bombers do not fly airborne alert with nuclear weapons today, although they did so routinely during the 1960s and technically could do so again if necessary.

Additionally, the three key national security laboratories no longer focus solely on the nuclear weapons mission (although this remains their primary mission); they also focus extensively on nuclear nonproliferation and counterproliferation, intelligence, biological/medical research, threat reduction, and countering nuclear terrorism, which includes a variety of nuclear-related detection activities.

The Nuclear Command, Control, and Communications System performs five essential functions: "detection, warning, and attack characterization; adaptive nuclear planning; decision-making conferencing; receiving Presidential orders; and enabling the management and direction of forces."[1]

Thus, it is hard to assess whether any one piece of the nuclear enterprise is sufficiently funded, focused, and/or effective with regard to the nuclear mission.

In today's rapidly changing world, the U.S. nuclear weapons enterprise must be, as described in the 2018 Nuclear Posture Review (NPR), *"modern, robust, flexible, resilient, ready and appropriately tailored"* to underpin the U.S. nuclear deterrent.[2] If the U.S. detects a game-changing nuclear weapons development in another country, the U.S. nuclear weapons complex must be able to provide a timely response. However, maintaining a capable U.S. nuclear enterprise presents many challenges.

To provide assurance against unexpected failures in the U.S. stockpile or changes in a geopolitical situation, the U.S. maintains an inactive stockpile that includes near-term hedge warheads that "can serve as active ready warheads within prescribed activation timelines" and reserve warheads that can provide "a long-term response to risk mitigation for technical failures in the stockpile."[3] The U.S. preserves upload capability on its strategic delivery vehicles, which means that, if necessary, the nation could increase the number of nuclear warheads on each type of its delivery

vehicles. For example, the U.S. Minuteman III intercontinental ballistic missile (ICBM) can carry up to three nuclear warheads, although it is currently deployed with only one.[4] While the United States preserves these capabilities, doing so in practice would take time and be both difficult and potentially costly. Certain modernization decisions (e.g., 12 versus 14 *Columbia*-class ballistic missile submarines with 16 versus 24 missile tubes per submarine) will limit upload capacity on the strategic submarine force. U.S. heavy bombers will continue to retain a robust upload capability.

Moreover, the United States has not designed or built a new nuclear warhead since the end of the Cold War. Instead, the National Nuclear Security Administration (NNSA) uses life-extension programs (LEPs) to extend the service life of existing weapons in the stockpile. Not all of the existing inactive stockpile, however, will go through the life-extension program. Hence, our ability to respond to contingencies by uploading weapons kept in an inactive status will decline with the passage of time. In other words, LEPs by themselves cannot be relied upon to sustain needed levels of reliability.

Presidential Decision Directive-15 (PDD-15) requires the U.S. to maintain the ability "to conduct a nuclear test within 24-to-36 months of direction by the President to do so."[5] However, successive government reports have noted the continued deterioration of technical and diagnostics equipment and the inability to fill technical positions that support nuclear testing readiness.[6] A lack of congressional support for improvements in technical readiness further undermines efforts by the NNSA to comply with the directive.

The nuclear weapons labs also face demographic challenges. Most scientists and engineers with practical "hands-on" experience in nuclear weapons design and/or testing are retired. This means that the certification of weapons designed and tested more than 30 years ago depends on the scientific judgment of designers and engineers who have never been involved in either the testing or the design and development of nuclear weapons. According to NNSA Administrator Lisa Gordon-Hagerty, more than 40 percent of the NNSA workforce will be eligible for retirement over the next five years, further adding to the loss of legacy nuclear weapons knowledge.[7]

The shift in emphasis away from the nuclear mission after the end of the Cold War led to a diminished ability to conduct key activities at the nuclear laboratories. According to Administrator Gordon-Hagerty:

> While the U.S. nuclear weapons stockpile and its supporting infrastructure are safe, secure, effective, and reliable, they are aging. Competing interests over the past thirty years postponed weapon and infrastructure modernization programs, which directly contributed to erosion of our critical capabilities, infrastructure, and capacity to ensure the deterrent's viability into the future. The need to modernize our nuclear weapons stockpile and recapitalize its supporting infrastructure has reached a tipping point.[8]

As a result of this neglect, at the same time the nation faces an urgent need to modernize its aging nuclear warheads, "NNSA is undertaking a risk informed, complex, and time-constrained modernization and recapitalization effort."[9]

Another important indication of the health of the overall force is the readiness of the forces that operate U.S. nuclear systems. Following reports of misconduct in 2014, the Air Force had to make a number of changes to improve the performance, professionalism, and morale of the ICBM force.[10] Today, the COVID-19 pandemic presents another potential obstacle to the readiness of nuclear operators. In April 2020, the Pentagon announced its plans to maintain the readiness of the nuclear enterprise during the pandemic, to include a tiered testing system with forces involved "in critical national capabilities such as strategic deterrence or nuclear deterrence" in the first tier.[11] The Air Force and Navy have also isolated

CHART 10

A Smaller and Less Diverse Nuclear Arsenal

TYPES OF WARHEADS IN THE
U.S. NUCLEAR STOCKPILE

1963: 51

1989: 28

2020: 12

TOTAL WARHEADS IN THE
U.S. NUCLEAR STOCKPILE

1967: 31,255

1988: 23,205

2020: 3,800
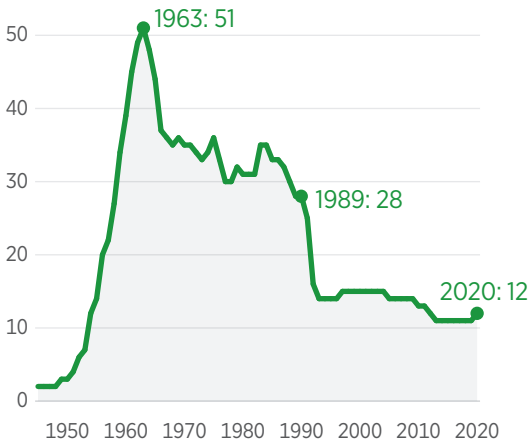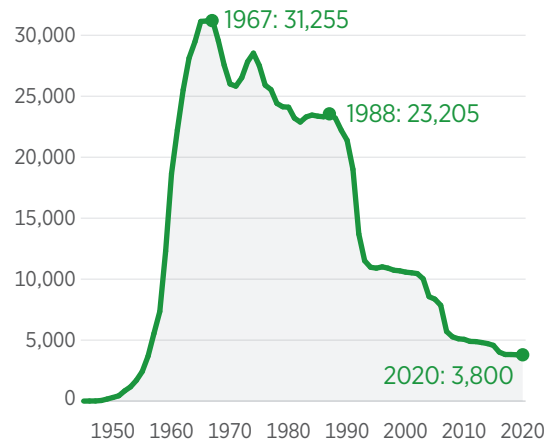
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those preparing for deployment to minimize risk to the force.[12]

Over time, fiscal uncertainty and a steady decline in resources for the nuclear weapons enterprise have adversely affected the nuclear deterrence mission. Despite America's continued commitment to nonproliferation and reductions in the number of the world's nuclear weapons, adversaries have increased both their nuclear forces and the role of nuclear weapons in their strategies. As Admiral Charles Richard, Commander, U.S. Strategic Command, testified before the Senate Armed Services Committee in February 2020:

The contemporary security environment is the most challenging since the Cold War. In the nuclear dimension, we face a range of potential adversaries, each with different interests, objectives, and capabilities. To maintain a credible deterrent in this environment requires us to modernize and recapitalize our strategic forces to ensure our Nation has the capability to deter any actor, at any level. Doing so requires we remain committed to modernizing and recapitalizing our strategic forces and supporting infrastructure, and that we continue to pursue

In recent years, bipartisan congressional support for the nuclear mission has been strong, and nuclear modernization has received additional funding. Preservation of that bipartisan consensus will be critical as these programs mature and begin to introduce modern nuclear systems to the force.

The Trump Administration has made significant progress in funding a comprehensive modernization program for nuclear forces that includes warheads, delivery systems, and command and control. Despite attempts to pull back from nuclear modernization, Congress has consistently funded the Trump Administration's budget request for these programs. Because such modernization activities require consistent, stable long-term funding commitments, it is essential that Congress continue to invest in this cornerstone of our security.

The Trump Administration's 2018 NPR, recognizing the reality of a worsening security environment that includes the rise of competition with a revisionist and resurgent Russia, an increasingly threatening China, and other growing strategic threats "including major conventional, chemical, biological, nuclear, space, and cyber threats, and violent nonstate actors," called for "tailored deterrence strategies" and reaffirmed that "aggression against the United States, allies, and partners will fail and result in intolerable costs for [the aggressors]."[14] Accordingly, the NPR called for modernization of nuclear weapons and the nuclear weapons complex, as well as significant reinvestments in the nuclear triad.[15]

The NNSA received $16.7 billion in fiscal year (FY) 2020, almost 10 percent more than the $15.2 billion it received in FY 2019, which included full funding for major efforts like modernization of plutonium pit production and five warhead modernization programs.[16] Modernization programs to replace the triad—including the Ground Based Strategic Deterrent (GBSD), Long Range Stand Off Weapon (LRSO), *Columbia*-class nuclear submarine, and B-21 bomber—also continue to progress in 2020. The NPR proposed two supplements to nuclear capabilities: a low-yield warhead for strategic submarine-launched ballistic missiles (SLBMs) in the near term, which was deployed in 2020, and a low-yield nuclear-armed sea-launched cruise missile, for which an analysis of alternatives is currently underway.[17]

Implications for U.S. National Security

U.S. nuclear forces are designed both to deter large-scale attacks that threaten America's sovereignty, allies, and forward-deployed troops and to assure our allies and partners. They are not designed to shield the nation from all types of attacks from all adversaries.

U.S. nuclear forces play an essential role in underpinning the broad nonproliferation regime by providing U.S. security guaranties that assure allies including NATO, Japan, and South Korea that they can forgo development of nuclear capabilities. In part, U.S. deterrence capabilities also enable the United Kingdom and France to limit their numbers of nuclear weapons to levels they might not otherwise agree to accept.

North Korea has demonstrated that a country with limited intellectual and financial resources can develop a nuclear weapon if it decides to do so. Iran appears to continue on a path that largely retains its ability to develop a nuclear weapon capability, despite U.S. and international pressure to not do so. Such a reality only adds to the importance of U.S. nuclear assurances to allies and partners. Further erosion of the credibility of American nuclear forces could lead countries like Japan or South Korea to pursue an independent nuclear option, encouraging instability across the region.

Several negative trends, if not addressed, could undermine the overall effectiveness of U.S. nuclear deterrence. The United States must account for adversaries that are modernizing their nuclear forces, particularly Russia and China. Additional challenges include increasingly aged nuclear warheads; an aging and crumbling nuclear weapons infrastructure; an

aging workforce; and the need to fully recapitalize all three legs (land, air, and sea) of the nuclear triad including the systems for nuclear command and control while also conducting timely and cost-efficient life-extension programs—all while maintaining the nation's commitment to a testing moratorium under the Comprehensive Test Ban Treaty, which was signed but rejected by the Senate.

The 2018 NPR noted a rapid deterioration of the threat environment since 2010 and identified four enduring roles for U.S. nuclear capabilities:

- Deterrence of nuclear and non-nuclear attack;

- Assurance of allies and partners;

- Achievement of U.S. objectives if deterrence fails; and

- Capacity to hedge against an uncertain future.[18]

Because the capabilities of U.S. adversaries can vary, the 2018 NPR emphasized the need for tailored deterrence strategies. For example, Russia is engaged in an aggressive nuclear buildup, having added several new modern nuclear systems to its arsenal since 2010. In his February 2020 testimony before the Senate Armed Services Committee, Admiral Richard warned that:

> Russia's aggressive and robust military and nuclear modernization campaign across its strategic triad and dual-use systems is close to completion. To date, Russia has recapitalized 76 percent of its strategic nuclear forces with modern weapons and equipment, strengthening its overall combat potential....
>
> Russia's nuclear forces include a range of strategic weapons, some not captured by existing arms control structures, and theater and tactical nuclear weapons entirely

outside the arms control framework.... Russia's overall nuclear stockpile is likely to grow significantly over the next decade—growth driven primarily by a projected increase in Russia's non-strategic nuclear weapons. Russia's determined pursuit of "non-strategic" nuclear weapons, together with their recent theory of nuclear rhetoric, indicates a troubling readiness to resort to nuclear weapons early in a crisis.[19]

Concurrently, Russia is using its dual-capable (nuclear/conventional capable) platforms to threaten the sovereignty of U.S. allies in Eastern Europe and the Baltics. It also is developing "novel technologies" such as a nuclear-powered cruise missile and nuclear-capable unmanned underwater vehicle.[20]

China is engaging in a similarly provocative nuclear buildup as it attempts to project power into the South China Sea, partly through illegally created islands on which China has installed offensive capabilities. Defense Intelligence Agency Director Lieutenant General Robert Ashley recently reported that China will likely at least double its nuclear stockpile within the next decade.[21] North Korea "has accelerated its provocative pursuit of nuclear weapons and missile capabilities."[22] And Iran, in addition to being the world's principal state sponsor of terrorism, retains "the technological capability and much of the capacity necessary to develop a nuclear weapon within one year of a decision to do so."[23]

Deterrence is an intricate interaction between U.S. conventional and nuclear forces, and the psychological perceptions of both allies and adversaries with respect to America's willingness to use such forces to defend its interests, as well as its allies and partners, are of the greatest importance. Nuclear deterrence must reflect and be attuned to the mindset of any particular adversary the U.S. seeks to deter. If an adversary believes that he can fight and win a limited nuclear war, the task for U.S. leaders is to convince that adversary otherwise. The U.S. nuclear portfolio must be structured

in terms of capacity, capability, variety, flexibility, and readiness to achieve these objectives. In addition, military roles and requirements for nuclear weapons will be inherently different depending on who is being deterred, what he values, and what the U.S. seeks to deter him from doing.

Due to the complex interplay among strategy, policy, and actions that any given state may take, as well as other actors' perceptions of the world around them, one will never know whether or when a nuclear deterrent or conventional forces provided by the U.S. might be perceived as insufficient. Nuclear weapon capabilities take years or decades to develop, as does the infrastructure supporting them—an infrastructure that the U.S. has neglected for decades. We can be reasonably certain, however, that a robust, well-resourced, focused, and reliable nuclear enterprise is much more likely to sustain the value of the U.S. deterrent than is one that is outdated and/or questionable.

The U.S. has demonstrated that it is capable of incredible mobilization when danger materializes, and today's nuclear threat environment is evolving, dynamic, and proliferating in unpredictable ways, with new and resurgent old actors developing new capabilities. Meanwhile, despite the promise of additional funding, the U.S. nuclear enterprise remains largely static, leaving the United States at what could well be a technological disadvantage. Such a posture puts both the security of the United States and the security of its allies and the entire free world at risk.

