



2022 INDEX OF **U.S. MILITARY STRENGTH**



edited by
Dakota L. Wood

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We are honored to dedicate the
2022 Index of U.S. Military Strength
to the Honorable John F. Lehman.

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Contributors

Heritage Experts

Dakota L. Wood is Senior Research Fellow for Defense Programs in the Center for National Defense, of the Kathryn and Shelby Cullom Davis Institute for National Security and Foreign Policy, at The Heritage Foundation. He served for two decades as an officer in the U.S. Marine Corps, including service as a strategic analyst for the Commandant of the Marine Corps and the Secretary of Defense's Director of Net Assessment.

Thomas W. Spoehr, Lieutenant General, U.S. Army (Ret.), is Director of the Center for National Defense. Before joining The Heritage Foundation, he served America for more than 36 years in the U.S. Army.

Frederico Bartels is Senior Policy Analyst for Defense Budgeting in the Center for National Defense. Before joining The Heritage Foundation, he served for three years as a Policy Analyst with Concerned Veterans for America.

Dean Cheng is a Senior Research Fellow in the Asian Studies Center of the Davis Institute. He specializes in China's military and foreign policy.

Maiya Clark is a Research Associate in the Center for National Defense. She focuses on the military industrial base.

Luke Coffey is Director of the Douglas and Sarah Allison Center for Foreign Policy of the Davis Institute. He joined Heritage after service as Senior Special Advisor to the Secretary of State for Defence of the United Kingdom.

James Di Pane is a Policy Analyst in the Center for National Defense. He focuses on military cyber and the U.S. Coast Guard and manages production of the *Index of U.S. Military Strength*.

Patty-Jane Geller is a Policy Analyst in the Center for National Defense. Her work addresses nuclear deterrence and missile defense.

Bruce Klingner is Senior Research Fellow for Northeast Asia in the Asian Studies Center. He served for two decades at the Central Intelligence Agency and the Defense Intelligence Agency.

Daniel Kochis is Senior Policy Analyst in European Affairs in the Davis Institute's Margaret Thatcher Center for Freedom, where he specializes in trans-Atlantic security issues including NATO, U.S.–Russia relations, and the Arctic.

Walter Lohman is Director of the Asian Studies Center. He has served on the staff of the Senate Committee on Foreign Relations, in the office of Senator John McCain, and as Executive Director of the U.S.–ASEAN Business Council.

Alexis Mrachek is Research Associate for Russia and Eurasia in the Allison Center.

James Phillips is Senior Research Fellow for Middle Eastern Affairs in the Allison Center. He has also served at the Congressional Research Service and at the East–West Center.

Nicole Robinson is a Research Associate in the Allison Center specializing in Middle East matters.

Brent D. Sadler is Senior Research Fellow for Naval Warfare and Advanced Technology in the Center for National Defense. He retired from the U.S. Navy as a captain and served for 26 years as a submarine officer aboard multiple nuclear submarines and in various senior posts including Naval Attaché, Malaysia, and Senior Advisor to the Chief of Naval Operations.

Jeff Smith is a Research Fellow in the Asian Studies Center. He specializes in South Asia, has authored and contributed to several books on Asian security matters, and formerly served as Director of Asian Security Programs at the American Foreign Policy Council.

John Venable is Senior Research Fellow for Defense Policy in the Center for National Defense. A 25-year veteran of the U.S. Air Force and F-16 pilot, he served in three combat operations, was commander of the Thunderbirds, and earned the rank of colonel before retiring.

External Reviewers and Expert Contributors

David A. Deptula, Lieutenant General, U.S. Air Force (Ret.), is Dean of the Mitchell Institute for Aerospace Studies.

Rebecca Grant, PhD, is President of IRIS Independent Research.

Rebeccah L. Heinrichs is a Senior Fellow at the Hudson Institute.

Tom Karako, PhD, is a Senior Fellow at the Center for Strategic and International Studies.

Sarah Kirchberger, PhD, is Head of the Center for Asia-Pacific Strategy and Security at the Institute for Security Policy at Kiel University (ISPK).

Any views presented in or reflecting the results of any prepublication review of this document by an officer or employee of the United States are rendered in his or her individual capacity and do not necessarily represent the views of the United States or any agency thereof.

Acknowledgments

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

James Di Pane, Policy Analyst in the Center for National Defense, ably shouldered the major task of shepherding production of the 2022 *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. Maiya Clark, Research Associate in the Center for National Defense, lent her detailed attention to the development and accuracy of the military service modernization tables for each service, a unique reference found only in this *Index*.

Once again, the indefatigable 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. Data Graphics Services Manager John Fleming and Data Graphics Designer Luke Karnick continued their impressive work 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 and Digital Director Maria Sousa 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, and 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, and this requires a strong economy, a strong society, and a strong 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 that, if implemented, would make Members of Congress better stewards of the taxes paid by all Americans. 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 eighth 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 *2022 Index of U.S. Military Strength* possible.

Finally, as we do each year, 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 ever more challenging world.

Preface

Recent calls by some elected leaders to reduce defense spending might lead one to conclude that they must believe we live in a world that is completely safe, secure, and free from the need for a robust defense. But the unfortunate reality is that our biggest adversaries are working diligently to surpass our military capabilities at a time when much of our military equipment—including planes, tanks, and ships—is decades-old and years past its useful service life.

Even a glance at the news headlines reveals critical problems in many areas of the world. We see every day that countries like China, Russia, and Iran are willing to invade a neighbor, use their military and militias to bully other countries, and even sponsor terrorist groups and cyber hackers to attack other countries, including the U.S. and our allies.

Rogue states like North Korea and Syria and problematic ones like Iran pose direct threats to their neighbors, to their regions, and ultimately to the security of the U.S. and the rest of the free world. China and Russia, especially, seek to overturn the more freedom-seeking international order that has defined global affairs since the end of World War II in order to move toward more authoritarianism, government control of commerce, and state surveillance of citizens—not just in their own countries but throughout much of the world.

What is there to stop them? Diplomacy has its place in advocating for freedom, free-market capitalism, and healthy international relations, and diplomacy absolutely must be the first tool reached for and the tool most desired in foreign affairs. But when

diplomacy fails, the U.S. must have the ability to protect itself, its people, and its interests physically and to deter aggression by its adversaries. A strong military is also important in assuring allies and friends that the U.S. remains a capable and reliable partner.

At The Heritage Foundation, we have long recognized that one of the very few obligations the U.S. Constitution places on the federal government is to provide for the common defense. That is why Heritage publishes its annual *Index of U.S. Military Strength*: to help decision-makers in government see where our strengths, our challenges, and our opportunities for improvement lie and to help them see how we stand relative to our adversaries. The *Index* also serves to ensure that the American public is aware of how well—or how poorly—their government is handling this most critical and sacred task.

Heritage takes this mission seriously so that the government we elect and empower through our collective treasure does what the American people need it to do—and the things that only a federal government can do—and does not lose focus by straying into things that would ultimately detract from its core function.

We trust that our work assessing the challenges to America's interests and our country's ability to meet those challenges will significantly inform the debate that is so essential to protecting what has made the United States the beacon of hope, opportunity, and liberty for all the world.

Kay C. James, President
The Heritage Foundation
October 2021

Introduction

The United States maintains a military force primarily to protect the homeland from attack and to protect its interests abroad. Other uses, of course—assisting civil authorities in times of emergency, for example, and maintaining the perception of combat effectiveness to deter enemies—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 *Index* is not meant either to predict what the U.S. military might be able to do in the future or to accord it efficacy today based on the promise of new technologies that are in development rather than fielded and proven in use. It is a report to American citizens on the status of the military that they join, that they support, and on which they depend.

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 the United States is confronted by physical threats to its national security interests, it is the hard power of its 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 aging and shrinking of America’s military forces, their reduced presence in key regions since the end of the Cold War, and various distractions created by America’s domestic debates have created a perception of American weakness that contributes to destabilization in many parts of the world and prompts 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 that the defense establishment is called upon to protect, and there continues to be a significant—even growing—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 weaker America.

This can seem odd to many observers because U.S. forces have dominated 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 America’s 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 in replacements for 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 that are relevant to the United States’ vital national interests and the 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. Going to war has always been controversial, but 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: It reviews the current condition of its subjects within the assessed year and describes 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 that are 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.

The authors acknowledge that advances in technology bring new capabilities into the military. New tools, platforms, and weapons tend to prompt some observers to assume that older capabilities can easily be replaced with new ones, often in reduced numbers, or that the current force will be transformed in ways that make it decisively better than an opponent's. Typically missing in the most optimistic assessments of what the military might then be able to do is a corresponding recognition that competitors quickly adopt similar technological advances in their own militaries or that the new capability might not be as effective as believed during its development.

The historical record of war shows repeatedly that new technologies convey temporary advantages: The force that wins is usually the one that is best able to sustain operations over time, replace combat losses with fresh forces and equipment, and use its capabilities in novel ways that account for the enemy, terrain, time, and achievable objectives. This reality has led the authors to return consistently to an appreciation for force capacity, the modernity of its capabilities, and the readiness of its forces for close combat with an equally capable and competent enemy. Consequently, this *Index* continues to emphasize the importance of the two-war force sizing benchmark and the necessity of ensuring that the current force is ready for war and materially capable of winning in hard combat.

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. Using only quantitative metrics to assess military power or the nature of an operating environment 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 that is inept or poorly led.

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 its linkages and relationships 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, economic, and diplomatic 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 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 and non-state actors 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 regardless 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 of behavior and ability to pose a credible threat 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 to win in combat, and is its equipment materially ready?

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. missile defense capabilities and challenges.

The *Index* provides our first assessment of the U.S. Space Force, the newest of the military services, noting its success in consolidating the

space-specific resources and missions of the other services without any decrement in support to the force. We continue to defer assessing U.S. cyber capabilities. There are no viable metrics at this point by which to measure the capacity, capability, or readiness of U.S. Cyber Command, its constituent service components, and elements of the government that contribute to activities in the cyber domain, and it is not yet clear how one would assess its role in contributing to "hard combat power," which is 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.

Unfortunately, spending on the military has not kept pace with inflation, much less the increased rates above inflation that Secretary Mattis, among others, have said are needed to rebuild U.S. forces exhausted by (now) 20 years of continuous operations so that they might be ready for the next major conflict. When queried about the potential effect of less-than-desired levels of funding, military officials will often say that the military will have to operate at increased risk, but few attempt to define exactly what risk means in the context of great-power competition or America's ability to defend its interests.

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

- The U.S. military must always balance demands that compete for resources and attention as it assesses how much it needs

in forces, as well as what types of forces it needs, to deal with current challenges while also looking ahead to future challenges. It must also account for how the use of the forces it has today affects what it will have tomorrow. Lieutenant General David A. Deptula, USAF (Ret.), addresses how we should understand risk in this context in “Managing Risk in Force Planning.”

- Dr. Sarah Kirchberger shoulders the task of addressing risk as it relates to the challenge of dealing with China, the most profound, multifaceted, and capable competitor the U.S. has faced since the Soviet Union. In “Understanding Risk in the Great Competition with China,” she illuminates how China’s behavior, capabilities, investments, and intentions frame risk as a factor in U.S. defense planning.
- In “What We Risk If We Fail to Fully Modernize the U.S. Nuclear Deterrent,” Rebeccah L. Heinrichs explains how U.S. investment—or lack of investment—in the nuclear enterprise strengthens or weakens America’s interests in non-proliferation and deterrence, as well as allies’ and competitors’ perceptions of U.S. capabilities.
- Finally, concerns about changes in the Earth’s climate have been raised for decades, but the topic and its implications for national security, especially as it relates to the U.S. military, have received increased attention over the past 20 years or so. Dr. Rebecca Grant, in “How Prioritizing Climate Change Could Weaken America’s Military,” looks into the nature of the debate and the effect it has on the military through the lens of risk: what risks the country may be running if it expects the military to do specific things related to a changing climate but does not account for this in funding and proper equipping and fails to appreciate the

degree to which such a course of action might affect the ability of the military to prepare for war.

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 do 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 are still 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 *2022 Index*, noting how conditions have changed during the preceding year helps to shed light on the effects 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 *2022 Index of U.S. Military Strength* describes changes that occurred during the preceding year, with updates current as of early September 2021.

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 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 and domestic discord that constrain its ability to sustain its forces at a level 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 continues to be 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 other uses, of course—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, one that both assesses the state of affairs for its respective year and measures 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. This framework provides a single-source reference for policymakers and other Americans who seek to know whether our military 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 (albeit in varying language) 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, Department of Defense staffs, and independent commissions 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.¹ Its emphasis on a return to long-term competition with major powers, explicitly naming China and Russia as primary competitors,² 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 that is sufficient to deter behavior that threatens U.S. interests.

No matter how much America desires that the world be a simpler, less threatening place that is 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 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, winning the support needed to increase defense spending to the level that a force with a two-war capacity requires is admittedly difficult politically. But this 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 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:** satellite platforms, ground stations, and personnel sufficient to support warfighting requirements.

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 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. military and political reengagement with the continent along with modest increases in European allies' defense budgets and capability investments. The U.S. military position in Europe is the strongest it has been for several years.

Joint exercises have continued, and a large withdrawal from Germany was cancelled. 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 has maintained its collective defense posture throughout the pandemic. Its renewed emphasis on collective defense has resulted in a focus on logistics. The biggest challenges to the alliance derive from gaps in capability and readiness among 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 2020 (assessed in the *2021 Index*), with no substantial changes in any individual categories or average scores. The *2022 Index* again assesses the European operating environment as "favorable."

The Middle East. The Middle East region is highly unstable, in large measure because of the erosion of authoritarian regimes, and remains a breeding ground for terrorism. Although Iraq has restored its territorial integrity since the defeat of ISIS, the political situation and future relations between Baghdad and the United States will continue to be difficult as long as a government that is sympathetic to Iran is in power. U.S. relations in the region will remain complex, but this has not stopped the U.S. military from operating as needed.

The supremacy of the nation-state is being challenged in many countries by non-state actors that wield influence and power comparable to those of small states. The region's primary challenges—continued meddling by Iran and surging transnational terrorism—are made more difficult by Sunni-Shia sectarian divides, the more aggressive nature of Iran's Islamist revolutionary nationalism, and the proliferation of Sunni Islamist revolutionary groups. COVID-19 exacerbated these

Global Operating Environment: Summary

VERY POOR	UNFAVORABLE	MODERATE	FAVORABLE	EXCELLENT
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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				✓	

economic, political, and regional crises during 2020 and continued to do so throughout 2021, and the result could be further destabilization of the post-pandemic operational environment for U.S. forces.

The U.S. benefits from operationally proven procedures that leverage bases and infrastructure in the region and from the logistical processes that are needed to maintain a large force forward deployed thousands of miles away from the homeland. The personal links between allied armed forces are also present, and joint training exercises improve interoperability and give the U.S. an opportunity to influence some of the region's future leaders.

America's relationships in the region are pragmatic, based 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 varied throughout the year, in general terms, the *2022 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 with 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 need to move 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. However, the U.S. has strong relations with allies in the region, and their willingness to host bases helps to offset the vast distances

that must be covered. The militaries of Japan and the Republic of Korea are larger and more capable than European militaries, and both countries are becoming more interested in developing missile defense capabilities that will be essential in combatting the regional threat posed by North Korea.

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 difficulty that would be involved in projecting U.S. 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 to defend its interests without substantial opposition or high levels of risk.

Threats to U.S. Interests

America faces challenges to its security at home and interests abroad from countries and organizations with:

- 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.

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 handful 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 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.

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 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 in 2021 pressured Ukraine with a large buildup of forces along its border, raising speculation about a possible incursion. It also has sustained its increased 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. Its economy was affected in the early stages of the COVID-19 pandemic but rebounded in the later stages and has grown in 2021. The

2022 Index again assesses Russia's behavior as “aggressive” and its growing capabilities as “formidable” (the highest category on the scale).

China is the most comprehensive threat the U.S. faces. It remains “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. It continued to exercise its first domestically produced aircraft carrier, commissioned in December 2019, and construction of its second continues. 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 probe the South Korean and Japanese air defense identification zones, drawing rebukes from both Seoul and Tokyo, and has been especially aggressive in sailing and flying through the seas and airspace around Taiwan.

Iran represents by far the most significant security challenge to the United States, its allies, and its interests in the greater Middle East. This is underscored by its open hostility to the United States and Israel, sponsorship of terrorist groups like Hezbollah, history of threatening the commons, and increased activity associated with its nuclear program. Iran relies heavily on irregular (including political) warfare against others in the region and fields more ballistic missiles than are fielded by 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 region’s general instability. The *2022 Index* extends the *2021 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

Threats to U.S. Vital Interests: Summary

SEVERE	HIGH	ELEVATED	GUARDED	LOW
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Behavior of Threats

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
China		✓			
Russia		✓			
Iran		✓			
North Korea			✓		
Non-State Actors		✓			
OVERALL		✓			

Capability of Threats

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
China	✓				
Russia	✓				
Iran		✓			
North Korea		✓			
Non-State Actors			✓		
OVERALL		✓			

Threats to U.S. Vital Interests

	SEVERE	HIGH	ELEVATED	GUARDED	LOW
China		✓			
Russia		✓			
Iran		✓			
North Korea		✓			
Non-State Actors		✓			
OVERALL		✓			

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.

Though Pyongyang has refrained from nuclear tests during 2021, it has engaged in a range of provocative behavior that includes missile tests.

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. North Korea also uses cyber warfare as a means of guerilla warfare against its adversaries and international financial institutions. 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.

A broad array of terrorist groups remain the most hostile of any of the threats to America examined in the *Index* even though they fall short of the state-level capabilities possessed by countries such as Iran. 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, threatening 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.

Based on the assessments of these threat sources, the 2022 *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."

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 service by 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 as we do the Army, Navy, Air Force, Marine Corps, and Space Force (newly scored in this edition), we acknowledge the importance of 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 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. Substantial progress was made in regaining readiness in 2020, but slippage because of continued underinvestment in defense relative to need has been noted in 2021, and the forecast for 2022 is gloomy given the level of funding requested in the President's FY 2022 budget submission.

Even though the military has been heavily engaged in operations for the past two decades, primarily in the Middle East but elsewhere as well, experience in warfare is ephemeral and context-sensitive. Valuable combat experience is lost as servicemembers who individually gained experience leave the force, and it retains direct relevance only for future operations of a similar type: Counterinsurgency and adviser support operations in Iraq, for example, are fundamentally different from major conventional operations against a state like Iran or China. In general, the withdrawals of U.S. military forces from Iraq in 2011 (now a decade in the past) and from Afghanistan this year 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 of the sort 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 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 in direct comparison. Rather, they are

assessments of the institutional, 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 *2022 Index*. The Army has sustained its commitment to modernizing its forces for great-power competition, but its modernization programs are still in their development phase, and it will be a few years before they are ready for acquisition and fielding. In other words, the Army is aging faster than it is modernizing. It remains "weak" in capacity with only 62 percent of the force it should have. However, 58 percent (18) of its 31 Regular Army BCTs are at the highest state of readiness, thus earning a score of "very strong" and conveying the sense that the service knows what it needs to do to prepare for the next major conflict. That said, its capability score remains "marginal" given the age of its equipment and the size and maturity of its modernization programs.

- **Navy as "Marginal," Trending Toward "Weak."** The Navy's current battle force fleet of 296 ships and intensified operational tempo combine to reveal a service that is much too small relative to its tasks, resulting in a capacity score of "weak," which is unchanged from the *2021 Index*. It desperately needs a larger fleet of 400 ships, but current and forecasted levels of funding will prevent this from occurring for the foreseeable future. This has the unhappy effect of causing the service to age more rapidly than it can replace older ships, thus making it easier for major competitors to achieve technological parity. It also has made it difficult for the Navy to conduct the training essential to achieving high levels of readiness. Consequently, the Navy is rated "marginal" on a downward slope to "weak" in readiness.

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

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

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				✓	

- **Air Force as “Weak.”** This is a down-grade from an assessment of “marginal” in the *2021 Index*. Though the Air Force possesses 86 percent of the combat aircraft that this *Index* recommends, public reporting of the mission readiness and physical location of these planes would make it difficult for the Air Force to respond rapidly to a crisis. Additionally, the need to source these aircraft from all locations for a single major fight would likely preclude a response to any other major combat action. Modernization programs are generally healthy, but the advanced age of key aircraft in the Air Force’s inventory is driving the service to retire planes faster than they can be replaced, leading to a capability score of “marginal.” The service also lost ground in readiness compared with the preceding year. A score of “weak” in this area is the result of a shortage of pilots and flying time that implies a lack of effort or focused intent given the general reduction in operational deployments as U.S. actions overseas have ebbed.
- **Marine Corps as “Strong.”** The score for the Marine Corps was raised to “strong” from “marginal” for two reasons: (1) because the *2021 Index* changed the threshold for capacity, 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, and (2) because of the Corps’ extraordinary efforts to modernize (which improves capability) and enhance its readiness during the assessed year. However, in the absence of additional funding in FY 2022, the Corps intends to reduce the number of its battalions even further from 24 to 21, and this reduction, if implemented, would harm the Corps’ overall ability to perform the role it has set for itself: enabling the projection of naval power into heavily contested combat environments. The service has moved ahead aggressively with a redesign of its operating forces and the acquisition of new warfighting tools, but it remains hampered by old equipment and problematic funding.

U.S. Military Power

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Army			✓		
Navy			✓		
Air Force		✓			
Marine Corps				✓	
Nuclear				✓	
Space		✓			
OVERALL			✓		

- Space Force as “Weak.”** 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. The *2021 Index* provided an overview of the new service, explaining its mission, capabilities, and challenges, but did not offer an assessment. With an additional year to gain more insight, the *2022 Index* scores the USSF as “weak” in all measured areas. The service has done quite well in transitioning missions from the other services without interruption in support, but it does not have enough assets to track and manage the explosive growth in commercial and competitor-country systems being placed into orbit. The majority of its platforms have exceeded their planned life span, and modernization efforts to replace them are slow and incremental. The force also lacks defensive and offensive counter-space capabilities.
- Nuclear Capability as “Strong” but Trending Toward “Marginal” or even “Weak.”** This is the opposite of the conclusion reached in the *2021 Index*, which reported a trend from “marginal” to “strong.” The grade of “strong”

recognizes the Trump Administration’s commitment to reversing the decline in the U.S. nuclear enterprise and the Biden Administration’s decision to sustain the commitment to modernization of the entire nuclear enterprise—warheads, platforms, command and control, personnel, and infrastructure—and allocate needed resources accordingly. Without this commitment, this overall score will degrade rapidly to “weak.” Progress in modernization efforts, combined with assurances from senior leaders that the forces remain reliable, warrants a more optimistic assessment than we have been able to provide in previous editions. That being said, this score of “strong” with a conditional trend toward “marginal” or “weak” reflects a greater risk of a degradation in nuclear deterrence than has been seen in the recent past. Current forces are assessed as reliable today, but nearly all components of the nuclear enterprise are at a tipping point with respect to replacement or modernization and have no margin left for delays in schedule. Failure of on-time appropriations and lack of Administration support for nuclear modernization could lead to a rapid decline in this portfolio to “weak” in future editions.

In the aggregate, the United States' military posture continues to be 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 that is now having a negative effect both on major acquisition programs and on installation-level repair capabilities. **The 2022 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 that is made more difficult by the generally weak condition of key military allies. The presidential decision to withdraw forces from Afghanistan might provide some breathing room for force recovery but only if other operational demands do not retask the military services.

In general, the military services continue to prioritize readiness and have seen some improvement over the past few years, but modernization programs, especially in shipbuilding, continue to suffer as resources are committed to preparing for the future and recovering from 20 years of operations. In the case of the Air Force, some of its limited acquisition funds are being spent on aircraft of questionable utility in high-threat scenarios while R&D receives a larger share of funding than efforts meant to replace quite aged aircraft are receiving. As observed in the *2021 Index*, 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. The Marine Corps’ plan to reduce its size even further so that it can redirect savings in manpower toward the capability modernization that it views as essential for success in future combat provides a stark example of the consequences of the government’s underinvestment in defense.

Congress and the Administration took positive steps to stabilize funding in the latter years of the Budget Control Act of 2011 (BCA). This mitigated the worst effects of BCA-restricted funding, but sustained investment in rebuilding the force to ensure that America’s armed services are properly sized, equipped, trained, and ready to meet the missions they are called upon to fulfill will be critical.

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

Endnotes

1. Though issued during President Donald J. Trump's Administration, the 2018 NDS has not yet been superseded by a similar document, focused on the military, from the Administration of President Joseph R. Biden. However, the Biden Administration has released interim guidance in which it sets out the broad outlines and priorities of its national security agenda. In particular, President Biden's *Interim National Security Strategic Guidance* reiterates the same core national security interests and the same set of major competitor countries posing challenges to U.S. interests that the preceding Administration identified and places them in a global context wherein the U.S. military must be ready to handle several problems in geographically separated locations. See President Joseph R. Biden, Jr., *Interim National Security Strategic Guidance*, The White House, March 2021, pp. 8–9, <https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf> (accessed August 19, 2021).
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Managing Risk in Force Planning

David A. Deptula, Lieutenant General, USAF (Ret.)

The United States is a global power with global commitments. As such, it cannot focus on a single problem or threat to the exclusion of others, nor can it seek to minimize risk across the board. To do so would be financially infeasible. Instead, the United States must seek to manage risk, setting priorities and allocating scarce resources to the most salient threats while accepting risk in other, less critical areas. As the United States enters another defense budget downturn, these choices become even more challenging as Congress and the Department of Defense (DOD) must grapple with what programs to cancel, curtail, or at least defer to balance the books.

Although the fiscal year (FY) 2022 defense budget request is essentially flat after accounting for inflation, rising internal costs, particularly for operations and maintenance (O&M) and compensation for U.S. servicemembers, mean that DOD must find savings elsewhere to offset this cost growth.¹ Congress, already aware of the many programs and expenses for which the Pentagon has requested funding, will deliberate on the implications of budgets that fall short of needs. This typically leads to hearings during which a Member asks someone from the Pentagon about the potential consequences of a loss of funding for something or another and the answer is usually, “Well, we’d have to operate at increased risk.”

Although correct in the strict sense, when the term “risk” is used repeatedly in this vague manner to explain the implications of virtually any defense cut, it quickly loses all meaning.

This lack of clarity and understanding of risk undermines effective decision-making for defense planning—something the United States cannot afford at a time of simultaneously growing threats to U.S. national security and fewer resources with which to deal with them.

Risk to What?

The first step in reaching a more precise understanding is to clarify what is at risk. From a force planning perspective, there are two relevant types of risk: operational and strategic. When Pentagon officials testify before Congress about the potential implications of programmatic cuts, they are typically referring to a form of operational risk, which broadly refers to the probability that a military force will be unable to achieve an operational mission objective set out for it within the current defense strategy.

The objectives of a national defense strategy are operationalized in a “force planning construct” that defines the number, types, and frequency of operations for which the U.S. military should be sized and shaped to support. For example, the unclassified summary of the 2018 National Defense Strategy (NDS) outlines that the U.S. military should be sized and shaped to “deter aggression in three key regions—the Indo-Pacific, Europe, and Middle East; degrade terrorist and WMD threats; and defend U.S. interests from challenges below the level of armed conflict” in peacetime.² In wartime, “the fully mobilized Joint Force will be capable of defeating aggression by a major power;

deterring opportunistic aggression elsewhere; and disrupting imminent terrorist and WMD threats.”³ The strategy also requires the U.S. military to remain prepared to “deter nuclear and non-nuclear strategic attacks and defend the homeland” in both peace and wartime.⁴

Broadly, the U.S. military’s ability to meet these objectives can be compromised in one of two ways:

- It lacks the capability and/or capacity to achieve current and future military objectives (risk to mission), or
- It is unable to provide and sustain the force over time at an acceptable level of readiness and across the range of objectives it is expected to execute (risk to force).

Risk to Mission. Risk to mission reflects the force’s capability and capacity to conduct current operations at an acceptable human, material, and financial cost as well as its expected performance against emerging or anticipated threats as laid out in the defense strategy. Whereas current operations have focused on the ongoing conflicts in Iraq and Afghanistan, as well as on deterring rogue regimes such as North Korea, the 2018 NDS made clear that the priority would now be confronting Russia and/or China. However, because these are not active conflicts, risk to mission relative to these objectives must be assessed against planning scenarios.

The most important and stressing scenarios for which the 2018 NDS called on the services to prepare involve defeating the invasion of a U.S. ally or friend by China or Russia before the invader can achieve a *fait accompli*.⁵ In this context, a *fait accompli* involves a peer adversary seizing territory before the U.S. military can respond effectively and then presenting an escalation dilemma that would coerce the United States and its allies into relenting and accepting the new status quo.⁶

DOD planning scenarios include a Chinese invasion to occupy Taiwan and a Russian

invasion of NATO’s eastern flank, mostly likely in the Baltic Sea region. In recent years, when DOD and others have used war games to assess these scenarios, the United States military has consistently lost.⁷ Given these discouraging results, the question that naturally follows is: What can be done to reduce this risk to mission?

It is widely acknowledged that DOD suffers from both capability and capacity shortfalls. However, a better understanding of what they are and how to address them requires operating concepts that link DOD’s planning guidance to its resource requirements. In other words, how much of what type of military power is needed to do what the planning scenarios or strategy demand?