Scoring U.S. Nuclear Weapons Capabilities

The U.S. nuclear weapons enterprise is composed of several key elements that include warheads; delivery systems; and the physical infrastructure that designs, manufactures, and maintains U.S. nuclear weapons. The nuclear enterprise also includes and must sustain the talent of our people: the nuclear designers, engineers, manufacturing personnel, planners, maintainers, and operators who help to ensure a nuclear deterrent that is second to none. The nuclear weapons enterprise entails additional elements like nuclear command and control; intelligence, surveillance, and reconnaissance (ISR); and aerial refueling, all of which also play a major role in conventional operations.

The factors selected below are the most important elements of the nuclear weapons complex. They are judged on a five-grade scale that ranges from "very strong," defined as having a sustainable, viable, and funded plan in place, to "very weak," defined as a situation in which the U.S. is not meeting its security requirements and has no program in place to redress the shortfall. The other three possible scores are "strong," "marginal," and "weak."

Current U.S. Nuclear Stockpile
Score: Strong

U.S. warheads must be safe, secure, effective, and reliable. The Department of Energy (DOE) defines reliability as "the probability that a weapon will perform in accordance with its design intent or military requirements."[24] Since the cessation of nuclear testing in 1992, reliability has been determined through the NNSA's Stockpile Stewardship Program, which consists of an intensive warhead surveillance program; non-nuclear experiments (i.e., experiments that do not produce a nuclear yield); sophisticated calculations using high-performance computing; and related annual assessments and evaluations.

The reliability of nuclear warheads and delivery systems becomes even more important as the number and diversity of nuclear weapons in the stockpile decrease. Fewer types of nuclear weapons means a smaller margin of error if all of one type are affected by a technical problem that might cause a weapon type and/or its delivery system to be decommissioned. Further, with less diversity, the risk that a problem might affect multiple systems

increases. America and its allies must have high confidence that U.S. nuclear warheads will perform as expected.

As warheads age, uncertainty about their ability to perform their mission as expected could increase and significantly complicate military planning. Despite creating impressive amounts of knowledge about nuclear weapons physics and materials chemistry, the U.S. could find itself surprised by unanticipated long-term effects on aging components that comprise a nuclear weapon. "The scientific foundation of assessments of the nuclear performance of US weapons is eroding as a result of the moratorium on nuclear testing," argue John Hopkins, nuclear physicist and a former leader of the Los Alamos National Laboratory's nuclear weapons program, and David Sharp, former Laboratory Fellow and a guest scientist at Los Alamos National Laboratory.[25]

The United States currently has the world's safest and most secure stockpile, but concerns about overseas storage sites, potential problems introduced by improper handling, or unanticipated aging effects could compromise the integrity and/or reliability of U.S. warheads. The nuclear warheads themselves contain security measures that are designed to make it difficult, if not impossible, to detonate a weapon absent a proper authorization. While some U.S. warheads have modern safety features that provide additional protection against accidental detonation, others do not.

Grade: The Department of Energy and Department of Defense are required to assess the reliability of the nuclear stockpile annually. Each of the three nuclear weapons labs (Los Alamos National Laboratory, Lawrence Livermore National Laboratory, and Sandia National Laboratory) reports its findings with respect to the safety, security, and reliability of the nation's nuclear warheads to the Secretaries of Energy and Defense, who then brief the President. Detailed classified reports are also provided to Congress. While these assessments do not include the nuclear weapons delivery systems, the Commander of U.S. Strategic Command does assess overall nuclear weapons system reliability, including the reliability of both warhead and delivery platforms.
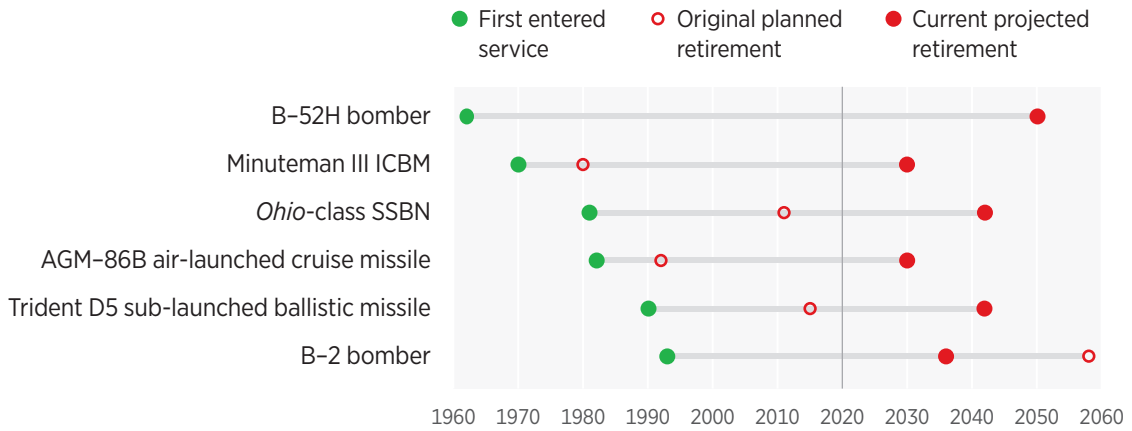
Absent nuclear weapons testing, the national laboratories' assessment of weapons reliability, based on the full range of surveillance, scientific, and technical activities carried out in NNSA's Stockpile Stewardship Program, depends on the expert judgment of the laboratories' directors. This judgment, albeit based on experience, non-nuclear experimentation, and extensive modeling and simulation, is nevertheless inherently subjective and no substitute for objective data obtained through direct nuclear testing. Nuclear testing was used in the past to diagnose potential problems with warheads and to certify the effectiveness of fixes to those problems. It was also used to certify current nuclear warheads, as well as to detect potential problems and confirm the effectiveness of fixes to those problems. Given that modern simulation is based on nuclear tests that were conducted primarily in the 1950s and 1960s with testing equipment of that era, there is a great deal more that today's nuclear testing and detection equipment could teach us about nuclear weapons physics.

By 2005, a consensus emerged in the NNSA, informed by the nuclear weapons labs, that "indefinite refurbishment" of the nuclear stockpile would be "extremely difficult to execute (because many warhead components can not [*sic*] be replicated as originally built), and would result in modifications on top of other modifications that [would] be increasingly difficult to certify without nuclear testing." Two major studies had "concluded that the Reliable Replacement Warhead (RRW) concept, if feasible, would be a preferred alternative to the indefinite refurbishment strategy."[26] When the U.S. did conduct nuclear tests, it frequently found that small changes in a weapon's tested configuration had a dramatic impact on weapons performance. In fact, the 1958–1961 testing moratorium caused weapons with serious problems to be introduced into the U.S. stockpile.[27] These problems were discovered only after the resumption of U.S. nuclear weapons testing following the Soviet

FIGURE 5

U.S. Nuclear Delivery Systems Outdated

Current U.S. nuclear delivery systems are between 27 and 58 years old, and some are expected to be retired within a decade.

● First entered service   ○ Original planned retirement   ● Current projected retirement

B–52H bomber
Minuteman III ICBM
Ohio-class SSBN
AGM–86B air-launched cruise missile
Trident D5 sub-launched ballistic missile
B–2 bomber

1960 1970 1980 1990 2000 2010 2020 2030 2040 2050 2060

NOTES: The original retirement date for the B-2 was set at 2058, but in the FY 2019 budget, the Air Force moved up the retirement date by 22 years to 2036. That move could have been caused by projected threats, the cost of sustainment, or both. The original programmed retirement date for the B-52H is not known, but the Air Force has recently stated it plans to continue flying this jet into the 2050s. The average B-52H bomber has logged approximately 20,300 hours, and based on airframe component lifetime estimates and flying 350 hours each year, it could continue flying until 2067.
SOURCES: Heritage Foundation research.

☏ heritage.org

Union's unannounced breakout from the 1962 agreed moratorium.

The United States is committed to sustaining its nuclear stockpile without nuclear testing, and this creates some inherent uncertainty concerning the adequacy of fixes to the stockpile when problems are found. These growing numbers of additional uncertainties include updates made to correct problems that were found in the weapons or changes in the weapons resulting from life-extension programs. It is simply impossible to duplicate exactly weapons that were designed and built many decades ago. According to Sandia National Laboratories Director Dr. Stephen Younger, we have had to fix "a number of problems that were never anticipated" by using "similar but not quite identical parts."[28]

One of the costs of having to certify weapons without nuclear testing, at least to date, has been fewer types of weapons (i.e., reduced diversity in the stockpile) and, consequently, a greater potential impact across the inventory of warheads should an unknown or misidentified error emerge in the certification process. Loss of diversity in the stockpile also increases the risk of "common-mode" failure that could affect multiple systems simultaneously, making the push for commonality with potential single points of failure in U.S. warheads worrisome. "To be blunt," warned then-Secretary of Defense Robert Gates in October 2008, "there

is absolutely no way we can maintain a credible deterrent and reduce the number of weapons in our stockpile without either resorting to testing our stockpile or pursuing a modernization program."[29]

The U.S. pursues warhead LEPs that replace aging components before they can cause reliability problems. The number and scope of LEPs being carried out over the next two decades will stress NNSA's warhead design and production complex and remains a concern, particularly given uncertainties regarding the congressional budget process. In spite of these concerns, in FY 2019 and FY 2020, the NNSA continued to assess that the stockpile is "safe, secure, and effective."[30]

In light of our overall assessment, we grade the U.S. stockpile conditionally as "strong" based on the results of the existing method used to certify the stockpile's effectiveness. This grade, however, will depend on whether support for an adequate stockpile, both in Congress and in the Administration, remains strong.

Reliability of U.S. Delivery Platforms Score: Strong

Reliability encompasses not only the warhead, but strategic delivery vehicles as well. For ICBMs and SLBMs, in addition to a successful missile launch, this includes the separation of missile boost stages, performance of the missile guidance system, separation of the reentry vehicles from the missile post-boost vehicle, and accuracy of the final reentry vehicle in reaching its target.[31]

The U.S. conducts flight tests of ICBMs and SLBMs every year to ensure the reliability of its delivery systems with high-fidelity "mock" warheads. Anything from faulty electrical wiring to booster separations could degrade the reliability and safety of the U.S. strategic deterrent. U.S. strategic, long-range bombers also regularly conduct Continental United States and intercontinental exercises and receive upgrades to sustain a demonstrated high level of combat readiness. The Air Force most recently tested the AGM-86B air-launched cruise missile launched from the B52-H bomber in 2017.[32] Platforms have to be modernized and replaced simultaneously, and already diminished capabilities make this even more difficult.

Grade: In July 2018, the Air Force suffered its first unsuccessful ICBM test since 2011,[33] but it has conducted four successful tests since then. These successes include one developmental test in February 2020, the first test hosted by Vandenberg Air Force Base since it became part of the U.S. Space Force.[34] The next ICBM test, scheduled for August 2020, reportedly remained on schedule despite the ongoing COVID-19 pandemic.[35] The SLBM tests were successful in 2019 and 2020.[36]

To the extent that data from these tests are publicly available, they provide objective evidence of the delivery systems' reliability and send a message to U.S. allies and adversaries alike that the U.S. system works and the U.S. nuclear deterrent is ready if needed. The aged systems, however, occasionally have reliability problems, as evidenced by the July 2018 failed Minuteman III launch. Moreover, because of its obsolescence against Russian air defense systems, the B52H bomber can no longer officially carry gravity bombs.[37] Aging will continue to affect delivery platform reliability until platforms are replaced, but two years of successful missile tests and bomber flights indicate that, at least for now, delivery platforms will likely continue to perform reliably.

Until significant evidence tells us otherwise, this factor receives a grade of "strong."

Nuclear Warhead Modernization Score: Marginal

During the Cold War, the United States focused on designing and developing new nuclear warhead designs in order to counter Soviet advances and modernization efforts and to leverage advances in understanding the physics, chemistry, and design of nuclear weapons. Today, the United States is focused on sustaining its aging stockpile rather than on fielding new nuclear warheads, but it also seeks to retain the skills and capabilities required to design, develop, and produce new warheads.

Relying only on sustaining our aging stockpile could increase the risk of failure caused by aging components and signal to adversaries that the United States is less committed to nuclear deterrence. In FY 2016, the United States established the Stockpile Responsiveness Program (SRP) "to exercise all capabilities to conceptualize, study, design, develop, engineer, certify, produce, and deploy nuclear weapons."[38] Congress doubled funding for the SRP from $34 million in FY 2019 to $70 million in FY 2020. The Administration requested $70 million for the program in FY 2021.[39]

Modern or new weapon designs could allow American engineers and scientists to improve previous designs and devise more effective means by which to address existing military requirements (e.g., the need to destroy deeply buried and hardened targets) that have emerged in recent years. Future warheads could improve reliability (i.e., remedying some ongoing aging concerns such as replacement of aged nuclear components) while also enhancing the safety and security of American weapons.

The ability to work on future/new weapon design options would help to ensure that today's American experts and those of the next-generation remain engaged and knowledgeable, would help to attract the best talent to the nuclear enterprise, and would help the nation to gain additional insights into foreign nations' (i.e., adversaries) nuclear weapon programs. As the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile noted, "Only through work on advanced designs will it be possible to train the next generation of weapon designers and producers. Such efforts are also needed to exercise the DoD/NNSA weapon development interface."[40]

Meanwhile, potential U.S. adversaries and current and future proliferants are not limited to updating only Cold War designs and can seek designs outside U.S. experiences. Other nations maintain their levels of proficiency by having their scientists work on new nuclear warheads.[41] As recently reported by the Department of State, "Russia has conducted nuclear weapons experiments that have created nuclear yield and are not consistent with the U.S. 'zero-yield' standard," and evidence points to China's possibly having done so as well.[42]

Grade: The nuclear enterprise was able to display improved flexibility when it produced a low-yield version of the W76 warhead, which was designed to counter Russia's perception of an exploitable gap in the U.S. nuclear force posture, within a year despite continued nuclear policy restrictions and a preference for life-extension programs. Such efforts to produce the W76-2 in 2019 warranted an improvement in this score last year.

The NNSA continues to improve in this category in 2020. As part of the SRP, the NNSA plans to conduct feasibility studies of the next Navy warhead, dubbed the W93 in the budget request for FY 2021.[43] Also, as part of its effort to restore the ability to produce plutonium pits, the NNSA produced five pits in 2019.[44] This continued effort in 2020 will help the NNSA to regain the capabilities needed to produce new warheads. The score for this category remains at "marginal," but it will improve when the NNSA, through the SRP in particular, begins to produce tangible advancements in pit production and W93 development.

Nuclear Delivery Systems
Modernization Score: Strong

Today, the United States fields a triad of nuclear forces with delivery systems that are safe and reliable, but as these systems age, there is increased risk of significantly negative impact on operational capabilities. Any margins allowing delay of platform replacement have been significantly diminished. The older weapons systems are, the more likely it is that faulty components, malfunctioning equipment, or technological developments will limit their reliability in the operating environment.