Operating concepts seek to solve operational challenges—in this case Russia’s or China’s *fait accompli* strategies—by describing the military objectives that military forces should achieve and how those forces should be organized and employed to achieve them in the smartest possible fashion. Critically, by describing solutions to concrete problems in terms that are understandable to all relevant stakeholders, operating concepts foster better understanding of what capabilities and force structure are needed, convey the potential implications of not resourcing a given program, and provide a foundation for an assessment of where potential tradeoffs exist—including across services—to accomplish a mission in the most effective and efficient manner possible.

The Army’s experience with its AirLand Battle doctrine provides insight into how operating concepts can help to focus attention on operational risks and close gaps between strategy and resources. In the wake of the Vietnam War, the Army found itself with a force that had hollowed out its high-end warfighting capabilities for a potential conflict against the Soviet Union to prioritize organizing, training, and equipping forces to support irregular warfare and counterinsurgency operations in Southeast Asia. To rebuild itself, the Army focused on the most salient, threat-based problem of the

day: a Soviet attack by a numerically superior force against NATO in Central Europe.

AirLand Battle, a combined-air/land doctrinal concept, sought to address this problem with land forces maneuvering in an aggressive defense while air forces attacked rear-echelon enemy forces feeding their front. By providing an understandable framework for how the services would execute the concept, AirLand Battle helped to rationalize and build support for the Army's "Big Five" modernization priorities: the M-1 Abrams tank, Bradley Infantry Fighting Vehicle, Apache attack helicopter, Black Hawk utility helicopter, and Patriot air defense system, all of which continue to be mainstays of the Army today. Critically, the concept also acknowledged the limitations of what the Army could accomplish on its own and fostered greater interservice cooperation and synchronization, recognizing that the Air Force was better suited to providing deep attacks beyond the forward edge of the battle area.

Risk to Force. Risk to force relates to the ability of the services to generate and sustain military forces over time. Risk to force can manifest itself in several ways. For example, the military could struggle to meet current campaign and contingency mission requirements, which could be an issue of either supply or demand for forces. On the supply side, the force could be too small to maintain sustainable force rotations at the desired operational tempo and for all the tasks the defense strategy expects it to execute. Over time, this kind of force generation imbalance can break the force: too few people and too little equipment trying to handle too much work.

This has been a chronic problem for the Air Force, which since the end of the Cold War has received insufficient funding to modernize and recapitalize its force.⁸ Unable to procure enough aircraft to modernize its fleet, the Air Force has had to rely on an aging and progressively smaller force, which in turn costs more to maintain and therefore crowds out even more resources that could have been used to acquire newer aircraft. The bomber force is

emblematic of this modernization death spiral. After almost three decades of budget pressures, the bomber force has dropped from a high of 422 bombers in FY 1988⁹ to just 158 today.¹⁰ At the same time, demand for bombers has risen dramatically, with one Air Force commander noting that the mission-driven need for bombers has risen 1,100 percent over a five-year period.¹¹

The lack of sufficient funding for new aircraft combined with higher-than-expected usage of current aircraft has accelerated the wear and tear on the bomber force. This dynamic is why the Air Force felt compelled to retire 17 of its most worn B-1Bs to sustain the remaining bombers and to help fund its modernization programs.¹² A similar pattern holds across most of the Air Force fleet, 44 percent of which is now operating beyond its planned service life.¹³

The flip side of this is that the demand for forces from combatant commanders may be more than the military can support. Some analysts have recently pointed out the need to review and potentially curb combatant commanders' "unbounded demands for U.S. forces, primarily for an ever-growing list of presence missions" for which they "have no incentive to be sparing."¹⁴ This puts tremendous strain on the service chiefs, who must balance meeting the demand for forces from combatant commanders with other priorities such as much-needed force modernization.

In recent years, all of the services have struggled to keep up with demand for their forces.

- To help bridge the gap between retiring its aging KC-10s and KC-135s and bringing its new KC-46s online, the Air Force was thinking of contracting privately operated tankers to help meet more than 25,000 hours of non-supported flying hours.¹⁵
- Navy aircraft carriers have repeatedly had to conduct back-to-back deployments without major maintenance periods. Last year, the USS *Stout*, a guided missile

destroyer, spent a record 215 straight days at sea, reflecting a U.S. Navy without enough ships to execute the tasks required of it.¹⁶

- The Army has struggled with deployment to dwell time ratios far above what is sustainable in the long term for the current force.¹⁷

Another way risk to force can manifest itself is through attrition in the execution of missions that leaves forces vulnerable or unable to respond to other challenges. Over the past several decades of operating against less capable adversaries, the U.S. military has grown accustomed to astonishingly low attrition rates. Quite simply, this would not be the case in the event of a peer conflict. For context, during the 1973 Yom Kippur War, the Israeli Air Force (IAF) lost 102 of its 390 aircraft in 19 days of operations against a peer adversary (a collection of Arab countries led by Egypt and Syria) and suffered a total aircraft lost or damaged rate of 4.8 percent during the first week of fighting.¹⁸

If the U.S. Air Force continues to skew its forces toward older aircraft that lack the degree of survivability that will be needed to operate in future threat environments, it should expect to experience similar loss rates or worse in a conflict with China or Russia. A recent analysis by the Mitchell Institute for Aerospace Studies shows that if a similar 5 percent attrition rate were applied to U.S. fighters in a simulated conflict with China, a U.S. force of 791 combat-coded fighters could be reduced to 236 fighters remaining available after just 19 days of combat.¹⁹

Lacking any spare capacity, it would take years to recover from such losses, during which time the United States would be exceedingly vulnerable to other threats. For example, a recent study determined that it would take the industrial base an average of 8.4 years at surge production rates to replace current inventories of combat aircraft, ships, and other major weapons systems.²⁰

Of course, this risk is not limited to platforms. The Air Force has an ongoing shortage of pilots that, despite reduced competition from airlines due to the COVID-19 pandemic, has not abated.²¹ The lack of sufficient pilots even during a time of relative peace means that virtually no elasticity exists to replace highly trained combat pilots in the event of combat casualties. As with aircraft, it would take years and significant investments to replace these lost pilots. According to a recent RAND study, it costs between \$5.6 million and \$10.9 million to train a basic qualified fighter pilot.²² Replacing potentially hundreds of pilots lost in battle would be enormously expensive just in dollars, not to mention the time it takes to train new pilots.

Shortfalls in munitions and other expendables are also a perpetual concern.²³ In a peer conflict, current inventories of preferred munitions such as Advanced Medium-Range Air-to-Air Missiles (AMRAAM) and Joint Air-to-Surface Standoff Missiles (JASSM) would be expended rapidly and could not be replenished quickly. Once depleted, U.S. forces would have to reduce their operational tempo or revert to less effective and shorter-range weapons that expose the launching aircraft to greater risk from enemy defenses.

Risk to National Interests

Strategic risk relates to threats posing dangers directly to the United States including its population, territory, civil society, critical infrastructure, and/or interests. The 2018 NDS encapsulates what this means in practice for the Department of Defense as being “prepared to defend the homeland, remain the preeminent military power in the world, ensure the balances of power remain in our favor, and advance an international order that is most conducive to our security and prosperity.”²⁴

Assessing strategic risk involves a complex cumulative judgement based on the priorities assigned to various objectives within a given strategy as well as the aggregated operational risk. As noted, there is strategic risk inherent in every defense strategy: There simply are not

enough resources to minimize risk across the board. Instead, a well-crafted defense strategy manages risk by establishing priorities based on its assessment of what the most salient threats are and, by extension, accepting more risk in areas deemed less critical. For example, the 2018 NDS prioritizes confronting China and Russia at the expense of dedicating a greater share of resources to combating terrorism.

Whereas the prioritization and reorientation of DOD's planning and resourcing toward great-power competition are reasonable and long overdue, other strategic risks accepted by the 2018 NDS warrant greater scrutiny. One notable example is the fact that its force planning construct requires the services to organize, train, and equip to fight either China or Russia—not both. This single-war condition represents a significant break from previous post-Cold War defense strategies, all of which considered it critical that the U.S. maintain the capacity to fight two wars nearly simultaneously. The logic of the two-war strategy was to have sufficient capacity and capability to deter a second opportunistic aggressor from taking advantage of a U.S. military that is already engaged against a different adversary in another theater.

The timing of the shift to a single-war construct is perplexing, considering that the United States faces more threats today than at any other time since the end of the Cold War. Rather than being strategy based, this situation was driven by arbitrary budgets set by Congress without any relationship to the content of the national security and national defense strategies. The reality is that senior DOD leaders have concluded that a two-war force cannot be achieved with the budget constraints imposed by Congress.²⁵ Unfortunately, the current DOD budget does not even support the projected cost of rebuilding the U.S. military to win a single war against a great-power adversary at a moderate level of confidence.

Simply put, the U.S. military today lacks the capacity and capability to defeat China in a military conflict.²⁶ Although perhaps understandable from a budgetary perspective, this

also increases the strategic risk that a second adversary could launch a major military operation that threatens America's vital interests. For example, the United States risks failing to defend NATO from opportunistic Russian aggression if U.S. forces are already locked in an existential fight with China in the Indo-Pacific theater.

The DOD leadership has a responsibility to make clear to the current Administration, the Congress, and the American people the shortfalls and risks to readiness of a defense budget that is unable to meet the requirements of the national defense strategy, and this requires a clear problem statement. For example, the Air Force's 2018 statement of need for 386 operational squadrons—24 percent larger than the 312 that exist today—made clear what was necessary to meet the demands of the national defense strategy. That requirement has not changed.

The services must submit budgets in accordance with directed guidance from the White House, but they also have a responsibility to advocate for what they need to execute the defense strategy. Conflating budget submissions with the actual defense strategy requirement can give the false impression that missions can be met no matter how small the budget may be.

Historically, the military services recognized a *planning force* (what it needed) and a *programming force* (what the budget allowed). The space between the two was a measure of risk. The planning force was eliminated in the late 1990s, and there is now no easy means to recognize the gap between what the military needs to execute the defense strategy and what it can field with the budget that it is issued.

The Biden Administration should reinstate the process of submitting both a planning force and a programming force. The formal re-establishment of the planning force on an annual basis would provide a visible measure of risk between what the military has and what it needs.

Given its more abstract nature, strategic risk is rarely discussed in the context of programmatic or capability decisions. One notable exception to this rule is the United States'

nuclear forces. Since the 1960s, the nuclear triad and its associated nuclear command, control, and communications (NC3) system have served as the bedrock of U.S. national security by providing a continuous deterrent to nuclear-armed adversaries who pose an existential threat to the United States and its allies. Over the past 30 years, however, nuclear modernization programs have repeatedly been truncated, deferred, or cancelled in favor of other programs that were deemed higher priority at the time.

The culmination of these decisions that used nuclear modernization as a “bill payer” is a triad that is on the brink, with nearly all of its major systems operating well beyond their original planned service lives. Although the same critics who argued against previous nuclear modernization initiatives are once again arguing against the need to modernize DOD’s nuclear enterprise,²⁷ the reality is that failure to modernize America’s nuclear forces in a timely manner would diminish the nation’s strategic nuclear deterrence posture even as the international security environment grows more dangerous, punctuated by Russia and China continuing to invest significant resources into their nuclear forces.

Risk in Time?

There is also a temporal element to risk: For a given decision, there can be tradeoffs in risk across time. One of the fundamental tradeoffs that defense planners must confront is that between investment in readiness, capability, and capacity.

- Readiness is the condition of forces with respect to their equipment, personnel, skills, proficiency, and sustainment necessary to fight and win the nation’s wars.
- Capability in this context refers not only to old equipment that may still be effective, but also to investments in the future force and is generally reflected in the budgets for modernization and research, development, test, and evaluation (RDT&E).

- Capacity relates to the size of the force, typically measured in terms of end strength or operational units.

The task that confronts the service chiefs and defense planners is attempting to find the proper balance among these three factors, making decisions on when and where to take risk in the current force to prepare for the future or else taking risk in future capabilities if they assess that the demand for current capabilities cannot be put in jeopardy.

Deputy Secretary of Defense Kathleen Hicks has referred to this balancing act as the “iron triangle of painful trade-offs” because defense planners “can nuance the edges of the dilemma, but for the most part, the [triangle] forecloses radical changes in the defense strategy.”²⁸ She further adds that, in general, as long as U.S. forces are engaged in active conflicts, investments in future capabilities are the most easily deferred.

Two change-minded leaders, Air Force Chief of Staff General Charles “CQ” Brown and Marine Corps Commandant General David H. Berger, recently co-wrote an op-ed that attempts to tilt the readiness balance in favor of modernization by introducing the future into the readiness part of the equation. In line with the 2018 NDS’s decision to accept more risk in the near term to modernize for future conflicts, the service chiefs argue that “we, as members of the Joint Chiefs of Staff, should embrace a framework for readiness that manages the relationship between today’s combatant command requirements with the modernization imperatives required to enable tomorrow’s combatant commanders.”²⁹

In other words, they are attempting to reframe readiness in terms of readiness to execute the mission from a capability perspective, which in their assessment requires placing more emphasis on future combat readiness and capabilities even at the expense of current readiness.

On the one hand, they have a valid point. Critical elements of readiness include sufficient and capable forces that can meet the anticipated

threats. Decades of deferred, truncated, or cancelled modernization mean that in the event of a major conflict, the United States would have to rely predominantly on 1970s and 1980s technology. Today, for example, the average Air Force tanker is more than 50 years old, and less than 20 percent and 13 percent of the fighter and bomber fleets, respectively, are stealthy.³⁰

Simply put, in view of the way that the character of the threat is advancing, the United States would not be able to sustain the fight against a peer adversary with such outdated equipment even if it achieved 100 percent readiness across its forces. In this sense, the effort by Generals Brown and Berger to redefine readiness to place greater emphasis on modernization has significant merit.

On the other hand, although this effort to change the framework is clever rhetorically, it does not provide a fundamental escape from the iron triangle of painful tradeoffs. The services are making big bets on future technologies that hold potential, such as artificial intelligence and hypersonic weapons, in the hope that they ultimately will help the United States to maintain its comparative military advantage against such peer competitors as China and Russia. Secretary of Defense Lloyd Austin has remarked that the FY 2022 defense budget includes “the largest-ever request for RDT&E for development of technologies,” with Joint Chiefs of Staff Chairman General Mark Milley adding that the budget “biases the future, slightly” over the present.³¹

However, in the rush to modernize, the challenge remains: How well will the military transform for an uncertain future as well as hedge for unexpected contingencies in the present? What remains unsaid is that these investments in the future are coming at the cost of having to divest existing force structure and current combat-credible readiness. Furthermore, budget constraints are compelling the services to divest current forces on the bet that their replacements will be fielded sometime in the next 10 years rather than waiting until the new capabilities have entered the force and demonstrated their combat relevance.

In the hope of staying ahead of the technology curve, the services are also forgoing sufficient procurement of capabilities that are available today. For example, instead of increasing procurement of F-35As to 80 per year as it once intended, the Air Force has requested only 48 F-35As per year in its three most recent budgets. At that rate, the Air Force will not fully field its planned F-35A force until the mid-2040s.³² Although preparing the force for the future as technology advances is critical, this approach dramatically increases the risk that the United States will lose a peer conflict if it occurs in the near term—something of which potential adversaries are undoubtedly aware and are monitoring closely.