Age degrades reliability by increasing the potential for systems to break down or fail to respond correctly. Corrupted systems, defective electronics, or performance degradation caused by long-term storage defects (including

for nuclear warheads) can have serious implications for American deterrence and assurance. Because it cannot be assumed (especially for systems approaching end of life) that a strategic delivery vehicle will operate in a reliable manner indefinitely, that vehicle's deterrence and assurance value may be significantly reduced with consequent effects on perceptions of deterrence among both allies and adversaries.

The U.S. Air Force and Navy plan to modernize or replace each leg of the nuclear triad in the next few decades, but fiscal constraints and inconsistent funding levels (including issues related to "continuing resolutions") will make such efforts difficult at best. Sustained leadership focus is imperative if the modernization program is to succeed.

The Navy is fully funding its programs to replace the *Ohio*-class submarine with the *Columbia*-class submarine, but issues involving cost estimates and potential industrial base impacts caused by the COVID-19 pandemic could make it harder to achieve the goal of deploying the first submarine in 2031.[45] The Air Force is funding the B-21 Raider Long-Range bomber, which will replace conventionally armed bombers before they become nuclear certified, and the Long Range Standoff Weapon, which will replace the aging air-launched cruise missile. Existing Minuteman III ICBMs are expected to remain in service until 2032, 50 years after their intended lifetime, when they will be replaced by the GBSD missiles. Existing Trident II D5 SLBMs have been life-extended to remain in service until 2042 through the end of the last *Ohio*-class submarine's lifetime.[46]

Remanufacturing some weapon parts is difficult and expensive either because the manufacturers are no longer in business or because the materials that constituted the original weapons are no longer available (e.g., because of environmental restrictions). U.S. triad modernization is a requirement validated by all four of the NPRs since the end of the Cold War and remains a "must" in all future deterrence scenarios. U.S. nuclear weapon modernization

plans benefited from predictability associated with the FY 2018–FY 2019 budget deal, but the economic downturn caused by the COVID-19 pandemic and the prospect of future defense budget cuts threaten such progress.

Grade: U.S. nuclear platforms are in dire need of recapitalization. Plans for modernization of the nuclear triad are in place, and Congress and the services have largely sustained funding for these programs. Moreover, some aspects of these programs have progressed in 2020. For instance, the Air Force awarded sole source contracts for both the LRSO and GBSD programs.[47] It is also setting up a joint developmental and operational test force to support the GBSD program.[48] In FY 2020, the Administration's budget request for nuclear modernization received full funding from Congress, despite an initial House-passed spending bill that included significant cuts in these programs. Potential modernization delays and congressional funding cuts could cause this score to be downgraded in the future, but this year, both Congress and the Administration have demonstrated a commitment to nuclear weapons modernization that again earns this indicator a grade of "strong."

Nuclear Weapons Complex
Score: Marginal

Maintaining a reliable and effective nuclear stockpile depends in large part on the facilities where U.S. devices and components are developed, tested, and produced. These facilities constitute the foundation of our strategic arsenal and include the:

- Los Alamos National Laboratories,

- Lawrence Livermore National Laboratories,

- Sandia National Laboratory,

- Nevada National Security Site,

- Pantex Plant,

- Kansas City Plant,

- Savannah River Site, and

- Y-12 National Security Complex.

In addition to these government sites, the defense industrial base supports the development and maintenance of American delivery platforms.

These complexes design, develop, test, and produce the weapons in the U.S. nuclear arsenal, and their maintenance is of critical importance. As the 2018 NPR stated:

> An effective, responsive, and resilient nuclear weapons infrastructure is essential to the U.S. capacity to adapt flexibly to shifting requirements. Such an infrastructure offers tangible evidence to both allies and potential adversaries of U.S. nuclear weapons capabilities and thus contributes to deterrence, assurance, and hedging against adverse developments. It also discourages adversary interest in arms competition.[49]

Maintaining a safe, secure, effective, and reliable nuclear stockpile requires modern facilities, technical expertise, and tools both to repair any malfunctions quickly, safely, and securely and to produce new nuclear weapons if required. The existing nuclear weapons complex, however, is not fully functional. The U.S. cannot produce the nuclear components needed to replace nuclear weapons in the stockpile.[50] For instance, the United States has not had a substantial plutonium pit production capability since 1993. A plutonium pit is the heart of a nuclear weapon that contains the nuclear material. The NNSA currently plans to produce no fewer than 80 plutonium pits a year by the 2030 time frame—a challenging timeline by the agency's own admission.[51]

If the facilities are not properly funded, the U.S. will gradually lose the ability to conduct the high-quality experiments that are needed to ensure the reliability of the stockpile without nuclear testing. In addition to demoralizing the workforce and hampering recruitment, old and/or obsolete facilities and poor working environments make maintaining a safe, secure, reliable, and militarily effective nuclear stockpile difficult. The NNSA's facilities are old: Nearly 60 percent are more than 40 years old, nearly 30 percent date to the Manhattan Project of the 1940s, and 10 percent are considered excess or no longer needed.[52] As a consequence, the NNSA had accumulated about $4.8 billion in deferred maintenance as of March 2020.[53] Aging facilities have also become a safety hazard: In some buildings, for example, chunks of concrete have fallen from the ceiling.[54]

The U.S. currently retains more than 5,000 old plutonium pits in strategic reserve in addition to pits for use in future LEPs. There are disagreements as to the effect of aging on plutonium pits and how long the U.S. will be able to depend on them before replacement. Because our laboratories estimated the life span of warhead plutonium to be between 45 and 60 years in 2006, it may not be long before the United States has to start replacing core components of its nuclear warheads.[55] Current capacities to do so are insufficient because the U.S. has only demonstrated an ability to produce about 10 plutonium pits a year at the Los Alamos PF-4 facility. If executed as planned, infrastructure modernization of PF-4, as mandated by the 2018 NPR, will boost that number to about 30 by 2026.

A second plutonium pit production facility is being planned to exploit the Mixed Oxide Fuel (MOX) facility that until last year was under construction at the Savannah River Site in South Carolina. The MOX building is being repurposed for plutonium pit production with production of no fewer than 50 pits per year to be achieved by 2030 for an overall requirement of no fewer than 80 plutonium pits a year. Achievement of this timeline is made more difficult by the fact that the NNSA is embarking on the most ambitious warhead sustainment program since the end of the Cold War, overhauling some five warhead types and stressing the demands on both workforce and facilities.

Manufacturing non-nuclear components can be extremely challenging either because some materials may no longer exist or because manufacturing processes have been forgotten and must be retrieved. There is a certain element of art to building a nuclear weapon, and such a skill can be acquired and maintained only through hands-on experience.

Grade: On one hand, the U.S. maintains some of the world's most advanced nuclear facilities. On the other, some parts of the complex—importantly, the plutonium and highly enriched uranium component manufacturing infrastructure—have not been modernized since the 1950s. Plans for long-term infrastructure recapitalization remain essential even as the NNSA is embarking on an aggressive warhead life-extension effort. Sustaining and/or increasing critically essential but always decaying tritium gas is likewise essential; delays only increase production needs because the more tritium decays because of our inability to replenish it, the more tritium gas we will need to cover our baseline needs.[56]

Significant progress has been made over the past year, however, in recapitalizing uranium infrastructure and in getting funded plans in place to recapitalize plutonium pit production capacity. With these projects only beginning and still at risk of major funding cuts or cancellations, the infrastructure's grade will likely remain at "marginal" until demonstrable progress has been made.

Personnel Challenges Within the National Nuclear Laboratories Score: Marginal

Combined with nuclear facilities, U.S. nuclear weapons scientists and engineers are critical to the health of the complex and the stockpile. The 2018 NPR emphasizes that:

> The nuclear weapons infrastructure depends on a highly skilled, world-class workforce from a broad array of disciplines, including engineering, physical sciences, mathematics, and computer science. Maintaining the necessary critical skills and retaining personnel with the needed expertise requires sufficient opportunities to exercise those skills. Should a technical or geopolitical development demand a new nuclear weapon, it is crucial that the nuclear weapons workforce possess the skills and the knowledge needed to design, develop, and manufacture warheads of different design in a timely manner.[57]

The ability to maintain and attract a high-quality workforce is critical to assuring the future of the American nuclear deterrent, especially when a strong employment atmosphere adds to the challenge of hiring the best and brightest. Today's weapons designers and engineers are first-rate, but they also are aging and retiring, and their knowledge must be passed on to the next generation of experts. This means that young designers need meaningful and challenging warhead design and development programs to hone their skills, and the SRP offers one visible means by which to address such concerns. The NNSA and its weapons labs understand this problem and with the support of Congress are beginning to take the necessary steps through SRP and foreign weapon assessment to mentor the next generation. To continue this progress, SRP funding should be maintained at least at its current rate of about $70 million per year.

The U.S. currently relies on non-yield-producing laboratory experiments, flight tests, and the judgment of experienced nuclear scientists and engineers, using robust modeling and simulation, to ensure continued confidence in the safety, security, effectiveness, and reliability of its nuclear deterrent. Without their experience, the nuclear weapons complex could not function. Few of today's remaining scientists or engineers at the NNSA weapons labs have had the experience of taking a warhead from initial concept to a "clean sheet" design, engineering development, production, and fielding. The SRP is remedying some of these shortfalls by having its workforce exercise most of the nuclear weapons design and engineering skills that are needed.

The average age of the NNSA's workforce decreased slightly to 46.9 years as of July 2019.[58] Still worrisome, however, is that NNSA sites are reporting rates of retirement eligibility from 15 percent to 44 percent, which will likely increase over the next five years.[59] Given the distribution of workforce by age, these retirements will create a significant knowledge and experience gap.

Grade: In addition to employing world-class experts, the NNSA labs have had some success in attracting and retaining talent (e.g., through improved college graduate recruitment efforts). As many scientists and engineers with practical nuclear weapon design and testing experience are retired, continued nuclear warhead annual assessments and certifications will rely increasingly on the judgments of people who have never tested or designed a nuclear weapon. In light of these issues, the NNSA workforce earns a score of "marginal," albeit with signs of improvement.

Readiness of Forces Score: Strong

The readiness of forces that operate U.S. delivery platforms is a vital component of America's strategic forces. The military personnel operating the three legs of the nuclear triad must be properly trained and equipped. It is also essential that the crews responsible for the nuclear mission are maintained in an appropriate state of readiness.

During FY 2020, the services have continued to align resources in order to preserve strategic capabilities in the short term. Nevertheless, the long-term possible effects of a continued flat defense budget could have major negative implications for the timely execution of programs. The economic downturn caused by the COVID-19 pandemic could also lead to programmatic delays or further defense budget cuts.

U.S. general-purpose forces are critical to ensuring the overall effectiveness of our nuclear forces (e.g., by providing a pool of qualified candidates to operate nuclear weapon delivery systems). Changes prompted in part by the 2014 Navy and Air Force cheating scandals

have addressed most morale issues and have recast the role of forces supporting the nuclear deterrent by, for example, providing additional funding for equipment purchases, creating more mid-career billets to help career-field continuity, focusing leadership attention, and changing training to focus on mission in the field rather than on a theoretical ideal.[60] Sustained attention to the situation in the nuclear enterprise is critical.

Grade: Despite uncertainties regarding the future impacts of budgetary shortfalls, the young men and women who secure, maintain, plan for, and operate U.S. nuclear forces are of an extremely high caliber. Nuclear force commanders have provided assurance that the COVID-19 pandemic has had no impact on force readiness and the ability to launch nuclear weapons.[61] Force readiness thus receives a grade of "strong."

Allied Assurance Score: Strong

The credibility of U.S. nuclear deterrence is one of the most important components of allied assurances. U.S. allies that already have nuclear weapons can coordinate actions with the United States or act independently. During the Cold War, the U.S. and the U.K. cooperated to the point where joint targeting was included. France maintains its own independent nuclear arsenal. The U.S. also deploys nuclear gravity bombs in Europe as a visible manifestation of its commitment to its NATO allies.

The U.S. also has an enduring extended deterrence role with its Asian allies. The United States provides nuclear assurances to Japan and South Korea, both of which are technologically advanced industrial economies facing aggressive nuclear-armed regional adversaries (i.e., China, Russia, and North Korea). Continued U.S. nuclear deterrence assurances and guarantees are critical and must be perceived as credible. Both Japan and South Korea have the capability and basic know-how to build their own nuclear weapons quickly should they chose to do so. That would be a major setback for U.S. nonproliferation policies.

The 2018 NPR took a positive step when it placed "[a]ssurance of allies and partners" second on its list of four "critical roles" that nuclear forces play in America's national security strategy. The 2018 NPR proposed two supplements to existing capabilities—a low-yield SLBM warhead and a new nuclear sea-launched cruise missile—as important initiatives to strengthen assurance along with the Obama and Trump Administrations' initiatives to bolster conventional forces in NATO.[62] The recent successful deployment of the W76-2 low-yield warhead will be an important component of America's ability to deter aggression against its Asian and NATO allies.

Grade: At this time, most U.S. allies are not seriously considering developing their own nuclear weapons. European members of NATO continue to express their commitment to and appreciation of NATO as a nuclear alliance even as they worry about the impact of Russia's intermediate-range ground-launched missile capabilities and the fate of the New Strategic Arms Reduction Treaty, set to expire in February 2021. Uncertainties surround the purchase and modernization of NATO's dual-capable aircraft and the replacement of existing U.S. nuclear weapons with the B61-12, which is now facing a delay of one to two years.[63] Recent controversy within the German government over continuing to deploy U.S. gravity bombs in Germany adds to this uncertainty. Nevertheless, both Germany and NATO Secretary General Jens Stoltenberg have recently affirmed their commitment to NATO's nuclear sharing.[64] The score for allied assurance therefore remains "strong."

Nuclear Test Readiness Score: Weak

In the past, nuclear testing was one of the key elements of a safe, secure, effective, and reliable nuclear deterrent. While the U.S. is currently under a self-imposed nuclear testing moratorium, it is still required to maintain a low level of nuclear test readiness at the Nevada National Security Site (formerly Nevada Test Site).

"Test readiness" refers to a single test or a very short series of tests, not a sustained nuclear testing program, reestablishment of which would require significant additional resources. Specifically, under the 1993 PDD-15, "DOE [now NNSA] will maintain the readiness and capability to conduct nuclear tests within 2 to 3 years."[65] Because of a shortage of resources, the NNSA has been unable to achieve this goal. Test readiness has not been funded as a separate program since FY 2010 and is instead supported by the Stockpile Stewardship Program that exercises testing elements at the Nevada National Security Site and conducts subcritical nuclear laboratory experiments.[66]

However, whether this approach can assure that the U.S. has the timely ability to conduct yield-producing experiments to correct a flaw in one or more types of its nuclear weapons is open to question. The U.S. might need to test to assure certain weapon characteristics that could possibly be validated only by nuclear testing and to verify render-safe procedures. The ability to conduct yield-producing experiments rapidly is likewise important, especially if the U.S. needs to react strongly to another nation's nuclear weapons tests and/or communicate its unquestioned resolve.