Ideally, the services would be able to fund current combat-credible readiness *and* make significant investments in future capabilities. However, this would be executable only if the military received significant funding increases. Instead, the services are constrained by the current budget environment, and this places them in the uncomfortable position of trying to choose the least bad option. Ultimately, it is up to Congress and the American people to decide whether they are willing to provide the military with the additional resources it needs. But regardless of the outcome, these decisions should be made with a full appreciation of the risks involved in not doing so.

How Much Risk?

Obviously, not all risks are created equal. The level of risk associated with a given threat or hazard is a function of two variables: the probability that a negative event will occur and the expected severity of the resulting harm. A greater level of risk is assumed either when it becomes more likely that a negative event will occur or when the likely harmful consequences of such an event become more severe. The potential harm or consequences of such an event are in turn estimated by considering the value of the interest at stake, the extent of the damage that can be done, and the permanence of the potential damage inflicted.

Based on the assessed probability and potential consequences of a negative event occurring, each potential threat is characterized with an associated level of risk ranging from low to high. Although bounded to the extent possible by empirical data, risk judgment is ultimately a qualitative effort that depends upon, among other things, the relative importance that a decision-maker assigns to more likely or more consequential threats.

By its nature, risk assessment is an inexact science hampered by a combination of the complexity of the subject matter, uncertainty driven by incomplete knowledge, and the ambiguity that can result in competing yet equally reasonable interpretations of the same sources of risk. However, current defense planners suffer from another, more avoidable challenge: The gap in threat perception between themselves and the broader American public they serve has grown alarmingly wide.

In this sense, the U.S. military has been a victim of its own success. For 30 years, the United States has had the uncontested ability to do virtually whatever it wanted militarily anywhere in the world. Additionally, the size of the force needed for post-Cold War operations in which the United States has engaged was such that the U.S. military could sustain those deployments indefinitely. The result of this recent dominance is that many can no longer conceive of a world in which U.S. military supremacy is not a given, and this has biased the perception of both inputs to the calculation of risk.

First, having grown accustomed to U.S. military superiority over lesser adversaries and not having experienced a larger, conventional war in more than 30 years, the public's perception of the likelihood of armed conflict between the United States and a peer competitor such as China or Russia is that it is highly unlikely. Furthermore, the public believes that the United States far outpaces any other power in defense spending—though the margin has in fact narrowed significantly³³—and this reinforces the belief that even should a conflict occur, it would be virtually impossible for the United States to lose. The reality, however, is

that both the possibility of war and the possibility that the United States might lose are very real and continue to grow more likely as the United States' military advantage in key regions continues to erode.

Second, the public also tends to underestimate the potential consequences of the risk posed by China and Russia. Reminiscent of debates during the Cold War over whether the United States would be willing to trade New York for Paris in a potential nuclear exchange, there is significant handwringing today over public willingness to go to war with a major power over Taiwan or Estonia, neither of which is perceived as a vital U.S. national interest. However, the potential consequences are profound. As the 2018 NDS points out, “failure to meet our defense objectives will result in decreasing U.S. global influence, eroding cohesion among allies and partners, and reduced access to markets”³⁴ that for decades have helped make Americans secure, prosperous, and free.

The fear is that it is going to require a significant defeat to wake up Congress and the American people to the danger. The United States could very well lose the next battle—and perhaps the next war—if it does not change course. Perhaps only then will the Administration, Congress, and the American people realize that the only thing more expensive than a first-rate military is a second-rate one. Unfortunately, by then, it may be too late to reverse the damage.

Conclusion

Making better-informed decisions about the acceptability of risk and, by extension, what should be done about it requires better communication among all relevant stakeholders: the Administration, defense planners in the Office of the Secretary of Defense, the armed services, Congress, and the American public. Effective communication should aim to reduce potential misunderstandings and potential surprises as they relate to risk.

The single most important step that DOD could take to improve the understanding of

both the nature and the extent of risk would be to require the services to release both a planning force that is sized to meet the demands of the national defense strategy and a programming force that reflects what can be achieved within the constraints of congressional appropriations. In this construct, the difference between the two equates to risk. This would dramatically improve transparency and insight into the degree of risk the U.S. military faces because of differences between what America's armed services need and what they are allocated.

Endnotes

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Understanding Risk in the Great Competition with China

Sarah Kirchberger, PhD

On Christmas Day 2018, during an awards ceremony for Chinese military industry leaders, retired People's Liberation Army (PLA) Major General Luo Yuan gave a speech discussing China's options for dealing with its main strategic rival, the United States of America. That speech soon made headlines because Luo, a deputy secretary-general of the Chinese Academy of Military Sciences, seemed to be advocating a preemptive attack on U.S. aircraft carriers as a way to shock the U.S. into retreat.¹

During earlier parts of his speech, Luo suggested attacking the opponent's weak spots with China's own superior forces:

[W]hen our soldiers are fighting, they should use our own strengths to attack the enemy's weak spots. Whatever the enemy fears for, we should attack! Wherever the enemy is weak, we will expand there! So, what exactly is the US afraid of?... I feel we have not done enough serious thinking and research on this question.... I am not an expert in this area, nor can I answer this question accurately myself. I do remember a saying by Mao Zedong though: "Imperialism is a paper tiger." So what are the characteristics of a paper tiger? Outwardly it looks strong, but it's weak on the inside; its appearance is severe, but it is devoid of substance. We don't know where their weaknesses are, but we do know where

their strengths are. And if you puncture their strengths, just like when puncturing a paper window, the weaknesses will be revealed.

Luo further elaborated on the specifics of how a "puncturing of US strengths" could be conducted:

Historical experience tells us that the United States is most afraid of people dying. We now have the DF-21D and the DF-26 missiles, these are aircraft carrier killers. If we sank one of their carriers, this would cause 5,000 casualties; if we sank two: 10,000 casualties—don't you think America would be afraid?²

Luo's suggestion does not necessarily represent the mainstream thinking among China's leadership. Nevertheless, such rhetoric coming from a seasoned military official signals a new low in the war of words that increasingly characterizes China–U.S. relations. If nothing else, Luo's ideas are a vivid example of the risk of escalation through miscalculation. Already in 2014, the influential navalist Zhang Wenmu of Beihang University had put forward the idea that China should adapt Vladimir Putin's hybrid strategy for occupying Crimea as a promising way to take Taiwan. He argued that China would certainly succeed because the collective West would not care enough to intervene.³

Though it remains difficult to assess how prevalent such ideas are, it would be dangerous to assume that they are shared only by a few rogue thinkers.⁴ During the preceding decade, popular Chinese writings had increasingly featured aggressive statements toward the U.S. and questioned the international order shaped by it. Such publications, among them “China Can Say No,” “Unhappy China,” “China’s Maritime Rights,” “China Dream,” and “Wolf Totem,” typically emphasized Chinese grievances.

In 2011, in an insightful analysis of what he calls the “geopolitik turn” in Chinese politics, Christopher Hughes traced in all of these texts a “morbid fascination with the relationship between violence and power,” notions of a Chinese “moral exceptionalism,” and the idea that China asserting its sovereignty over territories such as Taiwan or the South China Sea (SCS) is “no more than a form of restorative justice.” Consequently, “China’s use of force and expansion is...always judged to be defensive,” and if such notions were to become more influential, the result would be “an increasingly zero-sum approach to international politics.”⁵

Challenges from Probing Behavior

Developments since Xi Jinping’s rise to power in 2012 have largely borne out this analysis. The disruptive communication style adopted by Beijing’s “Wolf Warrior” diplomats all over the world also appeared during the 2021 U.S.–China summit in Alaska when China’s most senior foreign affairs official disregarded previously agreed rules on speaking time limits and berated his American hosts.

Rhetoric aside, a multitude of actions taken by China’s military and paramilitary forces in the Western Pacific reveal a pattern of gray-zone activity that seems designed to disrupt the status quo. By conducting threatening actions below the threshold of military aggression on a steadily increasing scale and frequency, China seems determined to test the willingness and capacity of neighboring states and the U.S. to respond effectively. There is a risk that China could succeed in numbing foreign observers into indifference in the face of

ever more transgressions, permanently shifting the boundaries of the “normal.”

This is a method China shares with Russia and Iran, as Jakub J. Grygiel and A. Wess Mitchell observe in *The Unquiet Frontier: Rising Rivals, Vulnerable Allies, and the Crisis of American Power*. They note that “probing” behavior, defined by them as a “test aimed at gauging the opposing state’s power and will to maintain security and influence over a region,” seems to have become a tool used increasingly “by revisionist powers for pushing the existing boundaries of their influence.”⁶

China’s probing has consisted so far of air incursions into Taiwan’s air defense identification zone (ADIZ) paired with exercises in the maritime space around Taiwan and in the SCS and also includes increased Maritime Militia activity around contested features in the South and East China Seas. The successful seizure of Scarborough Shoal from the Philippines in 2012 and the subsequent land reclamation and militarization of occupied Paracel and Spratly features can also be classified as “probing.” From China’s viewpoint, those attempts to create a new status were vastly successful.

The PLA derives a number of benefits from disruptive actions. Each air incursion into Taiwan’s ADIZ not only exerts psychological pressure on Taiwan’s public, but also provides valuable intelligence on terrain and on electronic signatures of Taiwanese defensive weapon and sensor systems. Further, by forcing the Republic of China (ROC) Air Force to intercept intruding aircraft, they are prematurely wearing down Taiwan’s aging fighter aircraft fleet. The strain may already have been responsible for several accidents that led to the loss of pilots and aircraft.

Steadily enhanced pressure from China’s Maritime Militia on the Senkaku Islands or on Philippine-occupied or Vietnamese-occupied reefs in the SCS has similar effects of combining intimidation tactics with intelligence collection and is similarly wearing down opponents’ capacities to respond. The downside for the PLA is a heightened China-related threat perception among affected countries that may

yet lead to enhanced military spending and better readiness on their part and incentivizes them to balance China by cooperating more closely with the U.S.

China's Capacity to Shape the Global Playing Field

China's increasingly disruptive behavior has been accompanied by an exceptionally fast growth in military capability. Investments that have poured into China's military buildup for three decades have borne fruit and threaten to tilt the conventional military power balance in the Western Pacific in China's favor much faster than most analysts had previously anticipated.⁷ Backed by an increasing capacity to cause harm, China's assertive actions signal its resolve to use that capacity when whatever Beijing defines as its "core interests" at any given time are threatened.

Meanwhile, China's ability to pressure the West has increased dramatically since the financial crisis of 2008. In a world that is characterized by interdependent markets and globalized supply chains, the Communist Party-led brand of Chinese state capitalism has not just been able to survive; it has thrived. Due to party-state control of the Chinese financial sector, bolstered by the PRC's large foreign reserves, and by following a state-capitalist approach, China was able to weather the financial crisis better than most and could even serve as an anchor of stability for other countries that were not so fortunate. This had a remarkable effect on the attitudes displayed by Chinese functionaries and diplomats abroad, who began to behave more assertively toward Western counterparts, and has bought China lasting leverage in Europe where its supportive role during the European debt crisis left a legacy, notably in Germany and Greece. It also has enhanced the attractiveness of the "Chinese Model of development" to some developing countries.

Making use of party-state control of strategic economic sectors, China nurtured its leading state-owned enterprises (SOEs) into industrial giants through a combination of subsidies and domestic protectionism while bolstering

their worldwide business outreach activities financially and politically, including through its Belt and Road Initiative (BRI).⁸ In port infrastructure investments such as the state-owned shipping giant COSCO's 67 percent stake in the port of Piraeus in Greece, according to the European Chamber of Commerce, a strategy of "vertical integration" is typically followed:

Chinese shippers use ports built and run by SOEs (State-Owned Enterprises) using steel and cement provided by SOEs; they use vessels built by the newly created shipbuilding behemoth [...] using steel made by SOEs, which is provided using iron and coal from SOEs; all of which is financed by SOE banks.⁹

The BRI fulfills multiple functions for China's Grand Strategy of making the world secure for the Chinese Communist Party (CCP). It allows China to hedge against the threat of blockade, generates dependencies and political support within key regions and within the U.N., and helps to market the Chinese business and investment models as well as cyber and space technologies abroad while its infrastructure investment projects help to make inroads into NATO's own backyard.

All of this has led to a situation in which key U.S. allies in Europe and the Indo-Pacific have become intertwined economically with China as closely as or even more closely than they are with the U.S. This has created openings for authoritarian influencing campaigns, coercive diplomacy, and elite capture, while the relative openness of Western high-tech research has given the PLA easy access to military and dual-use technologies that would otherwise be unavailable.¹⁰ The one-sided dependence of entire business sectors on access to the Chinese market imposes prohibitive costs on companies and political actors that are brave enough to risk political friction in their dealings with China. This increasingly calls into question the ability and willingness of some allies to choose sides in a scenario in which tensions between the U.S. and China escalate.

When seeing the chance to drive a wedge between the U.S. and its allies, China is keen to ensure that the West cannot unify to “gang up on China.” At the same time, China is actively competing for influence with European and U.S. initiatives in Africa and the Middle East and North Africa (MENA) region, but increasingly also in South America, and is offering its surveillance technologies to non-democratic governments in an effort to check the spread of democratic values around the world—values that the CCP sees as an existential threat.¹¹

As a result of these developments, the Western relationship with China has entered an age of uncertainty. Western leaders are facing a more complex and therefore arguably more challenging threat situation than they faced before 1989 in a world that was neatly bifurcated into opposing camps between which there was little economic exchange.

During the Cold War, the U.S. and the Soviet Union shared an understanding of the risk from mutually assured destruction (MAD); had a reasonably clear picture of each other’s military capabilities, strategic intent, and non-negotiable red lines; and had established direct communication links as a mechanism to minimize the risk of accidental escalation. Today, the overall picture is far less clear. China’s ability to present a different face to different allies makes it hard for Western leaders to form a unified situational awareness regarding the challenges posed by China, and this alone presents significant potential for miscalculation.¹² In addition, while a Beijing–Washington hotline similar to the U.S.–Russian communication link has existed since 2008, reports indicate that China has cut it off several times, and U.S. attempts to communicate through that channel have typically not been answered.¹³

In this context, a discussion of some military risk factors in the U.S.–China relationship is necessary. An escalation could occur not only through mishap or accidents, but also if China and the U.S. were drawn into a downward spiral and began to see conflict between them as ultimately inevitable. In such a situation, China could see resorting to a preemptive strike

as a rational decision. More likely than that, however, would be accidental escalation due to miscalculation—for instance, if brinkmanship were to go wrong in one of the many hot spots where China and the U.S. compete over critical interests.

One key question is: Would nuclear deterrence put strong enough constraints in place to make scenarios of war through accidental escalation or through premeditated preemptive attack exceedingly unlikely? While it is not possible to provide any definite answers, thinking through the implications of various risk scenarios, including those that are deemed unlikely, is a necessity for the U.S., its allies, and the Chinese themselves: It is, after all, in the long-term interest of all sides *including China* to avoid a catastrophic war.

Can There Really Be War Between Two Nuclear-Armed Powers?

During the Cold War, nuclear deterrence was a decisive factor that constrained both sides’ moves. Today, new technological developments have brought about shifts in the strategic balance that need to be factored into the old assumptions.

One such factor is the pace and quality of China’s military modernization, which the Chairman of NATO’s Military Committee, Air Chief Marshal Sir Stuart Peach, recently described as “shocking.”¹⁴ To some degree, this effort is intended to counter American arms programs that have long worried Chinese military experts: ballistic missile defense (BMD) and conventional prompt global strike (PGS). As Lora Saalman notes:

Chinese analysts view PGS as part of a larger U.S. effort to achieve “absolute security,” with BMD as the shield and PGS as the sword, such that Washington is able to act preemptively.... Chinese analysts tend to view U.S. PGS as a threat to Beijing’s conventional and nuclear weapons systems, as well as its command and control centers.¹⁵

Notably, Chinese military commentators tend to view any U.S. program—whether real or only contemplated, whether funded or not, whether terminated or ongoing—as being factually in existence, and they react to it as a threat that requires adequate countermeasures. An abundance of technical Chinese articles dissecting PGS, for instance, have advocated that China give up on its “no first use” policy of never deploying nuclear weapons first; intensify the military use of space; enhance the resilience of its space infrastructures and global intelligence, surveillance, and reconnaissance (ISR) capabilities; and improve its space launch vehicles and offensive cyber capabilities.¹⁶

Being critical of American PGS does not preclude China from striving for similar capabilities itself, as Saalman also points out. China’s diverse ballistic missile program has been described as the most active in the world, giving China the world’s largest inventory of short-range and medium-range ballistic missiles, many of which can be either conventionally or nuclear armed. These form the backbone of China’s version of a layered defense strategy, commonly known as anti-access/area denial or A2/AD, to deter foreign interventions in its near abroad. According to a recent study by the International Institute for Strategic Studies (IISS), about 95 percent of China’s ballistic and cruise missiles (approximately 2,200 rockets) fall within the 500 km–5,500 km range prohibited by the Intermediate-Range Nuclear Forces (INF) treaty. This makes the prospects of China’s joining a comparable arms control mechanism dim.¹⁷

Meanwhile, China is working on a full nuclear triad by developing an intercontinental-range submarine-launched ballistic missile, the JL-3, which reportedly can carry up to 10 independent warheads and is intended for China’s next-generation nuclear-powered ballistic missile submarines (SSBNs). With an estimated range of 12,000 km, it would give China the option of targeting at least part of the continental U.S. from a bastion in the SCS. A first successful test firing took place on

June 2, 2019.¹⁸ At the same time, two recent studies based on satellite imagery analyses noted significant new construction activity of about 250 new ballistic missile silos in Gansu and Xinjiang provinces. This amounts to a ten-fold expansion of the previously operational Chinese missile silo capacity. It also “exceeds the number of silo-based ICBMs operated by Russia, and constitutes more than half of the size of the entire US ICBM force,” making it “the most extensive silo construction since the US and Soviet missile silo construction during the Cold War.”¹⁹ This was not the end of the story. In August 2021, U.S. intelligence agencies identified a third, similar-sized missile silo field under construction in Inner Mongolia and estimated that the three new silos would be able to field a total of 350 to 400 new ICBMs. With 10 warheads per DF-41 missile, this would amount to space for more than 4,000 nuclear warheads—if all silos were indeed used to house missiles rather than some being left empty as part of a shell game. This would exceed America’s approximately 3,800 warheads, of which more than 2,400 are in storage. The actual number of warheads would be limited by China’s available stockpile of fissile material. Experts estimate that at present, China has enough weapons-grade uranium and plutonium “for about 730 nuclear warheads without having to build new enrichment or reprocessing facilities.”²⁰

In addition, many Chinese military and dual-use programs, including the global SAT-NAV (satellite navigation) constellation BeiDou; other remote sensing and communication satellites such as Gaofen, Yaogan, Jilin, Tianlian, and Hainan; China’s own BMD program; and hypersonic glide vehicles (the DF-ZF HGV was tested in 2014) would be able to contribute to a PGS capability over time. The commercial nanosatellite Jilin-1 constellation, for instance, aims “to have 60 satellites operational by 2020, and 138 satellites in service by 2030, which will ultimately make it possible to offer a 10-minute revisit capability anywhere in the world.”²¹ In the summer of 2020, Jilin-1’s maker, Chang Guang Satellite Technology, posted several

high-resolution videos of U.S. airports on its Weibo channel and demonstrated the system's real-time ability to identify and track individual aircraft.²²

Another remote-sensing constellation under development, the Hainan-1, is intended for all-weather non-stop ship identification in all areas between latitudes 30 degrees North and 30 degrees South, which includes the entire South China Sea. A Chinese research paper indicated that simulations have already yielded 95 percent accuracy in identifying ships larger than 30 meters in length, which is sufficient for most surface warships.²³

When combined with the existing military remote-sensing constellations Gaofen and Yaogan and a global network of ground stations that is also under development, such systems would enable targeting updates for an intercontinental PGS system, and the small, cheap nanosatellites especially would add a layer of resilience through redundancy and the easy replacement of lost units.²⁴ “If the same ideas on preemption are applied to China’s own PGS,” notes Saalman, “then its nuclear posture may change, whether declared or not.”²⁵

To counter perceived threats to its land-based nuclear-tipped missiles, China has begun to work on a full nuclear triad and the significant expansion of its warhead inventory. Other key priorities are a drive to further enhance A2/AD capabilities to discourage interventions within China’s near abroad, developing the maritime domain, and building a blue-water power projection capability. A further aim is to transform the PLA from a fully mechanized force into an “informationized” (networked) force and eventually a force that has adapted to the “intelligentization of warfare” and can take full advantage of militarily focused artificial intelligence (AI).²⁶

The Impact of Emerging Technologies

China sees the emphasis on 4IR (fourth industrial revolution)²⁷ technologies in the military, especially AI, as a potential game-changer that could allow the PLA to leapfrog over some of its current deficiencies; ethical concerns

regarding the safe use of AI in warfare do not seem to exist at all.²⁸ China fully embraces the potential of AI for improving the accuracy and lethality of its cruise missiles. According to an account of an August 2016 interview with Wang Changqing, Director of the General Design Department at the China Aerospace Science and Industry Corporation’s Third Academy:

“[O]ur future cruise missiles will have a very high level of artificial intelligence and automation,” he said. “They will allow commanders to control them in a real-time manner, or to use a fire-and-forget mode, or even to add more tasks to in-flight missiles.”

Chinese engineers have researched the use of artificial intelligence in missiles for many years, and they are leading the world in this field, he said.²⁹

AI is also a key enabler of China’s “blue ocean information network,” a vast surveillance infrastructure deployed in the South China Sea that consists of fixed and mobile sensor arrays, unmanned systems, and communication platforms interlinking with ships, aircraft, and unmanned aerial vehicles (UAVs) that aims to render the underwater domain transparent. If successful, it could compromise the stealth of U.S. nuclear attack submarines operating in that area.³⁰

Another application of AI is intended to network hypersonic weapons into smart swarms for coordinated attacks in order to overwhelm missile defense through saturation attack. A study from the Beijing Institute of Technology titled “Network for Hypersonic UCAV [Unmanned Combat Aerial Vehicle] Swarms” seeks to multiply the power of hypersonic weapons by having them work together. Such swarms would be far more dangerous than individual hypersonic missiles, multiplying the power of high-speed weapons.³¹

One reason for China’s willingness to embrace AI for offensive purposes in warfare is the problem of nuclear asymmetry. Beijing’s

comparatively small nuclear arsenal makes concepts that neutralize an opponent's numerical advantage especially attractive. Writes Saalman:

AI and autonomy...offer Beijing the long-term potential to disrupt Washington's traditional strengths. They open the door for swarm and other technologies that could overwhelm conventional and nuclear platforms that are larger, more cumbersome, and less agile. While China may be concerned about potential adversaries tracking its own nuclear platforms and systems, Beijing is just as likely to avail itself of these relatively inexpensive methods of disrupting US activities.³²

The heavy reliance of American net-centric warfare on data links and space infrastructures for geolocation, communications, and C4ISR (command, control, communications, computers, intelligence, surveillance and reconnaissance) has not only acted as a force multiplier; as a side-effect, it has created vulnerabilities that can be exploited through asymmetric attacks. Having analyzed American vulnerabilities, the PLA is exploring asymmetric attack vectors against the nodes that enable a networked system.

Here China is following a holistic approach of "unrestricted" (total) warfare encompassing all domains.³³ Bringing down a military network by jamming data links, blinding sensors, spoofing or otherwise disabling SATNAV and SATCOM (satellite communication) satellites, or physically destroying key platforms that are relied upon by other units (for instance, for area defense)—in other words, disrupting the system through cyber, electronic warfare, and kinetic attacks—is an approach long favored by PLA thinkers. In a study of PLA writings on "system destruction warfare," Jeffrey Engstrom summarizes the concept:

[T]he PLA's very theory of victory in modern warfare recognizes *system destruction warfare* as the current

method of modern war fighting. Under this theory, warfare is no longer centered on the annihilation of enemy forces on the battlefield. Rather, it is won by the belligerent that can disrupt, paralyze, or destroy the operational capability of the enemy's operational system. This can be achieved through kinetic and nonkinetic strikes against key points and nodes while simultaneously employing a more robust, capable, and adaptable operational system of its own.³⁴

At the same time, psychological and information warfare aimed at undermining an opponent's ability to interpret the facts correctly, arrive at a reliable situational awareness, and maintain societal resolve to resist an opponent in the face of an unclear threat situation is explicitly part of such an approach. So is "legal warfare" employed to delegitimize the opponent's actions and win international support for one's own position.

Though by no means new, information and psychological warfare has gained new traction in the age of social media. The openness of democratic societies offers multiple vectors for attacking societal cohesion, disrupting election procedures, or hindering the formation of political will in other ways, while cyberattacks on critical infrastructures have the potential to disrupt and wear down societies. Depending on the concrete circumstances, asymmetric "system destruction warfare" might be employed as a first salvo, in particular if it were possible to disguise the initial attack or make attribution to a particular perpetrator difficult.

How High Is the Risk of a Conventional First Strike?

Jon Solomon has emphasized that naval forces have to confront the risk of possibly falling victim to a devastating first salvo. This might be fired by an enemy if he is certain that war is unavoidable. In such a case, the opponent would expect his own ISR assets to degrade sharply once the fighting starts, knowing that the "maritime picture will never be as

accurate and comprehensive at any later point in a conflict as it is during peacetime's waning moments." The awareness of a fast-closing window of opportunity for accurate targeting of capital ships might induce such an attacker to try to "maximally neutralize a defender's higher campaign-value fleet assets" as long as he still sees the chance to do so.³⁵

Another key question is: How could a war that began with a conventional first strike remain conventional without escalating to nuclear war if it turns into a protracted fight? Depending on just how disastrous the prospect of losing would seem to those in power, it is not farfetched to consider that the danger of losing might tempt that side into using the threat of nuclear coercion to avoid such an outcome. Even though China officially adheres to a "no first use" policy, that is just a declaration of intent that could be changed at any time and should not be taken as a guarantee.³⁶

Some analysts do not consider a nuclear escalation scenario when discussing conventional war between China and the U.S., deeming it far too unlikely, but that might be unwise.³⁷ As a RAND study cautioned in 2016, "confidence that an adversary will comply with one's script and, more generally, that the results of a decision can be controlled are tantamount to assuming away risk."³⁸ Even if the U.S. were willing to accept defeat on the battlefield at the hands of China without ever resorting to the threat of using its far superior nuclear arsenal, the assumption that playing the nuclear card would not even be contemplated by China's leaders in a desperate situation is just such an expectation of the CCP's adhering to a script. Mao's contempt for nuclear weapons as "paper tigers" is a case in point.

For the CCP, the risk of losing a conflict with the U.S. that China started might create such a harsh domestic backlash that accepting military defeat might make the CCP's position at home precarious. Given the CCP's record of defending its power position by all means possible, Beijing might very well resort to nuclear brinkmanship. Both sides in such a situation might try to find ways to employ the

threat potential of their nuclear weapons to avoid defeat while still trying to contain the risk of full-blown nuclear war—but the road to a potentially catastrophic escalation would be open, and whether an attempt to contain it would be successful is uncertain.

In one hypothetical scenario of a future great-power conflict between the U.S. and a China–Russia coalition that was developed by the authors of the 2015 sci-fi novel *Ghost Fleet*,³⁹ the risk of a nuclear escalation was artfully eliminated from the equation through a Chinese–Russian first strike that neutralized the U.S. nuclear arsenal. This plot ploy allows for a plausible scenario in which two nuclear-armed opponents engage in a full-blown, kinetic, protracted, and yet purely conventional great-power conflict.

In the book, China and Russia have formed a secret alliance and have prepared the ground for a preemptive strike against the U.S. to take Hawaii. To achieve this, the attackers use a novel, secretly developed detection technology from space to target all U.S. nuclear-powered capital warships, including all SSBNs, simultaneously while carefully placed cyber weapons paralyze the land-based and air-based nuclear forces. This leaves the U.S. unable to resort to nuclear retaliation despite having absorbed devastating losses. In that Pearl Harbor 2.0-type scenario, Hawaii is invaded and occupied.

The book's plot sketches out how the conflict continues as a conventional war in which the U.S. finds itself fighting as the underdog and China and Russia, having achieved their limited war aims, refrain from further attacking the U.S. mainland. The rest of the novel describes the process of reconquering Hawaii through guerilla warfare, tactical ingenuity, and acts of individual heroism while portraying the use of emerging technologies including sophisticated cyber weapons and autonomous systems deployed in swarm formations. The story ends with an uneasy truce.

It is worthwhile to ask what the necessary preconditions for such a *Ghost Fleet*-style first strike scenario would be. The American defenders in that case would need to have

overlooked—for several years—the forming of a secret Russian–Chinese military alliance; the successful development and deployment of a novel technology that enabled the detection and targeting of nuclear reactors from space, even aboard submerged strategic submarines; and the long-term infiltration of their own critical cyber networks through the hardware and software supply chain. A series of striking intelligence failures and massive deficiencies in early warning on the part of the U.S. would have been necessary for such a bold, high-risk preemptive strike to be secretly planned and successfully executed. It can be inferred that in the absence of such a string of failures, the odds of success would have been low—probably too low for a rational actor even to contemplate.