Current law requires that the U.S. must maintain a capability to conduct a nuclear test within 24 to 36 months of a presidential decision to do so.[67] However, the FY 2020 Stockpile Stewardship and Management Plan (SSMP) states that fully complying with domestic regulations, agreements, and laws would "significantly extend the time required for execution of a nuclear test."[68] The time needed to conduct not just a test to address a need within the existing stockpile, but a test to develop a new capability was most recently reported in the FY 2018 SSMP as 60 months.[69] Because the United States is rapidly losing its remaining practical nuclear testing experience, including instrumentation of very sensitive equipment, the process would likely have to be reinvented from scratch.[70]

Grade: The Trump Administration has recently discussed whether to conduct a nuclear test as a demonstration for U.S. adversaries that allegedly have been conducting nuclear

explosive tests of their own.[71] As noted, however, the U.S. through NNSA can meet the legally required readiness requirement only if certain domestic regulations, agreements, and laws are waived. In addition, the U.S. is not prepared to sustain testing activities beyond a few limited experiments because it no longer retains the deep drilling technology in Nevada and has only a few "holes" that are able to contain a nuclear test. Thus, testing readiness earns a grade of "weak."

Overall U.S. Nuclear Weapons Capability Score: "Marginal" Trending Toward "Strong"

It should be emphasized that "trending toward strong" assumes that the U.S. maintains its commitment to modernization of the entire nuclear enterprise—from warheads to platforms to personnel to infrastructure—and allocates needed resources accordingly. Without this commitment, this overall score will degrade rapidly to "weak." Continued attention to this mission is therefore critical.

Although a bipartisan commitment has led to continued progress on U.S. nuclear forces modernization and warhead sustainment, these programs remain seriously threatened by potential future fiscal uncertainties. The infrastructure that supports nuclear programs is very aged, and nuclear test readiness has revealed troubling problems within the forces.

On the positive side, the 2018 NPR strongly articulates a core nuclear weapons policy solidly grounded in the realities of today's threats and growing international concerns. The 2018 NPR clearly and strongly articulates a continued commitment to extended deterrence. The commitment to warhead life-extension programs, the exercise of skills that are critical for the development of new nuclear warheads (under the SRP), and the just-in-time modernization of nuclear delivery platforms represent a positive trend that must be maintained. Averaging the subscores across the nuclear enterprise in light of our concerns about the future results in an overall score of "marginal."

U.S. Military Power: Nuclear

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Nuclear Stockpile				✔	
Delivery Platform Reliability				✔	
Warhead Modernization			✔		
Delivery Systems Modernization				✔	
Nuclear Weapons Complex			✔		
National Labs Talent			✔		
Force Readiness				✔	
Allied Assurance				✔	
Nuclear Test Readiness		✔			
OVERALL			✔		

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Ballistic Missile Defense

Patty-Jane Geller

$\mathbb{M}$issile defense is a critical component of the national security architecture that enables U.S. military efforts and can protect national critical infrastructure, from population and industrial centers to politically and historically important sites. It can strengthen U.S. diplomatic and deterrence efforts and provide both time and options to senior decision-makers amid crises involving missiles flying on both ballistic and non-ballistic trajectories (e.g., cruise missiles and hypersonic weapons).

The Growing Missile Threat

Missiles remain a weapon of choice for many U.S. adversaries because they possess important attributes like extraordinarily high speed (against which the U.S. has a limited ability to defend) and relative cost-effectiveness compared to other types of conventional attack weapons.[1] The number of states that possess missiles will continue to increase, as will the sophistication of these weapons, as modern technologies become cheaper and more widely available.

Despite U.S. diplomatic efforts, North Korea continues its aggressive development of a nuclear ICBM program that will allow it to strike the United States. It also has recently tested ground-based and sea-based ballistic missiles. Iran continues to modernize and proliferate its regional missile systems. Its recent successful rocket launch demonstrates that Iran has the ability to build and launch sophisticated missiles, which implies that it

either has or is developing the know-how to advance to the ICBM-level of capability.[2] According to Dr. Robert Soofer, Deputy Assistant Secretary of Defense for Nuclear and Missile Defense Policy:

> As adversary missile technology matures and proliferates, the threat to the U.S. homeland, allies, partners, and our forces in the field becomes increasingly dynamic and difficult to predict. While traditional fixed and mobile ballistic missile threats continue to grow, adversaries are also investing in ground-, air-, and sea-launched cruise missiles with diverse ranges. China and Russia are also developing and testing hypersonic missile technology, with Russia recently deploying the world's first operational intercontinental-range hypersonic glide vehicle (HGV). These missile technologies are being incorporated into adversary strategies meant to coerce and intimidate the United States and its allies by threatening critical targets in our homelands.[3]

An additional concern is ballistic missile cooperation between state and non-state actors, which furthers the spread of sophisticated technologies and compounds challenges to U.S. defense planning.[4]

The Strategic Role of Missile Defense

Because they are designed to defeat incoming missile attacks, missile defense systems can

save lives and protect civilian infrastructure from damage or destruction. More important, missile defense plays a critical role in strategic deterrence. The ability to deter an enemy from attacking depends on convincing him that his attack will fail, that the cost of carrying out a successful attack is prohibitively high, or that the consequences of an attack will be so painful that they will outweigh the perceived benefit of attacking.

A U.S. missile defense system strengthens deterrence by offering a degree of protection to the American people and the economic base on which their well-being depends, as well as forward-deployed troops and allies, making it harder for an adversary to threaten them with ballistic missiles. By raising the threshold for missile attack, missile defense limits the option for a "cheap shot" against the United States. A missile defense system also gives a decision-maker a significant political advantage: By protecting key elements of U.S. well-being, it mitigates an adversary's ability to intimidate the United States into conceding important security, diplomatic, or economic interests.

Missile defense systems also enable U.S. and allied conventional operations. Adversaries want to deny the United States the ability to conduct offensive operations during a regional conflict, which they can attempt to do by targeting U.S. and allied forward deployed personnel or military assets. In addition, they might try to decouple the United States from defense of its allies by threatening to strike the U.S. homeland or forces abroad if the United States intervenes in a regional conflict. Missile defenses in place make it easier for the U.S. military to introduce reinforcements that can move more freely through a region and can therefore strengthen the credibility of U.S. extended deterrence.

Finally, a missile defense system gives decision-makers more time to choose the most de-escalatory course of action. Without the ability to defend against an attack, U.S. authorities would be limited to an unappealing set of responses that could range from preemptively attacking an adversary to attacking his ballistic missiles on launch pads or even conceding to his demands or actions. With a missile defense system, however, decision-makers would have additional options and more time to consider their implications and arrive at the one that best serves U.S. security interests. In other words, missile defense systems could be profoundly stabilizing.

The U.S. Missile Defense System

The U.S. missile defense system has three critical components: sensors, interceptors, and a command and control infrastructure that provides data from sensors to interceptors. Of these, interceptors receive much of the public's attention because of their visible and kinetic nature. Different physical components of a ballistic missile defense system are designed with the phase of flight in which an intercept occurs in mind, although some of them—for example, the command and control infrastructure or radars—can support intercepts in various phases of flight. Interceptors can shoot down an adversarial missile in the boost, ascent, midcourse, or terminal phase of its flight.

Another way to consider ballistic missile defense systems is by the range of an incoming ballistic missile (short-range, medium-range, intermediate-range, or intercontinental-range) that an interceptor is designed to shoot down, since the length of the interceptor's flight time determines how much time is available to conduct an intercept and where the various components of a defense system must be placed to improve the probability of such an intercept. With intercontinental-range ballistic missiles, the United States has "about 30 minutes" to detect the missile, track it, provide the information to the missile defense system, come up with the most optimal firing solution, launch an interceptor, and shoot down an incoming missile, ideally with enough time to fire another interceptor if the first attempt fails.[5] The time frame is shorter when it comes to medium-range and short-range ballistic missiles.

Missile defense can also be framed by origin of interceptor launch. At present, U.S. interceptors are launched from the ground or from

MAP 10

U.S. Missile Defense Assets
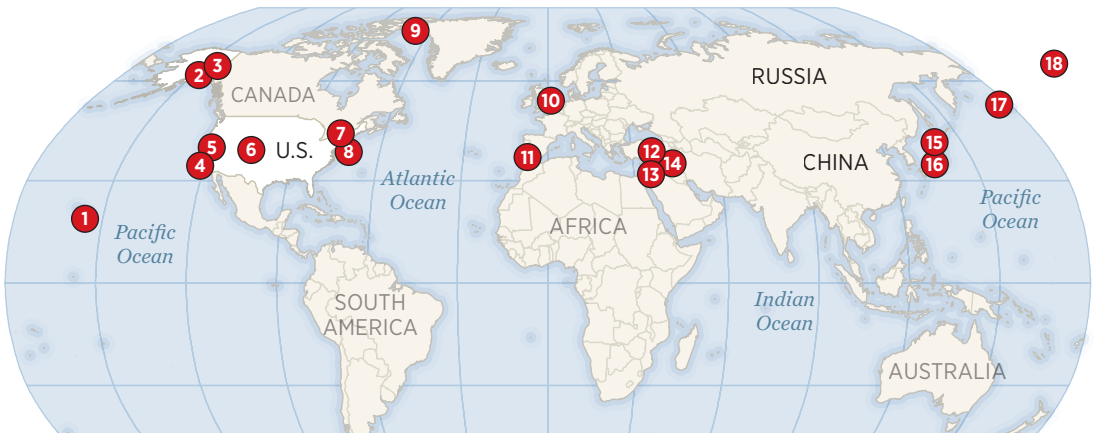
GBI—Ground based interceptors
GFC—Fire control center
GMD—Ground-based midcourse defense

IDT—In-Flight Interceptor
 Communications System (IFICS)
 Data Terminal

TPY-2—Transportable Radar Surveillance
 and Control Model 2
UEWR—Upgraded early warning radar

1 **Pearl Harbor, HI (base)**
 • Sea-based X-Band radar

2 **Clear, AK**
 • UEWR

3 **Ft. Greely, AK**
 • 40 GBIs
 • GMD
 • GFC
 • IDT

4 **Vandenberg AFB, CA**
 • 4 GBIs
 • 2 IDTs

5 **Beale AFB, CA**
 • UEWR

6 **Scriever AFB, CO**
 • GFC

7 **Ft. Drum, NY**
 • IDT

8 **Cape Cod, MA**
 • UEWR

9 **Thule, Greenland**
 • UEWR

10 **Fylingdales, UK**
 • UEWR

11 **Rota, Spain (base)**
 • Sea-based Aegis BMD
 SPY-1 radar

12 **Kurecik AFB, Turkey**
 • TPY-2 radar

13 **Israel**
 • TPY-2 radar

14 **CENTCOM-Middle East**
 • TPY-2 radar

15 **Shariki, Japan**
 • TPY-2 radar

16 **Kyogamisaki, Japan**
 • TPY-2 radar

17 **Shemya, AK**
 • Cobra Dane radar
 • IDT

18 **Outer space**
 • Defense support program
 satellites
 • Space-based infrared
 system satellites
 • Space tracking and
 surveillance
 system-demonstrator

NOTE: Locations are approximate.
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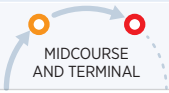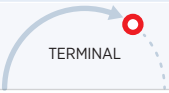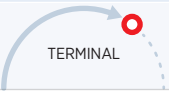
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FIGURE 6

U.S. Missile Defense: Interceptors

MISSILE
THREAT TYPE

				MISSILE THREAT TYPE
○ MIDCOURSE				Intercontinental
				5,500 km
	○ MIDCOURSE			Intermediate-Range
				3,000 km
	○ ● MIDCOURSE AND TERMINAL	● TERMINAL		Medium-Range
				1,000 km
	○ ● MIDCOURSE AND TERMINAL	● TERMINAL	● TERMINAL	Short-Range
Ground-based Interceptor	**Aegis Standard Missile-3**	**Terminal High Altitude Area Defense**	**Patriot Advanced Capability-3**	
44 interceptors	40 Aegis BMD-equipped ships	7 batteries	15 battalions	

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the sea. In the past, the United States explored concepts to launch interceptors from the air or from space, but only limited efforts have been made since the U.S.'s withdrawal from the Anti-Ballistic Missile Treaty in 2002.[6] There is renewed interest in boost-phase missile defense concepts within the Trump Administration, but the fiscal year (FY) 2021 budget

submission for the Missile Defense Agency (MDA), a U.S. Department of Defense agency charged with "develop[ing] and deploy[ing] a layered Missile Defense System to defend the United States, its deployed forces, allies, and friends from missile attacks in all phases of flight,"[7] does not include funding to explore space-based or air-based missile interceptors.

The current U.S. missile defense system is a result of investments made by successive U.S. Administrations. President Ronald Reagan envisioned the program as having a layered ballistic missile defense system, including ballistic missile defense interceptors in space, that would render nuclear weapons "impotent and obsolete."[8] These layers would include boost, ascent, midcourse, and terminal interceptors, including directed-energy interceptors, so that the United States would have more than one opportunity to shoot down an incoming missile.

The United States stopped far short of this goal, even though the Strategic Defense Initiative program resulted in tremendous technological advances and benefits.[9] Instead of a comprehensive layered system, the U.S. has no boost-phase ballistic missile defense systems and is unable to handle the advanced ballistic missile threats from China or Russia.

The volatility and inconsistency of priority and funding for ballistic missile defense by successive Administrations and Congresses—Administrations and Congresses, it should be noted, controlled by both major political parties—have led to the current system, which is numerically and technologically limited and cannot address more sophisticated or more numerous long-range ballistic missile attacks. Historically, U.S. policy has been one of protecting the homeland only from a "limited" ballistic missile attack.[10] The National Defense Authorization Act (NDAA) for Fiscal Year 2017 dropped the word "limited" that had been a fixture of policy since the National Missile Defense Act of 1999 even as it continued to focus on ballistic missiles. The 2020 NDAA made it a matter of policy to rely on nuclear deterrence to defend against "near-peer intercontinental

threats" and focus on improving missile defense against "rogue states."[11]

In the future, as technological trends progress and modern technologies become cheaper and more widely available, North Korean or Iranian ballistic missiles may rival, in sophistication if not numbers, those of Russia or China. Consequently, the U.S. must remain aware of how such threats are evolving and alter its missile defense posture accordingly.

In January 2019, the Trump Administration published its congressionally mandated Missile Defense Review (MDR), a statement of policy intended to guide the Administration's missile defense programs. The MDR addresses the dangerous threat environment that has evolved since the last MDR in 2010 and advocates a comprehensive approach to all missile threats that integrates offensive capabilities, active defenses, and passive defenses. It also acknowledges that the United States is no longer vulnerable only to ballistic missiles and recognizes the need to defend against cruise and hypersonic missiles as well.[12] For FY 2021, the Trump Administration requested $20.3 billion for missile defeat and defense (MDD), including $9.2 billion for the MDA (a decrease of $1.2 billion from the FY 2020 enacted budget); $7.9 billion in missile defense capabilities outside of the MDA, such as the Space Development Agency (SDA) and the services; and $3.2 billion for "missile defeat or left-of-launch activities."[13]

Interceptors

Interceptors comprise one major component of the U.S. missile defense system. Different types of interceptors that respond to different missile threats have been emphasized over the years, and these choices are reflected in the composition of today's U.S. missile defense.