In other words, unerring vigilance, regular war-gaming, awareness of one's own vulnerabilities, recognition of unlikely worst-case scenarios, incessant monitoring of all military and paramilitary activities, analyses of scientific developments in military-technological and dual-use fields and of diplomatic developments worldwide would go a long way toward averting any scenarios of this type.

What Might China Actually Be Planning to Do?

One indicator that China is trying to hedge against the risk of a crippling first strike is the emphasis placed on building much larger numbers of individual weapon systems than ever before. This could be to ensure the ability not just to overwhelm an opponent, but also to create sufficient redundancy in the face of heavy losses. One particularly striking example of this is the enlargement of the PLA Navy (PLAN) fleet.

The modernization of the PLA that started in the mid-1990s was long hampered by the Western arms embargo, but it has gained unprecedented momentum under Xi Jinping. The scale and pace are highly unusual and have enabled China to replace its motley array of old and obsolete hulls with large series of far more modern and capable warships that are also significantly larger and more seaworthy overall.

- In the largest peacetime naval buildup since at least the 1930s, China has been producing warships as if it were already at war, with shipyards reportedly working around the clock seven days per week, sometimes completing hulls ahead of schedule.⁴⁰
- An entirely new class of 72 corvettes was commissioned by the PLAN within just eight years alongside numerous new frigates, destroyers, submarines, amphibious assault vessels, and missile catamarans.
- Between 2014 and 2018, measured in tons of steel, China has added the equivalent of the entire Royal Navy (Europe's largest) to its already large navy. Similarly, the Chinese Coast Guard has been massively enlarged and is now the world's largest according to tonnage.⁴¹
- The past decade has already seen the addition of two aircraft carriers to the fleet, and more are in the pipeline. It is unclear just how many aircraft carrier groups China is planning to operate, but a retired military official has indicated that “at least six aircraft carriers” would be needed to “break through the first island chain involving South Korea, Japan, Taiwan island and the Philippines to achieve command of the sea” and that the PLAN would need “about 10 more bases for the six aircraft carriers...[h]opefully...in every continent.”⁴² The opposite trend is the norm in Western countries, where naval programs typically suffer from cost overruns, cuts, and significant delays.

China's huge buildup has not been accompanied by any serious attempts to defuse regional worries through strategic communication—for instance, through transparency and other trust-building measures. As with the land reclamation and island militarization frenzy in the South China Sea that China long denied, Beijing's intentions regarding its arms

programs are typically not declared openly until irrefutable evidence exists, and details remain hard to access.

The pace of China's fleet enlargement has already allowed the PLAN to surpass the number of hulls in active service with the U.S. Navy while in the United States, the coming decade has been labeled the "Terrible 20s" because it will be characterized by an impending shortage of materiel as a result of failures in procurement planning:

Fleets of ships, aircraft, vehicles, and other equipment are reaching the end of their service lives, hitting the edge of their upgrade limits, and losing combat relevance. As great-power competition accelerates, the United States is offering a free and open window of opportunity and advantage to its adversaries. Unless policymakers take concrete steps now, defense leaders will continue America's sleepwalk into strategic insolvency and its consequences. The aptly named "Terrible 20s" have arrived.⁴³

Tanner Greer has elaborated on this theme by emphasizing the danger of inviting attack:

In the mid 2020s the United States will be struggling to pay the Pentagon's "modernization crunch." *The Navy, Marine Corps, and Air Force will be midway through a transition to a new, counter-China force structure.* The number of attack submarines and stealth bombers that the United States can put in the field will be at an absolute low.

It is at this moment we project the PLA will be capable of executing a cross straits invasion.

This does not make conflict inevitable. But if the Chinese have concluded that military means are the only way to bring about Taiwan's integration into the People's Republic of China, Beijing's

leaders will soon face powerful pressure to escalate towards war. Waiting until the 2030s or 2040s to sabre rattle is to wait for the U.S. military's counter-China modernization and procurement programs to run their course. There will be a terrific temptation to "resolve" the problem before these programs have been implemented.⁴⁴

Moreover, projected U.S. capability gaps are not the only reason why the 2020s have been labeled a "decade of concern." A thought experiment conducted by the retired U.S. Navy Captain James E. Fanell, a former Director of Naval Intelligence, Pacific Fleet, supposes that Xi Jinping aims for China to have accomplished the successful integration of Taiwan at the latest by 2049 in time for the PRC's centenary. By that time, if the great celebration is to be a festive affair attended by international dignitaries, any military and political fallout from an attack on Taiwan would need to have subsided. Having learned from the world's reaction to the 1989 Tiananmen massacre, the hypothesis goes, Beijing likely concluded that the world needs about 20 years to forgive and forget—as the widespread international participation in the 2008 Beijing Olympics showed. Meanwhile, suppressing potential insurrections on Taiwan might also take several years.⁴⁵

If such a timetable is indeed in existence, the implication would be that this decade is a particularly tempting time in which to attempt a military change in the Taiwan Strait, and impending U.S. capability gaps during the 2020s could enhance this appeal.

Such sobering thought experiments can help to develop an awareness of how Western shortcomings might be seen by Beijing as a window of opportunity that could make an attempt on Taiwan seem tempting enough to face the risk of escalation rather than missing the chance once and for all. This means that the current situation calls for extreme watchfulness, clear signaling, and the enhancement of deterrence by all necessary means to ensure that it does not fail. Taiwan itself plays a key

role in this, as the most effective deterrence would be Taiwan's ability to defend itself.

Worryingly, RAND analyst David Ochmanek recently reported that U.S. war-gaming exercises simulating an attack on Taiwan over the years have consistently indicated that the U.S. would lose if it followed its standard approach and that American attempts to counter Chinese military advances were still falling short of the required goal. Ochmanek attributes this to "attention deficit disorder," a result of concentrating on counterterrorism and counterinsurgency wars for the past two decades.⁴⁶

However, a recent Pentagon war game in which U.S. forces changed their approach and integrated emerging technologies into a changed posture yielded decidedly more promising results. This time, "a more defensive and dispersed posture less reliant on large, vulnerable bases, ports and aircraft carriers" was adopted. To make the posture more resilient, this strategy employed "large numbers of long-range, mobile strike systems, to include anti-ship cruise missile batteries, mobile rocket artillery systems, unmanned mini-submarines, mines and robust surface-to-air missile batteries for air defense," while focusing strongly on "surveillance and reconnaissance capabilities for both early warning and accurate intelligence to enable quicker decisions by U.S. policymakers, and a more capable command-and-control system to coordinate the actions of more dispersed forces." In that particular war game, the dispersed, resilient U.S. posture reportedly dissuaded the opponent from risking an attack in the first place.⁴⁷

How Can Risk Be Mitigated?

Navigating the challenges of the 2020s and managing the military risk ensuing from China's rise and increasingly assertive stance will require vigilance and wisdom. If history can be seen as a path-dependent process that is shaped by the interactions of all parties, it is important for the West to get its part of the interaction right.

As the experiences of Pentagon war games show, there is a strong necessity to enhance

the state of readiness; improve early warning and intelligence (as well as intelligence sharing among allies); create redundancies in key military systems and weapon platforms; develop resilient postures relying on dispersed rather than concentrated forces; strengthen industry and logistic capabilities; enhance the resilience of critical infrastructures; and—above all—bolster threatened allies' abilities to defend themselves. The aim should be to eliminate as many attack vectors as possible.

Such an approach would have the added benefit of signaling resolve and demonstrating the ability to adapt. It would counter the other side's misperceptions of an irreversible Western decline.

The current dynamic calls for close cooperation among all powers that have a stake in maintaining the rules-based international order and deterring China from risking military adventurism. To be effective, such a Western approach needs a combination of credible capacity-building, clearly communicated strategic intentions and priorities, and measured yet determined reactions to individual rogue actions that are aimed at slowly hollowing out the status quo.

Allies should use different countries' experiences, best practices, capabilities, and strengths to create a sum that is larger than its parts. The goal should be to signal to China's military planners and political leadership the costs and dangers of engaging in brinkmanship while at the same time pointing out a possible way to peaceful coexistence with the large community of democratic nations—if and when China's leaders drop their threatening behavior and adopt a more reasonable path.

It is ultimately not in China's interest to challenge the U.S. militarily as long as China cannot be assured of victory. Risking a humiliating defeat would endanger CCP rule within China and would certainly disrupt China's economic growth, which still depends on exchanges with the outside world. The West therefore needs to make sure that China can never be certain of victory.

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What We Risk If We Fail to Fully Modernize the U.S. Nuclear Deterrent

Rebeccah L. Heinrichs

Central to the effectiveness of U.S. strategic deterrence is convincing our enemies of our resolve to defend American vital interests from aggression with whatever combinations of weapons are necessary. Weapons within the arch of strategic deterrence include conventional and missile defenses, but the nuclear deterrent is the keystone.

The primary purpose of U.S. nuclear weapons, as expressed in the 2018 Nuclear Posture Review (NPR), is to deter a nuclear attack, whether small or large in scale, against a U.S. ally or the United States itself. But that is not their sole purpose. They are also intended to prevent large-scale conventional warfare that threatens U.S. vital interests, as well as a chemical and biological weapons attack, and provide assurances to allies who have chosen not to acquire their own nuclear capabilities, which is more conducive to preventing a nuclear exchange.

At the heart of effective nuclear deterrence is the credible threat that the United States is willing to employ nuclear weapons to defend its vital interests when absolutely necessary. By maintaining a force that could reliably contribute to terminating a war with as little damage as possible, should deterrence fail, on terms most favorable to the United States, the United States strengthens deterrence.

Since the end of the Cold War, the United States has sought to move away from nuclear weapons in its national defense strategy, and as recently as the Administration of

President Barack Obama, U.S. leaders downplayed major-power conflict as a thing of the past.¹ Regrettably, adversaries of the U.S. have not agreed and have invested in the weapons they deem most able to thwart U.S. aims and threaten U.S. security. The global threat environment is more complex and more dynamic than at any time since the end of the Cold War, and the peace that America has enjoyed for 70 years is tenuous.

There are many factors that have led us here, but the crux of the problem is that as our enemies become more able to challenge the United States, they simultaneously perceive an inverse correlation in the strength of American resolve to defend its stated vital national interests. Their doubt in U.S. resolve is abetting the deterioration of the credibility of strategic deterrence that has underpinned the post–World War Two order.

The United States, by failing to invest sufficiently in a modern nuclear enterprise and a reliable triad of modern nuclear delivery systems, has given adversaries reason to doubt. An American observer might enthusiastically disagree with the notion that American resolve has weakened, but what matters for deterrence is *our adversaries’* perception of our resolve, and the United States has given them reason to doubt.

When the stakes are as high as they are, especially in the context of competition against two adversaries—China and Russia—contesting the

United States in multiple theaters, the risk of a regional conventional conflict escalating with dire implications increases. While the focus of much public commentary is on how the United States ought to shift and add conventional firepower and defensive systems, we cannot miss the salience of the unique contributions of our nuclear deterrent in today's dynamic threat context.

Our nuclear forces complement our conventional forces and provide a backstop to their use. Our nuclear deterrent signals to adversaries that should they decide to attack U.S. interests with conventional weapons and then escalate to a larger-scale conventional war with strategic effects, they will not be able to do so with a reasonable hope that the United States will ultimately back down. Our nuclear deterrent therefore strengthens the deterrent effect of our conventional weapons and strategies. This means that U.S. military planners and operators, whether they realize it or not, rely heavily on the effectiveness of nuclear deterrence when they project power in the face of our adversaries' provocations and threats. Our nuclear deterrent is therefore in use every minute of every day, and the importance of the deterrent effect's remaining sound cannot be overstated.

To demonstrate a real, as opposed to merely rhetorical, commitment to America's nuclear deterrent and do so clearly, the United States must fully modernize its nuclear capabilities, especially given the actions of our adversaries. Failing to do this with a sense of urgency and willingness to adapt risks three major outcomes:

- Adversaries could employ nuclear weapons, whether in a regional context because they believe that a nuclear employment, however small in scale, will cause the United States to back down and sue for peace or, in the case of rogue nations, against U.S. soil.
- Adversaries could either initiate a conventional war against U.S. vital interests that

could escalate to nuclear employment or employ chemical or biological weapons.

- Allies could doubt the U.S. commitment to their security and acquire their own nuclear weapons, tempting other nations to do the same and creating a far more precarious global security environment.

Adversaries Are Emphasizing Nuclear Weapons

The security environment continues to increase in complexity and volatility. While the thought of a nuclear exchange today might seem to some too horrible even to contemplate, it is a possibility, and we must think seriously about how we might prevent it. It is imperative that we take a clear-eyed assessment not only of other nations' nuclear capabilities, but also of their national agendas as well as other factors such as the willingness of those who threaten the United States to threaten our way of life and the relative peace and security that the United States has helped to maintain for the past seven decades. It is only when we do this that we can most effectively deter major war and, should deterrence fail, win as quickly as possible on terms favorable to the United States.

China. The Chinese Communist Party (CCP), led by President Xi Jinping, has become more willing to threaten to use force to carry out its national agenda. That is because since the 1990s, when the United States sat at the apex of its global power both economically and militarily, the CCP has invested in the kinds of weapons it needs to coerce and threaten the United States. When Xi came to power, as explained by Oriana Mastro:

[He ordered the most] ambitious restructuring of the PLA since its founding, aimed specifically at enabling Chinese forces to conduct joint operations in which the air force, the navy, the army, and the strategic rocket force fight seamlessly together, whether during an amphibious landing, a blockade, or a missile

attack—exactly the kinds of operations needed for armed unification.²

Importantly, China is focusing on cyber operations and space and counterspace operations as well.³ Chinese leaders have also engaged in nuclear threats, have practiced employing nuclear weapons against U.S. bases in China's military exercises, and have significantly increased the tempo of China's military provocations against U.S. assets (forces and bases), partners, and allies.⁴

The CCP's national ambition and willingness to threaten military force to challenge U.S. vital interests underscore the significance of China's nuclear program. Although China will not reveal details of its nuclear program, senior U.S. military officials have informed Congress that China is investing significantly in its nuclear weapons at a serious pace. As stated in 2019 by Lieutenant General Robert T. Ashley, then the Director of the Defense Intelligence Agency, “[T]heir trajectory is consistent with President Xi's vision for China's military, which was laid out at the 19th Party Congress, and stated that China's military will be fully transformed into a first-tier force by 2050.”⁵

The U.S. should be concerned not only about the quantity of nuclear warheads China is producing, but also about the increasing quality of China's military. As recently summarized by Admiral Charles Richard, Commander of U.S. Strategic Command:

[China's] strategic dyad of ICBMs and SLBMs will soon become a triad, with the completion of a nuclear-capable long-range bomber. China is building new land-based, road-mobile ICBMs, providing its forces more flexibility and capability. The PLA Navy Jin-class ballistic-missile submarines carry up to 12 SLBMs each. China has built new warning and [command and control] capabilities and improved its readiness. Further, China's nuclear weapons stockpile is expected to double (if not triple or quadruple) over the next decade.⁶

China's economic and political pressure and military intimidation of Taiwan has led to a growing consensus that Taiwan is the most likely near-term flashpoint between the United States and China. China is using “gray zone tactics”⁷ against Taiwan, meant to exhaust and intimidate the Taiwanese so that when the People's Republic of China (PRC) makes its big move, Taiwan will lack the political will to fight back.⁸ The PRC hopes that if Taiwan does not fight as though its very existence depends on it, and if the United States has not adapted its weapons deployments in time to win against the PRC at acceptable costs, the United States will not come to Taiwan's defense.

But the security and sovereignty of democratic Taiwan *is* vital to America's interest and is a linchpin of the U.S.-led order. China scholar Michael Mazza articulates the stakes in play should the PRC conquer Taiwan:

The PLA would for the first time have unimpeded access to the Pacific Ocean, allowing it more easily to threaten Guam, Hawaii, and the continental United States. PLA ballistic missile submarines might ply the waters of the Western Pacific, allowing China to pose a more potent nuclear weapons threat to the United States.⁹

The U.S. also has an interest in trading and traveling safely in a region that will generate two-thirds of the global economy in the next 10 years¹⁰ and will want to do so without having to obtain permission from the Chinese.

China's willingness to prevent Taiwan's indefinite security as a free and democratic state has been demonstrated by the kinds of weapons China has recently unveiled, such as its nuclear-capable DF-26 that can conduct medium-range and long-range precision strikes against targets at sea and on land.¹¹ Chinese officials have periodically threatened explicitly to attack not just U.S. aircraft carriers, but also allies who might side with and assist the United States in a regional war with China—and even U.S. cities—with nuclear weapons.¹² Such audacious threats apply even to

what could be a purely conventional conflict over the fate of democratic Taiwan's security. Recent reports reveal that China is building more than 250 new intercontinental ballistic missile (ICBM) silos, which brings greater clarity from unclassified sources to Admiral Richard's warnings that China is undertaking a "breathtaking" expansion of delivery systems.¹³ In a not-so-discreet warning, China also conducted war-gaming exercises as recently as 2020 during which it flew nuclear-capable H-6 bombers in what appeared to be a simulated bombing of Guam, a U.S. territory.¹⁴

It is because the stakes over the fate of Taiwan are so high for the United States and the CCP that the possibility of a military conflict is not only real, but becoming more acute and, because of the strategic nature of an all-out conventional conflict, runs the risk of escalating to the employment of nuclear weapons.

Last (but certainly not least), militarily threatening the U.S. against intervening on behalf of allies and partners in the region would also seriously impede the ability of the U.S. to provide credible security assurances to allies like Japan, South Korea, and the Philippines. Ending U.S. extended deterrence would be in line with China's stated national interests. Chinese writers have revealed that China is hostile to U.S. extended deterrence in Asia. There exists in China a belief that U.S. extended deterrence is an unnecessary holdover from the Cold War that bespeaks a hostile approach toward China and that, rather than diminishing in strength as we move further away from the Cold War, it is growing stronger. As evidence of this, for example, they have pointed to the 2010 Japanese Defense Program Guidelines, which stated that Japan "will continue to maintain and improve the credibility of US extended deterrence, with nuclear deterrent as a vital element, through close cooperation with the US."¹⁵

Russia. The North Atlantic Treaty Organization (NATO), though never without political challenges for the United States, remains a salient alliance protecting and promoting U.S. interests and security. Russia continues

to identify both the alliance and the United States as its primary foes. Russia, led by President Vladimir Putin, uses a variety of means to create and stoke divisions in the alliance, to weaken it, and to undermine U.S.-led initiatives that seek to support NATO.

In 2012, the U.S. National Intelligence Council reported that "[n]uclear ambitions in the United States and Russia over the last 20 years have evolved in opposite directions" and that "[r]educing the role of nuclear weapons in US security strategy is a US objective, while Russia is pursuing new concepts and capabilities for expanding the role of nuclear weapons in its security strategy."¹⁶ Nearly a decade later, this has been made all the clearer.

In the wake of the Russian Federation's invasion of Ukraine in 2014, senior Russian officials repeatedly made statements referencing Russia's nuclear forces in an effort to intimidate U.S. allies, challenge the NATO alliance, and weaken the U.S. commitment to security on the European continent. Russian officials, for example, have repeatedly threatened pre-emptive nuclear attack against purely defensive U.S. systems deployed with NATO forces on Polish territory.¹⁷ Russia also recently announced that it will deploy 20 additional military units in Western Russia using the pretense that it is countering NATO.

Despite the relief of some on the U.S. political left and various liberal internationalist analysts, the New Strategic Arms Reduction Treaty (New START) has not moderated Russia's aggressive, illegal, and abusive behavior against other nations, nor has it stopped the growth of Russia's nuclear weapons program. Setting aside for a moment the accounting problems in New START, Russia has simply gone around New START parameters to build delivery systems that are not limited by the treaty. As the Trump Administration's 2019 Missile Defense Review explains:

Moscow is fielding an increasingly advanced and diverse range of nuclear-capable regional offensive missile systems, including missiles with unprecedented

characteristics of altitude, speed, propulsion type, and range. These missile systems are a critical enabler of Russia's coercive escalation strategy and nuclear threats to U.S. allies and partners.¹⁸

The kinds of nuclear weapons in which Russia has chosen to invest raise serious concerns that they are regarded as warfighting weapons. Russia has built a large and diverse arsenal of theater and tactical nuclear weapons and delivery systems. As assessed by the U.S. intelligence community, Russia also believes that the ranges and types of those systems may give it an escalation advantage.¹⁹ The nature of this category of weapons intensifies the concern of U.S. military strategists that Moscow has lowered the threshold for employment of a nuclear weapon by embracing escalate-to-deescalate doctrine.²⁰ This concept holds that Russia may employ a low-yield nuclear weapon in a purely conventional conflict in the hope that the United States would simply back down and concede Russia's victory.

Importantly, despite regularly opposing missile defense advancements by the U.S. and its allies, Russia and China are investing in significant missile defense systems of their own. Both are developing anti-satellite systems (ASATs).²¹ In addition, Russia has modernized its missile defense system deployed around Moscow and throughout Russia, including 68 nuclear-armed interceptors and other mobile missile defense systems. The Trump Administration wisely included these advances in the 2019 Missile Defense Review against the backdrop of Russian and Chinese opposition to modest U.S. developments.²²

North Korea. North Korea remains an authoritarian state and commits some of the world's worst atrocities against its own people. The rogue regime remains desirous of bringing democratic South Korea under dictator Kim Jong-un's rule. North Korea presents a long-standing proliferation concern. It has developed a nuclear missile capability and tests missiles to intimidate the United States and its allies in the region.

At the start of the last U.S. Administration, Kim Jong-un was repeatedly testing nuclear weapons and missiles, flying them over Japanese territory, and threatening to shoot at Guam, home to American citizens and an island on which U.S. military operations in the region rely. In 2017, North Korea successfully tested the Hwasong-14 ICBM, demonstrating that it could likely deliver a nuclear warhead all the way to the American Midwest. Since the summits with President Donald Trump, Kim Jong-un has not resumed testing of ICBMs, but he has tested other missiles in violation of United Nations Security Council Resolutions 1718 and 1874.²³

Iran. Iran is ruled by a terrorist regime and proliferates weapons to proxy states and terrorist entities. It continues to threaten the existence of Israel, a U.S. ally, has demonstrated a commitment to improving its nuclear program, and has a record of hiding work and lying about the nature of its nuclear weapons program.²⁴ The Iranian regime also has sought to extort the United States for sanctions relief by threatening further work on nuclear weapons.

At the same time, Iran continues to improve its massive missile arsenal. In 2020, the Islamic Revolutionary Guard Corps conducted a successful satellite launch, and the regime's space-launch program is developing capabilities that are directly applicable to the advancement of an ICBM program. Also, Iran has shown that it is willing to proliferate SCUD missiles to its proxies in Yemen, to be used against Saudi Arabia, and to launch other kinds of missile attacks against U.S. partner and even ballistic missiles against U.S. bases.

Risk in the Reluctance to Modernize

The threat environment is far more complex than it was during the Cold War, and adversaries are thinking about the employment of nuclear weapons in different and alarming ways. This is true despite actions by the U.S. to move away from nuclear weapons in its defense strategy. Some of those actions include reducing, at times unilaterally, the number of nuclear weapons in the U.S. arsenal (the United

States has reduced its stockpile by 25 percent since 2010, a time of rapid nuclear advancement by adversaries); committing to a unilateral testing moratorium; and committing, as the Obama Administration’s Nuclear Posture Review did, to considering the employment of nuclear weapons in more limited scenarios, accelerating the dismantling of retired warheads, and not developing new nuclear weapons.²⁵

Despite the Obama Administration’s ambition to lead the world down to fewer nuclear weapons, it did commit to modernizing the U.S. nuclear stockpile and its delivery systems. Thus, there are ongoing efforts in the Department of Defense (DOD) and the National Nuclear Security Administration (NNSA) to modernize nearly every aspect of the U.S. nuclear arsenal over the next two decades. This includes ensuring the safety and reliability of the stockpile, improving the NNSA’s infrastructure, overhauling the nuclear command and control architecture, and recapitalizing all three legs of the nuclear triad.

The price for maintaining and modernizing the U.S. nuclear deterrent mission is about 7 percent of the national defense budget at its highest peak.²⁶ The Trump Administration agreed to continue the modernization effort, and the Biden Administration appears poised to do the same, barring a change that could be outlined in the forthcoming NPR.²⁷ But there is already pressure to delay aspects of the modernization project, either by insisting on more studies before moving forward with various components, by delaying replacement of aging systems in favor of another service life extension, by going down to fewer numbers of deployed weapons, and by shelving various commitments altogether.

President Joe Biden’s Interim National Security Strategic Guidance, while recognizing deepening “rivalries” with China and Russia, aims to reduce the role of nuclear weapons, elevate arms control initiatives, and avert an “arms race.”²⁸ To be sure, it also commits to ensuring that the U.S. strategic deterrent remains safe, secure, and effective, but the document’s emphasis does not instill confidence that the

Biden Administration appreciates the imperative need to shore up the credibility of the nuclear deterrent.

Slowing or stopping modernization can jeopardize the United States’ ability to maintain a safe and reliable nuclear enterprise. It also incurs increased operational and technical risk and can undermine confidence in America’s ability to deliver a particular nuclear payload to a desired target accurately at a time of its choosing. U.S. adversaries and allies are watching.

Risks to the Nuclear Stockpile and NNSA Infrastructure

A safe, responsive, and resilient nuclear weapons infrastructure enables the United States to adapt to shifting requirements in the dynamic threat context. Although the NNSA has been able to certify the safety and reliability of the stockpile to the President, its infrastructure is decades-old, continues to age, and in some cases is deteriorating.

Unlike what the United States did during the Cold War and what adversaries like Russia, for instance, are doing now, the United States does not maintain a fully functional nuclear weapons design, development, test, and manufacturing enterprise capable of annually producing significant quantities of nuclear warheads to meet its national security requirements.²⁹ During the Cold War, the U.S. nuclear industrial infrastructure included active design and engineering laboratories and testing facilities. Warheads were developed with an intended service life of 10–15 years.³⁰

The United States has been under a unilateral underground explosive testing ban since the 1990s when President George H. W. Bush halted it and 1993 when President William Clinton announced an indefinite moratorium that remains in place today. It is also worth noting that North Korea tests, and there is reason to believe that Russia and China have tested above a zero yield. As the U.S. nuclear stockpile ages and the U.S. continues to refrain from testing, the pressure to be able to certify that the stockpile is safe and reliable builds.

The NNSA continually assesses each nuclear weapon to determine its reliability and detect problems with components caused by aging. Part of routine maintenance includes the disposal of components that must be retired in a way that both protects the health of NNSA personnel and avoids creating an environmental hazard. Compounding the challenge of maintaining a reliable and safe stockpile is the fact that the U.S. is unable to produce the core component of warheads—plutonium pits—in sufficient quantities.³¹ Russia, China, and North Korea also produce plutonium pits.

Without a change in policy, degradation from plutonium will cause the stockpile to atrophy. Being able to produce at least 80 plutonium pits per year is the minimum requirement articulated by the nation’s senior military and civilian leaders across Administrations and is legally required. The NNSA’s highest infrastructure priority should be to reconstitute plutonium pit production so that the number of pits produced is enough to meet security requirements.³² The new production capabilities would also enhance safety protections to keep the radioactive material from harming U.S. personnel.

The risks involved in failing to reconstitute this capability at two sites range from jeopardizing the health of U.S. citizens working in the labs, to not being able to certify to the President that the stockpile is safe and reliable, to failing to produce and sustain the stockpile at numbers necessary to carry out the nation’s deterrent objectives. In particular, a delay in the pit production plan would render the NNSA unable to meet the DOD nuclear deterrent mission requirement to field the Minuteman III (MMIII) W78 warhead replacement for the Ground-Based Strategic Deterrent (GBSD) system by the end of this decade. To put a finer point on it, the U.S. could lose the ability to threaten adversaries with ICBMs credibly by the end of the decade and go unilaterally from a triad of delivery systems to a dyad simply by attrition.³³

A modern, reliable industrial infrastructure must be able to maintain existing capabilities

and flexibility and manufacture new or replacement components in a timely manner. Failing to allocate the necessary funds as scheduled would strain the NNSA’s ability to certify to the President through the Stockpile Stewardship Program that the nuclear weapons stockpile is safe, secure, and reliable. Successive extensions of the service life of the current inventory of warheads will inevitably decrease confidence in the quality of the nuclear stockpile as the warheads deviate further from designs that scientists had validated by using data collected from actual explosive nuclear tests.

Risks to the Triad of Delivery Systems

Nuclear delivery systems rely on decades-old technology.³⁴ The 2018 Trump Nuclear Posture Review agreed with the Obama NPR that a nuclear triad, complemented by NATO’s dual-capable aircraft and a nuclear command, control, and communications system, is the most cost-effective means of meeting deterrence and assurance aims. As stated in the 2018 NPR, “The triad provides the President flexibility while guarding against technological surprise or sudden changes in the geopolitical environment.”³⁵ But to remain credible, we must implement the Obama and Trump Administrations’ commitments to recapitalization of each leg and do so without unnecessary delays prompted by yet another study.

The Land-Based Leg. The land-based leg of the triad is the most reliable and responsive of the three. Comprised of ICBMs, it serves a great deterrent purpose by significantly raising the threshold for a would-be enemy’s nuclear first strike on the United States. Currently, there are 450 MM III silos—400 ICBMs that are operational and 50 silos in what is called “warm” status (meaning that they do not contain missiles)—and 45 launch sites, located in five states. The United States’ Minuteman III ICBMs entered service in 1970. The plan at the time was to retire them after a decade. The Ground-Based Strategic Deterrent will replace the Minuteman III by the end of this decade—40 years later than intended—and its service life is expected to stretch into 2075.