Ballistic missile defense interceptors are designed to intercept ballistic missiles in three different phases of their flight.

- **The boost phase** is from the launch of a missile from its platform until its engines stop thrusting.

- **The midcourse phase** is the longest and thus offers a unique opportunity to intercept an incoming threat and, depending on other circumstances like the trajectory of the incoming threat and quality of U.S. tracking data, even a second shot at it should the first intercept attempt fail.

- **The terminal phase** is less than one minute long, occurring as the missile plummets through the atmosphere toward the target, and offers a very limited opportunity to intercept a ballistic missile threat.

Boost-Phase Interceptors. The United States currently has no capability to shoot down ballistic missiles in their boost phase. Boost-phase intercept is the most challenging option technologically because of the very short time frame in which a missile is boosting, the missile's extraordinary rate of acceleration during this brief window of time, and the need to have the interceptor close to the launch site.[14] It is, however, also the most beneficial time to strike. A boosting ballistic missile is at its slowest speed compared to other phases; it is therefore not yet able to maneuver evasively and has not yet deployed decoys that complicate the targeting and intercept problem.

In the past, the United States pursued several boost-phase programs, including the Airborne Laser, the Network Centric Air Defense Element, the Kinetic Energy Interceptor, and the Air Launched Hit-to-Kill missile. Each of these programs was eventually cancelled because of insurmountable technical challenges, unworkable operational concepts, or unaffordable costs. As stated in the MDR, the Trump Administration is considering an option that would incorporate the F-35 initially as a sensor platform and later potentially as an interceptor platform for boost-phase intercepts. However, the current budget does not include funding for MDA development of a boost-phase interceptor program.

Midcourse-Phase Interceptors. The United States deploys two systems that can shoot down incoming ballistic missiles in the midcourse phase of flight. This phase offers more predictability as to where the missile is headed than is possible in the boost phase, but it also allows the missile time to deploy decoys and countermeasures designed to complicate interception by confusing sensors and radars.

The Ground-Based Midcourse Defense (GMD) system is the only system capable of shooting down a long-range ballistic missile headed for the U.S. homeland. It consists of 40 Ground-Based Interceptors (GBIs) in Alaska and four in California. In 2017, Congress approved a White House reprogramming request to increase the number of GBIs from 44 to 64 to keep up with the advancing ballistic missile threat, but this project has yet to be completed.[15] At about $70 million apiece, GBIs are rather expensive—but they are also a lot cheaper than the damage that would be caused by a successful ballistic missile attack. In March 2019, the MDA conducted a groundbreaking and successful "salvo" GMD test against an ICBM target in which one GBI intercepted the target and a second intercepted the biggest piece of debris from the exploded target.[16]

In order to increase the probability of an intercept, the United States has to shoot multiple interceptors at each incoming ballistic missile. At present, because its inventory of ballistic missile defense interceptors is limited, the United States can shoot down only a handful of ballistic missiles that have relatively unsophisticated countermeasures.[17]

The Aegis defense system is a sea-based component of the U.S. missile defense system. It is designed to address the threat of short-range, medium-range (1,000–3,000 kilometers), and intermediate-range (3,000–5,500 kilometers) ballistic missiles. It utilizes different versions of the Standard Missile-3 (SM-3) depending on the threat and other considerations like ship location and quality of tracking data. The U.S. Navy is planning to increase the number of BMD-capable ships from 48 at the end of FY 2021 to 65 at the end of FY 2025.[18] The increase reflects an increase in demands for these assets.

The Aegis Ashore system in Romania and one being deployed to Poland will relieve some of the stress on the fleet because missile defense–capable cruisers and destroyers are multi-mission and are used for other purposes, such as wartime fleet operations and even anti-piracy operations, when released from ballistic missile missions by the shore-based systems. These Aegis Ashore sites will help to protect U.S. allies and forces in Europe from the Iranian ballistic missile threat. Two Aegis Ashore batteries were sold recently to Japan to help protect U.S. allies and forces in the Indo-Pacific from the North Korean and Chinese threats, but this project has since been suspended.[19]

In February 2020, the MDA "confirmed it would conduct an ICBM intercept test with the SM-3 Block IIA missile in the third quarter of 2020." The test would be "the first ICBM-class intercept attempt for the SM-3 Block IIA missile."[20] The Pentagon hopes to use SM-3 Block IIAs as an "underlay" to the GMD system to defend the homeland, with GBIs taking the first shot at an incoming target and SM-3 interceptors taking a second shot if GBIs missed.[21] Deploying such an underlay would require the Pentagon to develop a concept of operations that includes deployment of SM-3 interceptors on Aegis ships or Aegis Ashore sites across the United States.

Terminal-Phase Interceptors. The United States currently deploys three terminal-phase missile defense systems: Terminal High Altitude Area Defense (THAAD); Patriot Advanced Capability-3 (PAC-3); and Aegis BMD.

A THAAD battery is capable of shooting down short-range and intermediate-range ballistic missiles inside and just outside of the atmosphere.[22] It consists of a launcher, interceptors, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) radar, and fire control.[23] The system is transportable and rapidly deployable. THAAD batteries have been deployed to such countries as Japan, South Korea, Israel, and the United Arab Emirates. The United States deployed a THAAD battery to Romania

in support of NATO ballistic missile defense in summer 2019 and signed a deal this year to deliver THAAD to Saudi Arabia.[24] This year's budget also included funding "to prove the technologies to enable expansion of engagement options and coverage areas for the THAAD weapon system."[25]

The PAC-3 is an air-defense and short-range ballistic missile defense system. A battery includes a launcher, interceptors, AN/MPQ-53/65 radar, an engagement control station, and diesel-powered generator units. The system is transportable, and the United States currently deploys it in several theaters around the world.[26] The system is the most mature of the U.S. missile defense systems.

The PAC-3's predecessor system, the Patriot, played a critical role in allied assurance during the First Gulf War when it was deployed to Israel. The purpose was to assure Israeli citizens by protecting them from Iraqi missiles, thereby decreasing the pressure on Israel's government to enter the war against Iraq. In so doing, the U.S. sought to prevent Israel from joining the U.S. coalition against Saddam Hussein's forces in Iraq, which would have fractured the Arab coalition.

The Aegis defense system also provides terminal capability against short-range and medium-range ballistic missiles, aerial threats, and cruise missiles, among others.[27]

Assessment: Interceptor strength is difficult to assess because deploying more interceptors to increase capacity or defend more targets would always be better than simply relying on the number currently deployed. To strengthen regional interceptor capability in the Middle East, for instance, after the January 2020 Iranian ballistic missile attack on al-Asad Air Base, which had no missile defenses, the Pentagon moved a Patriot battery to al-Asad to provide a short-term solution to the Iranian threat.[28] Nevertheless, deployment of more short-range to medium-range interceptors to more unprotected locations *ad infinitum* is clearly not sustainable.

The budget for FY 2021 includes funding to procure additional PAC-3, SM-3, and THAAD

interceptors, but DOD can also improve the effectiveness of interceptors more creatively.[29] For instance, the Pentagon is developing a THAAD remote launch capability, which can enable a commander to spread out THAAD interceptors to expand a defended area.[30] In addition, the Army recently increased its THAAD battery requirement from seven (the existing number) to eight.[31] This eighth THAAD battery was not included in the FY 2021 budget request; instead, it appeared as the number two priority on the MDA's Unfunded Priorities List.[32]

In terms of GBI capacity and capability to defend the homeland, Air Force General Terrence J. O'Shaughnessy, Commander, U.S. Northern Command (NORTHCOM), recently stated that he "retains confidence in the current ground-based interceptor fleet" but that it will need to improve to remain ahead of emerging threats.[33] After a series of North Korean provocations in 2017, the Trump Administration and Congress agreed on the need to expand interceptor capacity from 44 to 64 to keep pace with the growing North Korean threat. Twenty new silos are under construction in Alaska, but they will remain empty because DOD does not have enough interceptors available to fill them.

Existing GBIs carry Exoatmospheric Kill Vehicles (EKVs) to intercept the target with kinetic kill technology, but EKVs are no longer manufactured. The MDA intended to produce a Redesigned Kill Vehicle (RKV) to top the 20 new interceptors, but this program was canceled in 2019. The MDA instead initiated the Next Generation Interceptor (NGI) program to develop advanced kill vehicles to fill the 20 new silos and replace the 44 existing GBIs, but fielding of NGIs will not begin until 2028 at the earliest.

In addition to a delay in capacity, the GMD system will lose capability as the existing EKVs face aging and obsolescence issues. RKV would have begun to replace EKVs as early as 2021, but with NGI not expected until the end of the decade, the 44 deployed interceptors may be at heightened risk. In fact, senior defense leaders estimate that the problems of North Korean ICBM advancement and aging EKVs will converge around 2025.[34]

General O'Shaughnessy recently expressed his concerns to the Senate Armed Services Committee:

> I want to make it clear that I am deeply concerned with the resulting delay in adding to our ground-based interceptor capability and capacity. As we progress toward a next-generation interceptor (NGI) capability, USNORTHCOM remains responsible for defending the homeland from missile attacks. It is therefore necessary to swiftly develop and field a lower-tier missile defense capability as a complement to NGI to intercept current and emerging missile threats. Given the nature of the ballistic missile threat, I am a strong advocate for bringing a layered capability on board for the warfighter well before NGI is fielded.[35]

Another way to improve interceptor capability is by fielding an interceptor as part of the Army's Indirect Fire Protection Capability (IFPC) Increment 2 to defend against short-range rockets, artillery, and mortars, as well as cruise missiles, against which the United States lacks sufficient defense capability.[36] As a system, IFPC would fill the gap between short-range tactical air defense and ballistic missile defense like PAC-3 and THAAD.

In response to a congressional requirement to field an interim cruise missile defense capability to meet the increasing cruise missile threat, the Army purchased two Iron Dome batteries manufactured by the Israeli company Rafael. While Iron Dome has successfully defended Israel from short-range attacks, particularly on the Israeli border with the Gaza Strip,[37] the Army has identified problems with integration of Iron Dome as part of an enduring IFPC solution.[38] The Army is working to find the best option for a long-term IFPC solution, but until it finds that option, it will lack a strong capability in the area of cruise missile defense.

Overall, the United States has multiple capable interceptors, but there is much room for improvement. The Pentagon has viable plans in place to improve the capability of Aegis and PAC-3 assets and to acquire additional systems of each, but it will need to focus on stabilizing the homeland missile defense system in particular in the near future.

Sensors

The sensor component of the U.S. missile defense system is distributed across the land, sea, and space domains and provides the United States and its allies with the earliest possible warning of a launch of enemy missiles in addition to missile tracking and discrimination. The sensors do this by detecting the heat generated by a missile's engine, or booster. They can detect a missile launch, acquire and track a missile in flight, and even classify the type of projectile, its speed, and the target against which the missile has been directed. The sensors relay this information to the command and control stations that operate interceptor systems, like Aegis (primarily a sea-based system) or THAAD (a land-based system).

On land, the major sensor installations are the upgraded early warning radars (UEWRs), which are concentrated along the North Atlantic and Pacific corridors that present the most direct flight path for a missile aimed at the United States. These include the phased array early warning radars based in California, the United Kingdom, and Greenland that scan objects up to 3,000 miles away.[39] These sensors focus on threats that can be detected starting in the missile's boost or launch phase when the release of exhaust gases creates a heat trail that is "relatively easy for sensors to detect and track."[40]

A shorter-range (2,000-mile) radar is based in Shemya, Alaska. Two additional sites, one in Cape Cod, Massachusetts, and the other in Clear, Alaska, are being modernized for use in the layered ballistic missile defense system.[41]

The other land-based sensors are mobile. These AN/TPY-2 sensors can be forward-deployed for early threat detection or retained closer to the homeland to track missiles in their terminal phase.[42] Of the United States' 12 AN/TPY-2 systems, five are forward-deployed with U.S. allies.[43]

In March 2017, in cooperation with the Republic of Korea, the United States deployed a THAAD missile system to the Korean Peninsula; in April, it was accompanied by an AN/TPY-2. The THAAD deployment was heavily criticized by China for allegedly destabilizing China's nuclear deterrence credibility because the system would be able to improve U.S. early warning, and therefore interception, of any Chinese nuclear-tipped missiles and undermine China's second-strike capability.[44] However, the THAAD system deployed in South Korea for the purposes of intercepting North Korean missiles is not set up in a way that could track or shoot down Chinese ICBMs directed toward the United States, so why China would be so opposed to it is unclear.[45]

There are two types of sea-based sensors. The first is the Sea-Based X-band (SBX) radar that is mounted on an oil-drilling platform and can be relocated to different parts of the globe as threats evolve.[46] SBX is used primarily in the Pacific. The second radar is the SPY-1 radar system that is mounted on all 84 U.S. Navy vessels equipped with the Aegis Combat System, which means they can provide data that can be utilized for ballistic missile missions. Of these 84 ships, 40 are BMD-capable vessels that carry missile defense interceptors.[47]

Finally, U.S. missile defense sensors operate in space. Control of the space BMD system is divided among the MDA, the U.S. Space Force, and the SDA.

The oldest system that contributes to the missile defense mission is the Defense Support Program (DSP) constellation of satellites, which use infrared sensors to identify heat from booster and missile plumes. The DSP satellite system has gradually been replaced by the Space-Based Infrared Radar System (SBIRS) to improve the delivery of missile defense and battlefield intelligence.[48] For instance, SBIRS can scan a wide swath of territory while simultaneously tracking a specific

target, making it a good scanner for observing tactical, or short-range, ballistic missiles.[49]

However, congressional funding delays have left SBIRS underfunded and have hampered the system's full development and deployment.[50] In 2017, the Air Force decided to end production of SBIRS early and move on to developing its replacement, the Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) satellites. The first of these satellites, which are designed to be more survivable against cyber and electronic attacks, are scheduled for delivery in 2025.[51]

The MDA also operates the Space Tracking and Surveillance System-Demonstrators (STSS-D) satellite system. Two STSS-D satellites were launched into orbit in 2009 to track ballistic missiles that exit and reenter the Earth's atmosphere during the midcourse phase.[52] Although still considered an experimental system, STSS-D satellites provide operational surveillance and tracking capabilities and have the advantage of a variable waveband infrared system to maximize their detection capabilities. Data obtained by STSS-D have been used in ballistic missile defense tests.

From as far back as President Reagan's Strategic Defense Initiative, successive presidential Administrations have called for a layer of sensing satellites in space to track a missile's flight from birth to death. From the ultimate high ground, space-based sensors can detect missile launches from almost any location from boost phase to terminal phase, compared to ground-based radars that are limited in their tracking range.[53] In particular, space-based sensors can help track hypersonic vehicles, which fly at lower altitudes than ballistic missiles and can maneuver during their trajectories.

Since many new threats are not flying on ballistic trajectories, the Trump Administration has paid close attention to developing this space sensor layer as endorsed by the MDR. In FY 2020, Congress provided slightly more than $140.5 million to the MDA to develop the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) to fulfill this need.[54]

This year, the President requested $99.6 million for the SDA to integrate the MDA's HBTSS payload into a future architecture of sensing and tracking satellites proliferated in Low Earth Orbit (LEO).[55]

Assessment: Senior defense leaders have stated repeatedly that the most important way to advance sensor capability is to deploy sensor satellites to space in order to track missiles throughout their entire flight from the high ground. Today's deployed radars and sensors are both vulnerable to adversary attack and limited in tracking range. As Admiral Charles Richard, Commander of U.S. Strategic Command, has explained:

> Future space-based sensors may be able to provide birth-to-death detection, tracking, and discrimination of hypersonic glide vehicle, cruise missile, and ballistic missile threats globally. These abilities cannot be fully achieved with the current or future terrestrial-based radar architecture due to the constraints of geography and characteristics of future missile threats.[56]

Similarly, General O'Shaughnessy recently stated that given the emerging threat, "the urgency of taking steps now to develop and field a future space-based sensing layer as soon as technology allows cannot be overstated."[57]

But the space sensor layer program has been unnecessarily plagued by bureaucratic infighting and insufficient funding requests. In FY 2019 and FY 2020, the Administration did not request funds for a space sensor layer, so Congress unilaterally provided funding to the MDA for HBTSS. In FY 2020 and FY 2021, the Administration tried to move the program to the SDA, even though Congress expressed its desire that HBTSS remain in MDA. Moreover, a decrease in research and development funding as requested in FY 2021 would increase the difficulty of demonstrating this space sensor layer quickly, especially because of the technological challenges associated with developing a sensor that can perform in LEO.[58]

In addition to space sensors, there is a gap in missile discrimination capability over the Pacific for tracking North Korean missiles. The MDA's Long Range Discrimination Radar (LRDR) being built in northern Alaska will improve coverage in the northern Pacific but will leave a tracking and discrimination gap over Hawaii and elsewhere in the Pacific. In the FY 2021 budget, the MDA omitted plans to build a Homeland Defense Radar (HDR)-Hawaii and another HDR-Pacific due to budgetary restraints. DOD plans to use deployed AN/ TYP-2 radars, the SBX radar, and radars on Aegis ships while these homeland defense radars remain delayed.[59] Eventual deployment of the space sensor layer will also improve this capability, but it is no substitute for a long-term solution that completely closes this Pacific midcourse discrimination gap.[60]

Some progress in sensor capability has been made over the past year. Congress reprogrammed funds for Next-Gen OPIR last year after the requirement for the program moved up in schedule. If implemented by Congress, the budget for FY 2021 should fully fund the program.[61] Additionally, the Army recently awarded a contract for the Lower-Tier Air and Missile Defense System radars that will provide 360-degree threat coverage for PAC-3 and other regional missile defense batteries; for comparison, the current Patriot radar can only scan the sky one slice at a time.[62]

Despite this progress, achievement of an advanced sensor capability requires stabilization of the space sensor layer program. Due to their ability to track and characterize missiles throughout the entirety of their flight, space sensors are essential to development of an interceptor capability against advancing threats like hypersonic vehicles.

Command and Control

The command and control architecture established for the U.S. ballistic missile defense system brings together data from U.S. sensors and relays them to interceptor operators to enable them to destroy incoming missile threats against the U.S. and its allies. The operational hub of missile defense command and control is assigned to the Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), which is housed at Schriever Air Force Base, Colorado.

Under the jurisdiction of U.S. Strategic Command, JFCC IMD brings together Army, Navy, Marine Corps, and Air Force personnel. It is co-located at Schriever with the MDA's Missile Defense Integration and Operation Center (MDIOC). This concentration of leadership from across the various agencies helps to streamline decision-making for those who command and operate the U.S. missile defense system.[63]

Command and control operates through a series of data collection and communication relay nodes among military operators, sensors, radars, and missile interceptors. To command and control the GMD system to defend the homeland, the first step is the Ground-based Midcourse Defense Fire Control (GFC) process, which involves assimilating data on missile movement from the United States' global network of sensors.

Missile tracking data travel through the Defense Satellite Communications System (DSCS), which is operated from Fort Greely, Alaska, and Vandenberg Air Force Base, California, or ground-based redundant communication lines to the Command Launch Equipment (CLE) software that develops fire response options, telling interceptors where and when to fire. Once the NORTHCOM Commander (who becomes the supported commander during GMD execution) in consultation with the President has determined the most effective response to a missile threat, the CLE fire response option is relayed to the appropriate GBIs in the field.[64] When the selected missiles have been fired, they maintain contact with an In-Flight Interceptor Communications System (IFICS) Data Terminal (IDT) to receive updated flight correction guidance to ensure that they hit their target.[65]

Overlaying the Command and Control operation is the Command and Control, Battle Management and Communication (C2BMC)

program. Through its software and network systems, C2BMC feeds information to and synchronizes coordination among the multiple layers of the ballistic missile defense system.[66] More than 70 C2BMC workstations are distributed throughout the world at U.S. military bases.[67] C2BMC has undergone multiple technical upgrades, called "spirals," since 2004 to bring more missile defense elements into the network. Last year, the MDA completed an upgrade that will help to expand Aegis missile defense coverage by enabling Aegis Weapons Systems to engage on remote. In FY 2021, the MDA plans to complete another upgrade to incorporate the LRDR into C2BMC.

Regional missile defense systems like THAAD, PAC-3, and Aegis are equipped with their own individual fire control systems to command and control the launch of their interceptors. The C2BMC system can also provide tracking information to individual missile defense batteries from other regional sensors. Aegis BMD systems have onboard command and control governed by the Aegis Combat System, but they can also provide their sensor data to the GMD system through C2BMC.[68]

C2BMC connects sensors and shooters around the world to a global network, but there is no comparable system to link sensors and shooters in a single region. The Army is developing the Integrated Air and Missile Defense (IAMD) Battle Command System (IBCS) to provide this capability. Once fielded, IBCS would connect all sensors and shooters in a region to a single fire control network, as opposed to having each missile defense battery operate its own collocated sensor and launcher as is done today.[69] IBCS would also link defenses against smaller threats, like IFPC, with ballistic missile defense.

Assessment: The United States has maintained a global command and control system that it continues to improve and update. In 2018, the MDA completed updates to the aging GFC system to improve efficiency.[70] Recent spiral upgrades to C2BMC have improved capability, and future spirals that are planned will continue to increase the integration of

ballistic missile defense elements across the world. As global missile threats advance to include not just ballistic missiles, but cruise and hypersonic missiles as well, the United States will need a more advanced command and control capability to address this increasingly vast range of threats.

DOD is currently developing a Joint All Domain C2 (JADC2) system so that it can integrate non-compatible sensors across all domains into a single network to respond more efficiently to this complex threat, and missile defense command and control will strengthen as the services begin to field JADC2 capabilities. IBCS will also provide an important improvement to regional missile defenses and must remain on schedule. IBCS was originally scheduled to reach initial operating capability in FY 2019 but has already been delayed to FY 2022 because of technical issues.[71] Although the current missile defense command and control architecture can address today's threat, advancements that are underway will become increasingly necessary to strengthen command and control for the future.

Conclusion

By choice of successive post–Cold War Administrations and Congresses, the United States does not have in place a comprehensive set of missile defense systems that would be capable of defending the homeland and allies from robust ballistic missile threats. U.S. efforts have focused on a limited architecture protecting the homeland and on deploying and advancing regional missile defense systems.

While the United States has in place multiple types of capable interceptors, a vast sensor network, and a command and control system, many elements of the missile defense system need to improve to defend more effectively against today's threat. At the same time, the development of missile threats, both qualitative and quantitative, outpaces the speed of missile defense research, development, and deployment to address the future threat.

The United States has not invested enough in future ballistic missile defense technologies,

has canceled future missile defense programs like the Airborne Laser and the Multiple Kill Vehicle, and has never invested in space-based interceptors that would make U.S. defenses more robust and comprehensive. This Administration has stressed the importance of U.S. missile defense, but Congress also needs to recognize its importance and provide sufficient funding for struggling programs like GMD and space sensors if we are to reap the strategic benefits that it provides.

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Conclusion: U.S. Military Power

The Active Component of the U.S. military is two-thirds the size it should be, operates equipment that is older than should be the case, and is burdened by readiness levels that are problematic. Some progress has been made, but it has been made at the expense of both capacity and modernization. Accordingly, this *Index* assesses the:

- **Army as "Marginal."** The Army's score remains "marginal" in the *2021 Index*. The Army has fully committed to modernizing its forces for great-power competition, but its programs are still in their development phase, and it will be a few years before they are ready for acquisition and fielding. It remains "weak" in capacity with 70 percent of the force it should have but has significantly increased the readiness of the force, scoring the highest level of "very strong" in 2020. The Army has a better sense of what it needs for war against a peer, but funding uncertainties could threaten its ability to realize its goals.

- **Navy as "Marginal."** The Navy's overall score remains "marginal" in the *2021 Index* but is trending toward "weak" in capability and readiness and remains "weak" in capacity. The technology gap between the Navy and its peer competitors is narrowing in favor of competitors, and the Navy's ships are aging faster than they are being replaced. The Navy sustained its focus on improving readiness in 2020, but it has a very large hole to fill, its fleet is too small relative to workload, and

supporting shipyards are overwhelmed by the amount of repair work needed to make more ships available.

- **Air Force as "Marginal."** The USAF scores "marginal" in all three measures but is trending upward in capability and capacity. The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the amount and quality of combat air power that would be needed to meet wartime requirements. Although it could eventually win a single major regional contingency (MRC), the time needed to win that battle and the attendant rates of attrition would be much higher than they would be if the service had moved aggressively to increase high-end training and acquire the fifth-generation weapon systems required to dominate such a fight.

- **Marine Corps as "Marginal."** The score for the Corps' capacity was raised to "marginal" from "weak" but only because this *Index* has changed the threshold, lowering it from 36 infantry battalions to 30 battalions in acknowledgment of the Corps' argument that it is a one-war force that also stands ready for a broad range of smaller crisis-response tasks. However, the Corps intends to reduce the number of its battalions further from 24 to 21, which would return it to a score of "weak." The service is moving ahead aggressively with a redesign of its operating forces, but it remains hampered by old equipment, and

U.S. Military Power: Army

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✔			
Capability			✔		
Readiness					✔
OVERALL			✔		

U.S. Military Power: Navy

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity		✔			
Capability			✔		
Readiness			✔		
OVERALL			✔		

U.S. Military Power: Air Force

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✔		
Capability			✔		
Readiness			✔		
OVERALL			✔		

U.S. Military Power: Marine Corps

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			✔		
Capability			✔		
Readiness			✔		
OVERALL			✔		

problematic funding continues to constrain its deployment-to-dwell ratio to 1:2 (too few units for its workload), forcing it to prioritize readiness for deployed and next-to-deploy units at the expense of other units across the force.

- **Space Force as "Not Assessed."** The Space Force was formally established on December 20, 2019, as a result of an earlier proposal by President Trump and legislation passed by Congress. As of mid-2020, the Space Force is still in the process of

U.S. Military Power: Space (not assessed this year)

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Capacity			n/a		
Capability			n/a		
Readiness			n/a		
OVERALL			n/a		

U.S. Military Power: Nuclear

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Nuclear Stockpile				✔	
Delivery Platform Reliability				✔	
Warhead Modernization			✔		
Delivery Systems Modernization				✔	
Nuclear Weapons Complex			✔		
National Labs Talent			✔		
Force Readiness				✔	
Allied Assurance				✔	
Nuclear Test Readiness		✔			
OVERALL			✔		

being established, and personnel numbers are very small. Given the nascent state of the Space Force, we do not render an assessment of it in the *2021 Index*. We hope to assess its strength in future editions of the *Index,* but this will be complicated by the classified nature of the force.

- **Nuclear Capability as "Marginal."** This score is trending toward "strong," but it should be emphasized that this assumes that the U.S. maintains its commitment to modernization of the entire nuclear enterprise—from warheads to platforms to personnel to infrastructure—and allocates needed resources accordingly. Without this commitment, this overall score

will degrade rapidly to "weak." Continued attention to this mission is therefore critical. Although a bipartisan commitment has led to continued progress on U.S. nuclear forces modernization and warhead sustainment, these programs remain seriously threatened by potential future fiscal uncertainties. The infrastructure that supports nuclear programs is very aged, and nuclear test readiness has revealed troubling problems within the forces.

In the aggregate, the United States' military posture is rated "marginal." The *2021 Index* concludes that the current U.S. military force is likely capable of meeting the demands of a single major regional conflict

U.S. Military Power

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Army			✔		
Navy			✔		
Air Force			✔		
Marine Corps			✔		
Nuclear			✔		
Space					
OVERALL			✔		

while also attending to various presence and engagement activities but that it would be very hard-pressed to do more and certainly would be ill-equipped to handle two nearly simultaneous major regional contingencies.

The military services have continued to prioritize readiness and have seen improvement over the past couple of years, but modernization programs continue to suffer as resources are redirected toward current operations and sustainment of readiness levels. The services have also normalized the reduction in size and number of military units, and the forces remain well below the level they need to meet the two-MRC benchmark.

Congress and the Administration took positive steps to stabilize funding for fiscal years 2018, 2019, and 2020 through the Bipartisan Budget Agreement of 2018, and the Bipartisan Budget Act of 2019 sustained support for funding above the caps imposed by the Budget Control Act of 2011 (BCA). While this allays the most serious concerns about a return to the damaging levels of the BCA, more will be needed in the years to come to ensure that America's armed services are properly sized, equipped, trained, and ready to meet the missions they are called upon to fulfill.

Glossary of Abbreviations

A

A2/AD	anti-access/area-denial
AAMDS	Aegis Ashore Missile Defense System
AAV	Amphibious Assault Vehicle
ABCT	Armored Brigade Combat Team
ABM	Ansar Bayt al-Maqdis
ABMS	Airborne Battle Management System
ACF	Army contingency force
ACV	Amphibious Combat Vehicle
ADIZ	Air Defense Identification Zone
ADMM-Plus	ASEAN Defence Ministers Meeting-Plus
AEHF	Advanced Extremely High Frequency (satellite system)
AEW	airborne early warning
AFAFRICA	U.S. Air Forces Africa
AFP	Armed Forces of the Philippines
AFRICOM	U.S. Africa Command
AFSOC	U.S. Air Force Special Operations Command
AFTA	ASEAN Free Trade Area
AIP	Air Independent Propulsion
AIT	American Institute in Taiwan
AMDR	Air and Missile Defense Radar
AMPV	Armored Multipurpose Vehicle
ANSF	Afghan National Security Forces
AN/TPY-2	Army Navy/Transportable Radar Surveillance
ANZUS	Australia–New Zealand–U.S. Security Treaty
AUSMIN	Australia–United States Ministerial
AOR	area of responsibility
APC	armored personnel carrier
APS	Army Prepositioned Stocks
AQAP	Al-Qaeda in the Arabian Peninsula
AQI	Al-Qaeda in Iraq
AQIM	Al-Qaeda in the Islamic Maghreb
ARF	ASEAN Regional Forum
ARG	amphibious ready group
ARNG	Army National Guard

ASAT	anti-satellite
ASBM	Anti-ship ballistic missile
ASEAN	Association of Southeast Asian Nations
ASG	Abu Sayyaf Group
ASW	anti-submarine warfare
ASUW	anti-surface warfare
AW	air warfare
AWACS	Airborne Warning and Control System

B

BBA	Bipartisan Budget Act of 2015
BCA	Budget Control Act of 2011
BCT	brigade combat team
BCW	biological and chemical weapons
BDCA	border defense cooperation agreement
BECA	Basic Exchange and Cooperation Agreement
BJP	Bharatiya Janata Party
BMD	ballistic missile defense
BUR	Bottom-Up Review
BVR	beyond visual recognition

C

C2	command and control
C4ISR	command, control, communications, computers, intelligence, surveillance, and reconnaissance
CA	civil affairs
CAB	combat aviation brigade
CAPE	Cost Assessment and Program Evaluation
CATOBAR	Catapult Assisted Take-Off, Barrier Arrested Recovery
CBO	Congressional Budget Office
CCG	Chinese Coast Guard
CCT	Combat Controller Team
CELAC	Community of Latin American and Caribbean States
CENTCOM	U.S. Central Command
CFC	Combined Forces Command (South Korea–U.S.)
CFSCC	Combined Force Space Component Command
CFT	Cross-Functional Team
CHAMSI	Cooperative Humanitarian and Medical Storage Initiative

CI	Counterinsurgency
CIA	Central Intelligence Agency
CISMOA	Communications and Information Security Memorandum of Agreement
CJTF-HOA	Combined Joint Task Force–Horn of Africa
CLF	Combat Logistics Force
CMRR	Chemistry and Metallurgy Research Replacement
CMT	combat mission team
COCOM	Combatant Command
CONUS	continental United States
COVID-19	Coronavirus Disease 2019
CPMIEC	China Precision Machinery Import–Export Corporation
CPT	Cyber Protection Team
CRS	Congressional Research Service
CSF	coalition support funds
CSG	carrier strike group
CSO	Critical Skills Operator
CT	counterterrorism
CTC	Combat Training Center
CTF	Combined Task Force
CTIC	Counter Terrorism Information Center
CVN	Aircraft Carrier, nuclear powered
CVW	carrier air wing
CW	chemical warfare
CYBERCOM	U.S. Cyber Command
CYOC	Cyberspace Operations Centre

D

D2D	deployment-to-dwell
DA-KKV	direct-ascent kinetic-kill vehicle
DCA	defense cooperation agreement
DDPR	Deterrence and Defense Posture Review
DIME	diplomatic, informational, military, and economic
DMZ	demilitarized zone
DNI	Director of National Intelligence
DOAF	Department of the Air Force
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOS	denial of service

DDOS	distributed denial of service
DPRK	Democratic People's Republic of Korea (North Korea)
DTTI	Defense Trade and Technology Initiative
DSG	Defense Strategic Guidance
DSR	Defense Strategic Review

E

EAC	enhanced air cooperation
EADRCC	Euro-Atlantic Disaster Response Coordination Centre
EAS	European Activity Set
EBO	effects-based operations
ECP	engineering change proposal
EDA	excess defense articles
EDCA	Enhanced Defense Cooperation Agreement
EDI	European Defense Initiative
EEZ	exclusive economic zone
EFP	enhanced forward presence
EFV	Expeditionary Fighting Vehicle
EOD	explosive ordnance disposal
EMD	engineering and manufacturing development
EMP	electromagnetic pulse
ERIP	European Recapitalization Incentive Program
ESG	Expeditionary Strike Group
EU	European Union
EUCOM	U.S. European Command
EW	electronic warfare

F

FATA	Federally Administered Tribal Areas
FATF	Financial Action Task Force
FCS	Future Combat System
FOC	full operational capability
FONOP	freedom of navigation operation
FRAGO	fragmentary order
FTA	free trade agreement
FY	fiscal year
FYDP	Future Years Defense Program

G

GAO	Government Accountability Office (formerly General Accounting Office)
GATOR	Ground/Air Task Oriented Radar
GCC	geographic combatant commander
GCC	Gulf Cooperation Council
GCV	Ground Combat Vehicle
GDP	gross domestic product
GEO	geosynchronous orbit
GFMAP	Global Force Management Allocation Plan
GMV	Ground Mobility Vehicle
GPF	general purpose forces
GPS	Global Positioning System

H

HA/DR	humanitarian assistance/disaster relief
HEO	highly elliptical orbit
HMMWV	High Mobility Multipurpose Wheeled Vehicle (HUMVEE)
HVE	homegrown violent extremist

I

IAMD	Integrated Air and Missile Defense
IBCT	Infantry Brigade Combat Team
ICBM	intercontinental ballistic missile
ICS	industrial control systems
ICT	information and communications technology
IDF	Israel Defense Forces
IED	improvised explosive device
IFPC	indirect fire protection capability
IFV	infantry fighting vehicle
INDOPACOM	U.S. Indo-Pacific Command
IMF	International Monetary Fund
INEW	Integrated Network Electronic Warfare
INF	Intermediate-Range Nuclear Forces (treaty)
INFSA	Integrated Naval Force Structure Assessment
IOC	initial operating capability
IRGC	Islamic Revolutionary Guard Corps

ISAF	International Security Assistance Force
ISIL	Islamic State of Iraq and the Levant
ISIS	Islamic State of Iraq and Syria
ISR	intelligence, surveillance, and reconnaissance

J

JCPOA	Joint Comprehensive Plan of Action
JOAC	Joint Operational Access Concept
JeM	Jaish-e-Mohammed
JP	joint publication
JSF	Joint Strike Fighter (F-35 Lightning II)
JSOC	Joint Special Operations Command
JSOTF-P	Joint Special Operations Task Force–Philippines
JSTARS	Joint Surveillance and Target Attack Radar System
JLTV	Joint Light Tactical Vehicle
JTF North	Joint Task Force North
JTF–SD	Joint Task Force–Space Defense
JuD	Jamaat-ud-Dawa

K

KATUSA	Korean Augmentees to the United States Army
KFOR	Kosovo Force

L

LAC	Line of Actual Control
LAF	Lebanese Armed Forces
LAV	Light Armored Vehicle
LCAC	Landing Craft Air Cushion Vehicle
LCS	Littoral Combat Ship
LEMOA	Logistics Exchange Memorandum of Agreement
LeT	Lashkar-e-Taiba
LHA	landing helicopter assault (amphibious ship)
LHD	landing helicopter dock (amphibious ship)
LNG	liquefied natural gas
LoC	Line of Control
LPD	landing platform/dock or amphibious transport dock (amphibious ship)

LRA	Lord's Resistance Army
LRASM	long-range anti-ship missiles
LRDR	long-range discrimination radar
LRS-B	Long-Range Strike Bomber
LRIP	Low-Rate Initial Production
LSD	landing ship dock (amphibious ship)

M

MAGTF	Marine Air-Ground Task Force
MANPADS	man-portable air-defense systems
MARCENT	U.S. Marine Corps Forces Central Command
MARFORAF	U.S. Marine Corps Forces Africa
MARFOREUR	U.S. Marine Corps Forces Europe
MARFORPAC	U.S. Marine Corps Forces Pacific
MARSOC	U.S. Marine Corps Special Operations Command
MCM	mine countermeasure (ship)
MCO	major combat operation (see MRC, MTW)
MCMV	mine countermeasure vessel (ship)
MDAP	Major Defense Acquisition Program
MDO	multi-domain operations
MDT	mutual defense treaty
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MIRV	multiple independently targetable reentry vehicles
MISO	Military Information Support Operations
MNLA	National Movement for the Liberation of Azawad
MNLF	Moro National Liberation Front
MNNA	major non-NATO ally
MOJWA	Movement for Oneness and Jihad in West Africa
MPC	Marine Personnel Carrier
MPS	Maritime Prepositioning Ships
MRC	major regional conflict (see MTW, MCO)
MRAP	Mine-Resistant Ambush-Protected (vehicle)
MRBM	medium-range ballistic missile
MRF	Marine Rotational Force
MSI	Maritime Security Initiative
MTW	major theater war (see MCO, MRC)

N

NAP	National Action Plan
NASIC	U.S. National Air and Space Intelligence Center
NATO	North Atlantic Treaty Organization
NAVAF	U.S. Naval Forces Africa
NAVEUR	U.S. Naval Forces Europe
NDN	Northern Distribution Network
NDAA	National Defense Authorization Act
NDP	National Defense Panel
NDS	National Defense Strategy
New START	New Strategic Arms Reduction Treaty
NGI	Next Generation Interceptor
NMI	NATO Mission Iraq
NNSA	National Nuclear Security Administration
NPR	Nuclear Posture Review
NPRIS	Nuclear Posture Review Implementation Study
NSC	National Security Council
NSR	Northern Sea Route
NSWC	Naval Special Warfare Command

O

OAR	Operation Atlantic Resolve
OAS	Organization of American States
OCO	overseas contingency operations
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
O-FRP	Optimized Fleet Response Plan
ONA	Office of Net Assessment
ONE	Operation Noble Eagle
OPCON	operational control
OPE-P	Operation Pacific Eagle-Philippines
OPIR	Overhead Persistent Infrared
OPLAN	operational plan
OPTEMPO	operational tempo
OSCE	Organization for Security and Co-operation In Europe
OTFSTM	Operating Tempo Full Spectrum Training Miles
OT&E	Operational Test and Evaluation

P

PACAF	U.S. Pacific Air Forces
PACFLT	U.S. Pacific Fleet
PACOM	U.S. Pacific Command
PAF	Philippine Air Force
PDD-15	Presidential Decision Directive-15
PGM	precision-guided munitions
PIM	Paladin Integrated Management
PLFP	Popular Front for the Liberation of Palestine
PLFP-GC	Popular Front for the Liberation of Palestine–General Command
PKK	Kurdistan Workers' Party
PKO	peacekeeping operation
PLA	People's Liberation Army
PLAAF	People's Liberation Army Air Force
PLAN	People's Liberation Army Navy
PLARF	PLA Rocket Forces
PLASSF	PLA Strategic Support Force
PLO	Palestine Liberation Organization
PNI	Presidential Nuclear Initiative
PNT	positioning, navigation, and timing
PRC	People's Republic of China
PRT	Provisional Reconstruction Team
PSA	Port of Singapore Authority
PSF	Peninsula Shield Force

Q

QDR	Quadrennial Defense Review
QNSTR	Quadrennial National Security Threats and Trends

R

RAF	Royal Air Force
RAP	readiness action plan
RBA	Ready Basic Aircraft
RCOH	refueling and complex overhaul (nuclear-powered ship)
RDJTF	Rapid Deployment Joint Task Force
RDT&E	Research, Development, Test, and Evaluation

RFP	Request for Proposals
RIMPAC	Rim of the Pacific
RKV	redesigned kill vehicle
RMA	revolution in military affairs
ROK	Republic of Korea (South Korea)
RP	Republic of the Philippines
RPG	rocket-propelled grenades

S

SAARC	South Asia Association of Regional Cooperation
SAC	strategic airlift capability
SAM	surface-to-air missile
SAR	search and rescue
SBCT	Stryker Brigade Combat Team
SBIRS	Space-Based Infrared System (satellite system)
SCN	Shipbuilding and Conversion, Navy (budget category)
SEAL	Sea Air Land operator (Navy)
SEATO	Southeast Asia Treaty Organization
SFA	Strategic Framework Agreement
SFAB	Security Force Assistance Brigades
SIGINT	signals intelligence
SIPRI	Stockholm International Peace Research Institute
SLBM	submarine-launched ballistic missile
SMU	special mission unit
SOCAFRICA	U.S. Special Operations Command Africa
SOCCENT	U.S. Special Operations Command Central
SOCEUR	U.S. Special Operations Command Europe
SOCPAC	U.S. Special Operations Command Pacific
SOF	U.S. Special Operations Forces
SOP	Standard Operating Procedure
SORT	Strategic Offensive Reductions Treaty
SOTFE	Support Operations Task Force Europe
SPE	Sony Pictures Entertainment
SPMAGTF	Special-Purpose Marine Air–Ground Task Force
SRBM	short-range ballistic missile
SRM	Sustainable Readiness Model
SSBN	ballistic missile submarine, nuclear-powered
SSGN	guided missile submarine, nuclear-powered

SSN	attack submarine, nuclear-powered
SSP	Stockpile Stewardship Program
STA-1	Strategic Trade Authorization-1
STRATCOM	U.S. Strategic Command
SUW	surface warfare

T

TACAIR	tactical air
TAFWN	The Air Force We Need
TAI	total active inventory
TANAP	Trans-Anatolian Natural Gas Pipeline
TAP	Trans-Adriatic Pipeline
TCO	transnational criminal organization
TDY	stateside temporary duty
THAAD	Terminal High Altitude Area Defense
TTP	Tehrik-e-Taliban Pakistan
TLAM/N	Tomahawk Land Attack Missile/Nuclear
TMP	technical modernization program
TNW	tactical nuclear weapon
TPP	Trans-Pacific Partnership
TRA	Taiwan Relations Act
TRANSCOM	U.S. Transportation Command
TSOC	Theater Special Operations Command

U

UAV	unmanned aerial vehicle
UAE	United Arab Emirates
UCLASS	Unmanned Carrier-Launched Airborne Surveillance and Strike
UCP	Unified Command Plan
UNASUR	Unión de Naciones Suramericanas (Union of South American Nations)
UNC	United Nations Council
UNCLOS	U.N. Convention on the Law of the Sea
USAF	U.S. Air Force
USAFCENT	U.S. Air Forces Central
USAFE	U.S. Air Forces Europe
USARAF	U.S. Army Africa
USARCENT	U.S. Army Central

USARPAC	U.S. Army Pacific
USAREUR	U.S. Army Europe
USASOC	U.S. Army Special Operations Command
USFJ	U.S. Forces Japan
USFK	U.S. Forces Korea
USMC	U.S. Marine Corps
USNAVCENT	U.S. Naval Forces Central
USNORTHCOM	U.S. Northern Command
USSF	U.S. Space Force
USSOCOM	U.S. Special Operations Command
USSOUTHCOM	U.S. Southern Command
USSPACECOM	U.S. Space Command
USV	unmanned surface vessel
USW	undersea warfare

V

VEO	violent extremist organizations
VFA	U.S.–Philippines Visiting Forces Agreement
VLS	vertical launching system

W

WGS	Wideband Global SATCOM (satellite system)
WMD	weapons of mass destruction
WRM	wartime readiness materials
WWTA	Worldwide Threat Assessment

Methodology

The assessment portion of the *Index of U.S. Military Strength* is composed of three major sections that address America's military power, the operating environments within or through which it must be employed, and threats to U.S. vital national interests.

The authors of this study used a five-category scoring system that ranged from "very poor" to "excellent" or "very weak" to "very strong" as appropriate to each topic. This particular approach was selected to capture meaningful gradations while avoiding the appearance that a high level of precision was possible given the nature of the issues and the information that was publicly available.

Some factors are quantitative and lend themselves to discrete measurement; others are very qualitative in nature and can be assessed only through an informed understanding of the material that leads to a judgment call. Further, because conditions in each of the areas assessed are changing throughout the year, any measurement must necessarily be based on the information at hand and viewed as a snapshot in time. While this is not entirely satisfactory when it comes to reaching conclusions on the status of a given matter, especially the adequacy of military power (and will be quite unsatisfactory for some readers), we understand that senior officials in decision-making positions will never have a comprehensive set of inarguable hard data on which to base a decision.

Purely quantitative measures alone tell only part of the story when it comes to the relevance, utility, and effectiveness of hard power. In fact, assessing military power or the nature of an operating environment using only quantitative metrics can lead to misinformed conclusions. Raw numbers are a very important component, but they tell only a part of the story of war. Similarly, experience and demonstrated proficiency are often decisive factors in war, but they are also nearly impossible to measure.

The assessment of the ***global operating environment*** in this *Index* focuses on three key regions—Europe, the Middle East, and Asia—because of their importance relative to U.S. vital security interests.

For ***threats to U.S. vital interests***, the *Index* identifies the countries that pose the greatest current or potential threats to U.S. vital interests based on two overarching factors: behavior and capability. The classic definition of "threat" considers the combination of intent and capability, but intent cannot be clearly measured, so "observed behavior" (including historical behavior and explicit policies or formal statements vis-à-vis U.S. interests) is used as a reasonable surrogate because it is the clearest manifestation of intent. The countries selected according to these criteria are scored in two areas: the degree of provocative behavior that they exhibited during the year and their ability to pose a credible threat to U.S. interests irrespective of intent.

Finally, the ***status of U.S. military power*** is addressed in three areas: capability (or modernity), capacity, and readiness. All three are fundamental to success even if they are not de facto determinants of success, something we explain further in the section. Also addressed is the condition of the United States' nuclear weapons capability, which is assessed in areas

that are unique to this military component and critical to understanding its real-world viability and effectiveness as a strategic deterrent.

Assessing the Global Operating Environment

Not all of the factors that characterize an operating environment are equal, but each contributes to the degree to which a particular operating environment is favorable or unfavorable to future U.S. military operations. Our assessment of the operating environment utilized a five-point scale that ranges from "very poor" to "excellent" conditions and covers four regional characteristics of greatest relevance to the conduct of military operations:

1. **Very Poor.** Significant hurdles exist for military operations. Physical infrastructure is insufficient or nonexistent, and the region is politically unstable. The U.S. military is poorly placed or absent, and alliances are nonexistent or diffuse.

2. **Unfavorable.** A challenging operating environment for military operations is marked by inadequate infrastructure, weak alliances, and recurring political instability. The U.S. military is inadequately placed in the region.

3. **Moderate.** A neutral to moderately favorable operating environment is characterized by adequate infrastructure, a moderate alliance structure, and acceptable levels of regional political stability. The U.S. military is adequately placed.

4. **Favorable.** A favorable operating environment includes good infrastructure, strong alliances, and a stable political environment. The U.S. military is well placed for future operations.

5. **Excellent.** An extremely favorable operating environment includes well-established and well-maintained infrastructure; strong, capable allies; and a stable political environment. The U.S. military is exceptionally well placed to defend U.S. interests.

The key regional characteristics consisted of:

a. **Alliances.** Alliances are important for interoperability and collective defense as allies would be more likely to lend support to U.S. military operations. Indicators that provide insight into the strength or health of an alliance include whether the U.S. trains regularly with countries in the region, has good interoperability with the forces of an ally, and shares intelligence with nations in the region.

b. **Political Stability.** Political stability brings predictability for military planners when considering such things as transit, basing, and overflight rights for U.S. military operations. The overall degree of political stability indicates whether U.S. military actions would be hindered or enabled and reflects, for example, whether transfers of power in the region are generally peaceful and whether there have been any recent instances of political instability in the region.

c. **U.S. Military Positioning.** Having military forces based or equipment and supplies staged in a region greatly facilitates the ability of the United States to respond to crises and, presumably, achieve successes in critical "first battles" more quickly. Being routinely present in a region also makes it easier to maintain familiarity with its characteristics and the various actors that might try to aid or thwart U.S. actions. With this in mind, we assessed whether or not the U.S. military was well positioned in the region. Again, indicators included bases, troop presence, prepositioned equipment, and recent examples of military operations (including training and humanitarian) launched from the region.

d. **Infrastructure.** Modern, reliable, and suitable infrastructure is essential to military operations. Airfields, ports, rail lines, canals, and paved roads enable the U.S. to stage, launch operations from, and logistically sustain combat operations in a region. We combined expert knowledge of regions with publicly available information on critical infrastructure to arrive at our overall assessment of this metric.

Assessing Threats to U.S. Vital Interests

To make the threats identified in this *Index* measurable and relatable to the challenges of operating environments and adequacy of American military power, *Index* staff and outside reviewers, working independently, evaluated the threats according to their level of provocation (i.e., their observed behavior) and their actual capability to pose a credible threat to U.S. interests on a scale of 1 to 5, with 1 representing a very high threat capability or level of belligerency. This scale corresponds to the tone of the five-point scales used to score the operating environment and military capabilities in that 1 is bad for U.S. interests and 5 is very favorable.

Based on these evaluations, provocative behavior was characterized according to five descending categories: benign (5); assertive (4); testing (3); aggressive (2); and hostile (1). Staff also characterized the capabilities of a threat actor according to five categories: marginal (5); aspirational (4); capable (3); gathering (2); and formidable (1). Those characterizations—behavior and capability—form two halves of the overall threat level.

Assessing U.S. Military Power

Also assessed is the adequacy of the United States' defense posture as it pertains to a conventional understanding of "hard power," defined as the ability of American military forces to engage and defeat an enemy's forces in battle at a scale commensurate with the vital national interests of the United States. The assessment draws on both quantitative and qualitative aspects of military forces, informed by an experience-based understanding of military operations and the expertise of the authors and internal and external reviewers.

It is important to note that military effectiveness is as much an art as it is a science. Specific military capabilities represented in weapons, platforms, and military units can be used individually to some effect. Practitioners of war, however, have learned that combining the tools of war in various ways and orchestrating their tactical employment in series or simultaneously can dramatically amplify the effectiveness of the force committed to battle.

The point is that the ability of a military force to locate, close with, and destroy an enemy depends on many factors, but relatively few of them are easily measured. The scope of this specific project does not extend to analysis of everything that makes hard power possible; it focuses on the status of the hard power itself.

This *Index* assesses the state of military affairs for U.S. forces in three areas: capability, capacity, and readiness.

Capability. Scoring of capability is based on the current state of combat equipment. This involves four factors: the age of key platforms relative to their expected life spans; whether the required capability is being met by legacy or modern equipment; the scope of improvement or replacement programs relative to the operational requirement; and the overall health and stability (financial and technological) of modernization programs.

This *Index* focused on primary combat units and combat platforms (e.g., tanks, ships, and airplanes) and elected not to include the array of system and component upgrades that keep an older platform viable over time, such as a new radar, missile, or communications suite. New technologies grafted onto aging platforms ensure that U.S. military forces keep pace with technological innovations relevant to the modern battlefield, but at some point, the platforms themselves are no longer viable and must be replaced. Modernized sub-systems and components do not entirely substitute for aging platforms, and it is the platform itself that is usually the more challenging item to field. In

this sense, primary combat platforms serve as representative measures of force modernity just as combat forces are a useful surrogate measure for the overall military that includes a range of support units, systems, and infrastructure.

In addition, it is assumed that modernization programs should replace current capacity at a one-to-one ratio; less than a one-to-one replacement assumes risk, because even if the newer system is presumably better than the older, until it is proven in actual combat, having fewer systems lessens the capacity of the force, which is an important factor if combat against a peer competitor carries with it the likelihood of attrition. For modernization programs, only Major Defense Acquisition Programs (MDAPs) are scored.

The capability score uses a five-grade scale. Each service receives one capability score that is a non-weighted aggregate of scores for four categories: (1) Age of Equipment, (2) Modernity of Capability, (3) Size of Modernization Program, and (4) Health of Modernization Program. General criteria for the capability categories are:

Age of Equipment
- **Very Weak:** Equipment age is past 80 percent of expected life span.

- **Weak:** Equipment age is 61 percent–80 percent of expected life span.

- **Marginal:** Equipment age is 41 percent–60 percent of expected life span.

- **Strong:** Equipment age is 21 percent–40 percent of expected life span.

- **Very Strong:** Equipment age is 20 percent or less of expected life span.

Capability of Equipment
- **Very Weak:** More than 80 percent of capability relies on legacy platforms.

- **Weak:** 60 percent–79 percent of capability relies on legacy platforms.

- **Marginal:** 40 percent–59 percent of capability is legacy platforms.

- **Strong:** 20 percent–39 percent of capability is legacy platforms.

- **Very Strong:** Less than 20 percent of capability is legacy platforms.

Size of Modernization Program
- **Very Weak:** Modernization program is significantly too small or inappropriate to sustain current capability or program in place.

- **Weak:** Modernization program is smaller than current capability size.

- **Marginal:** Modernization program is appropriate to sustain current capability size.

- **Strong:** Modernization program will increase current capability size.

- **Very Strong:** Modernization program will vastly expand capability size.

Health of Modernization Program
- **Very Weak:** Modernization program faces significant problems; too far behind schedule (five-plus years); cannot replace current capability before retirement; lacking sufficient investment to advance; cost overruns including Nunn–McCurdy breach, which occurs when the cost of a new item exceeds the most recently approved amount by 25 percent or more or if it exceeds the originally approved amount by 50 percent or more.[1]

- **Weak:** Modernization program faces procurement problems; behind schedule (three–five years); difficult to replace current equipment on time or insufficient funding; cost overruns enough to trigger an Acquisition Program Baseline (APB) breach.

- **Marginal:** Modernization program faces few problems; behind schedule by one–two years but can replace equipment with some delay or experience some funding cuts; some cost growth but not within objectives.

- **Strong:** Modernization program faces no procurement problems; can replace equipment with no delays; within cost estimates.

- **Very Strong:** Modernization program is performing better than DOD plans, including with lower actual costs.

Capacity. To score the capacity of the Army, Navy, and Air Force, each service's size (be it end strength or number of platforms) is compared to the force size required to meet a simultaneous or nearly simultaneous two-war or two–major regional contingency (MRC) benchmark. This benchmark consists of the force needed to fight and win two MRCs and a 20 percent margin that serves as a strategic reserve. The Marine Corps is handled a bit differently, and the explanation for this difference is provided both in note 2 below and in a more expanded discussion within our assessment of the Corps.[2] A strategic reserve is necessary because deployment of 100 percent of the force at any one time is highly unlikely. Not only do ongoing requirements like training or sustainment and maintenance of equipment make it infeasible for the entirety of the force to be available for deployment, but committing 100 percent of the force would leave no resources available to handle unexpected situations.

Thus, a "marginal" capacity score would exactly meet a two-MRC force size, a "strong" capacity score would equate to a plus–10 percent margin for strategic reserve, and a "very strong" score would equate to a 20 percent margin.

Capacity Score Definitions
- **Very Weak:** 0 percent–37 percent of the two-MRC benchmark.

- **Weak:** 38 percent–74 percent of the two-MRC benchmark.

- **Marginal:** 75 percent–82 percent of the two-MRC benchmark.

- **Strong:** 83 percent–91 percent of the two-MRC benchmark.

- **Very Strong:** 92 percent–100 percent of the two-MRC benchmark.

Readiness. The readiness scores are derived from the military services' own assessments of readiness based on their requirements. For many reasons, not least of which is concern about informing a potential enemy's calculations on sensitive, detailed aspects of a force's readiness for combat, the services typically classify their internal readiness reporting. However, they do make some public reports, usually when providing open testimony to Congress. Thus, the *Index* does not delve into comprehensive reviews of all readiness input factors, but rather relies on the public statements of the military services regarding the state of their readiness.

It should be noted that even a "strong" or "very strong" score does not indicate that 100 percent of the force is ready; it simply indicates that the service is meeting 100 percent of its own readiness requirements. Often, these requirements assume that a percentage of the military at any one time will not be fit for deployment. Because of this, even if readiness is graded as "strong" or "marginal," there is still a gap in readiness that will have significant implications for immediate combat effectiveness and the ability to deploy quickly. Thus, anything short of meeting 100 percent of readiness requirements assumes risk and is therefore problematic.

Further, a service's assessment of its readiness occurs within its size or capacity at that time and as dictated by the Defense Strategic Guidance, National Military Strategy, and related top-level documents generated by the Administration and senior Defense officials.

It does not account for the size-related "readiness" of the force to meet national security requirements assessed as needed by this *Index*. Consequently, for a service to be assessed as "very strong" would mean that 80 percent–100 percent of the existing force in a service meets that service's requirements for being "ready" even if the size of the service is less than that required to meet the two-MRC benchmark. Therefore, it is important that the reader keep this in mind when considering the actual readiness of the force to protect U.S. national security interests against the challenges presented by threats around the world.

Readiness Score Definitions

- **Very Weak:** 0 percent–19 percent of service's requirements.

- **Weak:** 20 percent–39 percent of service's requirements.

- **Marginal:** 40 percent–59 percent of service's requirements.

- **Strong:** 60 percent–79 percent of service's requirements.

- **Very Strong:** 80 percent–100 percent of service's requirements.

Endnotes

1. See 10 U.S. Code § 2433, Unit Cost Reports, https://www.law.cornell.edu/uscode/text/10/2433 (accessed June 3, 2020).

2. As noted in the introduction to the chapter assessing military power, the three large services (Army, Navy, and Air Force) are sized for global action in more than one theater at a time. The Marines, by virtue of overall size and most recently by direction of the Commandant, focus on one major conflict while ensuring that all Fleet Marine Forces are globally deployable for short-notice, smaller-scale actions. Having assessed that the Indo-Pacific region will continue to be of central importance to the U.S., and noting that China is a more worrisome "pacing threat" than any other competitor and that the Joint Force lacks the ability to operate within the range of intensely weaponized, layered defenses featuring large numbers of precision-guided munitions, the Corps is reshaping itself to optimize its capabilities and organizational structures for this challenge. This *Index* concurs with this effort but assesses that the Corps will still need greater capacity to succeed in war in the very circumstances for which the Marines believe they must prepare. Consequently, we assess the Marine Corps' capacity against a one-war metric.

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