Numerous government and non-government agencies have concluded that extending the life of Minuteman III yet again would be unwise. For example, General Timothy M. Ray, Commander of Air Force Global Strike Command, has testified that “indefinite sustainment is impractical, unaffordable, and ineffective due to age-related deterioration, the evolution of the industrial base, and the expanding technical capabilities of our adversaries.”³⁶ In other words, pursuing GBSD is more affordable than extending the MMIII again. Extending the MMIII again would also deprive the United States of a more effective, versatile, adaptable missile with a modularity that enables it to respond more flexibly to a dynamic threat environment.

General Ray urged Congress to continue funding on schedule and in the full amount to “mitigate risk for the transition from MMIII to GBSD. Maintaining GBSD schedule momentum and reducing schedule risk is critical to avoiding capability shortfalls to warfighter requirements during transition.”³⁷ Schedule risk always entails unplanned cost increases as well as potential holes in capability at any given time.

Although MMIII has gone through various life extension programs and replacements of component parts, the Obama Administration recognized that it was untenable. There are significant concerns regarding the degradation of certain parts of the system and the challenge of repairing or replacing them.³⁸ By failing to keep GBSD on schedule to replace aging MMIIIs, the U.S. could well find itself with fewer than 400 ICBMs to deploy. As nuclear strategist Dr. Matthew Kroenig has warned:

Reducing numbers [of ICBMs] would make an enemy first strike more effective, allow larger adversaries to consider a nuclear first strike while holding a larger nuclear force in reserve, and place a first strike within reach for smaller powers, such as North Korea. Most importantly, deep ICBM reductions conflict with another important U.S. goal: achieving its objectives if deterrence fails.³⁹

It is also important to keep in mind that although the current fleet of ICBMs cannot be intercepted by the missile defense systems employed by adversaries of the U.S., this might not always be the case. Moreover, cyber threats and other new technologies could also pose a challenge for the MMIII. The 2018 NPR warned that “Minuteman III will have increasing difficulty penetrating future adversary defenses.”⁴⁰

The Air Leg. As with the land-based leg of the triad, the air leg must be recapitalized. The air leg is comprised of bombers with air-launched cruise missiles (ALCMs) and gravity bombs. The Air Force is developing the B61-12 guided bomb, which will be used on the F-35A (Air Force variant) and stealthy bombers. Nuclear-capable bombers assist in a crisis by providing the United States with a highly visible means of signaling resolve. This can both deter adversaries and reassure allies. Because bombers can be called back once deployed, the air leg of the triad can also have a strong escalatory impact.

The current AGM-86B ALCM carried by U.S. bombers is scheduled to retire in 2030, and the Long Range Stand Off (LRSO) weapon (assuming that Administrations and Congresses maintain support) will replace it. The ALCM now in use is becoming obsolete against both current and evolving enemy air defenses. The B-52 cannot (and the B-2 probably cannot) continue dependably in the nuclear mission beyond 2030 without the LRSO.⁴¹ It is too early to know how survivable the B-21 will be against enemy air defenses in 2030.

Thus, by permitting the LRSO to slip in schedule, the United States faces the real possibility of losing a reliable air leg of the nuclear triad. This is a matter of particular concern in the context of the great-power contest, when the LRSO could play a leading role in deterring and—if deterrence fails—retaliating against Russian use of low-yield weapons. This makes the LRSO a leading guarantor of the credibility of extended deterrence because it provides a credible, tailored retaliatory response option in a regional context. But the LRSO is not the

only weapon system that is meant to fill this role in the current dynamic threat context.

The Trump Administration's 2018 review of the nuclear landscape and threats concluded that "in the near-term, the United States will modify a small number of existing SLBM warheads to provide a low-yield option, and in the longer term, pursue a modern nuclear-armed sea-launched cruise missile (SLCM)."⁴² Rather than relying solely on the low-yield options provided by the Dual-Capable Aircraft (DCA), which may not be in an acceptable state of readiness, these modest changes would provide the United States with appropriate options to disabuse the Russians of the idea that they could launch a low-yield attack against a NATO ally and that the United States would not have a prompt, reliable, and proportional response at hand that could penetrate ever-changing and improving air defenses.

In 2020, the United States made good on its intent to field the low-yield W76-2 warhead on the SLBM.⁴³ Having these additional options either deployed or planned for deployment to locations near allied countries as a forward presence offers important additions in terms of assurance and deterrence. In 2019, then-presidential candidate Joe Biden said he opposed the low-yield adaptations.⁴⁴

The publicly released version of the NPR discussed these adaptations as appropriate and tailored responses to Russia's changing nuclear strategy and doctrine. They are certainly that, but they should also be understood as necessary additions to the tailored response options in the Asia context as well. By maintaining these two modest changes and including them in the Biden Administration's NPR, the United States has the ability to bolster the credibility of its response to a potential nuclear employment in the regional context, thereby raising the nuclear thresholds that adversaries are lowering. On the other hand, failing to maintain these options:

- Risks tempting a peer adversary that is in danger of losing a conventional war to employ nuclear weapons,

- Could cause allies under the U.S. deterrence umbrella to doubt America's resolve and ability to end a disastrously escalating war as quickly as possible and with the least amount of damage, and
- Could tempt allies to eschew U.S. guarantees and acquire their own nuclear deterrents.

The Sea-Based Leg. The sea-based leg of the triad is the nation's most survivable nuclear platform. It consists of 14 *Ohio*-class ballistic missile submarines (SSBNs) armed with the intercontinental-range Trident II D5 missile and constitutes 70 percent of the nation's operational nuclear weapons.⁴⁵ SSBNs are also key contributors to regional nuclear assurances of allies under the U.S. nuclear umbrella. U.S. SSBNs patrol the world's oceans and—for now—can do so undetected. For just one nuclear-capable submarine to be destroyed or lose communication, however, could imply that this most secure of the legs has been fundamentally compromised and that the nation has lost its entire sea-based leg.

Like the ALCM and Minuteman III, the *Ohio*-class SSBNs face real challenges because of component part obsolescence. They are scheduled to be retired and replaced by the *Columbia*-class SSBNs at some point around 2031. The *Columbia*-class SSBNs are the U.S. Navy's number one priority and are expected to operate well into the 2080s—a fantastic value.⁴⁶

It is impossible to anticipate the advancements of our adversaries' anti-submarine warfare capabilities throughout the decade and into the 2030s, but it would be prudent to assume that they possess far more advanced detection capabilities that threaten the stealth of our submarines and would weaken the survivability of our current fleet. The disarmament advocacy group Global Zero acknowledged this risk in its 2012 report, stating that within the next several decades, detection technology could advance to the point where submarines might be discoverable.⁴⁷ The *Columbia* SSBN is designed to take such advancements into

account, but the entire *Ohio*-class fleet must be retired by 2039 regardless of whether the *Columbia*-class SSBNs are ready. One can deduce that if the *Columbia*-class's funding slips and its deployment is delayed, one leg of the U.S. nuclear triad—at least for a time—could be underprepared.

The United States is at a crossroads. If it fails to keep the modernization plan on schedule and across multiple Administrations and Congresses, it could drop below necessary deployed levels of delivery systems. As President Obama's Secretary of Defense Ash Carter said in 2016:

The fact is, most of our nuclear weapons on delivery systems have already been extended decades beyond their original expected service lives. So it's not a choice between replacing these platforms or keeping them; it's really a choice between replacing them or losing them. That would mean losing confidence in our ability to deter, which we can't afford in today's volatile security environment.⁴⁸

Risks in Missile Defense

Maintaining the credibility of our strategic deterrent will necessarily require a refocused effort to bring about qualitative improvements in missile defense. Missile defense enjoys greater support among policymakers now than it did during the Cold War. Homeland missile defense protects Americans at home from rogue nations' ICBMs, and regional missile defense systems protect U.S. bases and allies abroad. However, Cold War ideas about how missile defense might affect "strategic stability" with peer adversaries help to prevent the United States from pursuing homeland defenses against anything other than rogue-state ICBMs. The 2018 Trump Missile Defense Review clearly states that:

While the United States relies on deterrence to protect against large and technically sophisticated Russian and Chinese intercontinental ballistic missile threats to

the U.S. homeland, U.S. active missile defense can and must outpace existing and potential rogue state offensive missile capabilities. To do so, the United States will pursue advanced missile defense concepts and technologies for homeland defense.⁴⁹

It does not say the United States is unwilling to improve its systems so that they can provide some defense against Russian and Chinese ICBMs; it merely notes the reality that the current deployments and capabilities are scaled to stay ahead of the rogue threat. But the variety of threats and the dangerous trends for missile development and proliferation are blurring and eventually could erase the line that separates what is considered a limited threat and a more expansive one.

Moreover, it would be wise not to put even unofficial constraints on U.S. missile defense deployments that could provide a defense against some plausible Chinese or Russian missile attacks against the U.S. homeland even if this seems unlikely. Lower-level conflicts at the regional level could escalate to outright conventional war but—as noted in the beginning of this essay—with strategic consequences, and the likelihood of an attack against the U.S. homeland increases in such a scenario. A more robust missile defense system that builds on the current homeland defense system but takes advantage of the space domain, including space-based interceptors, would likely strengthen U.S. strategic deterrence.

Even if policymakers do not make the concerted (and prudent) policy commitment to provide a defense against a small attack from China or Russia, the threats from North Korea and even Iran make it necessary that U.S. missile defense advance faster. The Missile Defense Agency is already asked repeatedly to do more but with a painfully small budget that does not grow with the increased responsibilities.

For example, assuming that Administrations and Congresses support and sustain it, the Next Generation Interceptor will be

added to missile fields in Alaska by the end of the decade, and this will affect America's entire Ground-Based Midcourse Defense (GMD) missile defense system. In a January 2020 House Armed Services Committee hearing, Congressman Doug Lamborn (R-CO) asked then-Undersecretary of Defense for Policy John C. Rood:

According to NORTHCOM [U.S. Northern Command], while we can be confident in our current GMD posture to counter a North Korean threat for the next 5 to 6 years, at the rate North Korea is developing their ICBM capabilities, we must begin assuming increased risks around 2025 and beyond. Do you agree with that assessment?⁵⁰

Rood did agree: "I do share that assessment."⁵¹ What that means in blunt terms is that North Korea could overwhelm the homeland missile defense system by 2025 if the United States does not commit to improving the system.

Conclusion

Bolstering the credibility of our strategic deterrent will require bold, coordinated moves across Administrations to signal adversaries that the United States is willing and able to do whatever is necessary to defend its citizens and vital interests and that, should deterrence fail, America will fight to make sure that the costs an adversary sustains far outweigh any conceivable gains.

The various elements of the nuclear deterrent are interdependent; slowing down or (worse) eliminating one will weaken the entire force. Moreover, if the United States loses entire legs of the nuclear triad through

obsolescence, adversaries will be tempted to exploit perceived U.S. weakness and vulnerability.

The United States must maintain consistent, full, and timely funding across Administrations and Congresses to ensure a safe, reliable, and flexible modern nuclear enterprise. Likewise, nuclear delivery systems must be modernized and, in some cases, replaced to ensure that the United States can credibly threaten to deliver nuclear payloads on desired targets in a timely manner. This capability will disabuse adversaries of the notion that the United States has only limited and unreliable options to retaliate in a proportional way if they attack U.S. vital interests with a nuclear weapon.

Failing to do this not only risks adversaries employing nuclear weapons, but also tempts allies under the nuclear deterrent umbrella to acquire their own nuclear weapons. Nuclear proliferation, even by an ally, could tempt other non-nuclear nations to acquire their own nuclear weapons. The global increase of nuclear-weapon states is not conducive to U.S. interests or to global security.

Finally, the United States must build the necessary defenses to contribute to deterrence by denial, which strengthens strategic deterrence and reinforces the credibility of the U.S. promise both to deter strategic attack and to fight to win as quickly as possible with as little damage as possible. The United States must move forward with confidence and end this decades-long chapter in American history during which some of our leaders have deemphasized U.S. nuclear strength and the goal of U.S. nuclear pre-eminence. For the sake of peace and to protect the American people, our way of life, and the U.S.-led order, a renewed and energetic commitment to the keystone of our national defense is imperative.

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How Prioritizing Climate Change Could Weaken America's Military

Rebecca Grant, PhD

At approximately 12:30 pm on October 10, 2018, Hurricane Michael struck Northwest Florida as a Category 5 storm with sustained winds of 160 miles per hour. Hurricane Michael had burgeoned into a massive storm in just two days. Trapped in a hangar at Tyndall Air Force Base were 17 U.S. Air Force F-22 stealth fighters. While 38 of the advanced-performance stealth jets had been flown out to safety at other bases, these 17 F-22 Raptors were undergoing repairs and could not be moved on short notice. Official reports found that Hurricane Michael was the third most intense storm to make landfall in the U.S. since 1900. A wind gust of over 130 mph was recorded at Tyndall before the sensor failed.¹

When Hurricane Michael passed, the pictures of smashed buildings and F-22s covered in roof debris seemed to deliver a final warning: Climate change could impact the Department of Defense (DOD). Rising global temperatures could fuel storms and floods and perhaps even spark international conflict. If so, shouldn't the U.S. military move climate change to the heart of its planning priorities?

Fast forward three years, and the Department of Defense has taken on the most ambitious climate change policy agenda in its history. On January 27, 2021, President Joe Biden declared by executive order "that climate considerations shall be an essential element of United States foreign policy and national security" and directed that:

The Secretary of Defense and the Chairman of the Joint Chiefs of Staff shall consider the security implications of climate change, including any relevant information from the Climate Risk Analysis described in subsection (c) of this section, in developing the National Defense Strategy, Defense Planning Guidance, Chairman's Risk Assessment, and other relevant strategy, planning, and programming documents and processes.²

"We know first-hand the risk that climate change poses to national security because it affects the work we do every day," said Secretary of Defense Lloyd Austin in an official Pentagon statement that same day.³ "Climate change is a threat," Chairman of the Joint Chiefs of Staff General Mark Milley similarly testified to Congress in June 2021. "Climate change has a significant impact on military operations, and we have to take that into consideration."⁴

For activists, skeptics, and everyone in between, the climate change discussion had arrived—and with significant risks.

America's military is facing China and Russia across multiple domains. Yet while the Defense Department strives to modernize nuclear deterrence forces, replace old aircraft and ships, guard access to space, and fend off cyberattacks, new directives mandate that the military must also focus on the effects of climate change. "Every dollar that we spend addressing the effects of climate change is a dollar that we are not

putting toward other priorities, like meeting the challenge posed by China and modernizing our forces,” as Deputy Secretary of Defense Kathleen Hicks pointed out in May 2021.⁵

Asking the military to split its attention between great-power competition and the wide-ranging impacts of climate change is a tough assignment. The potential consequences of the effects of climate change for the military include everything from seawalls to B-2 bomber flights over the Arctic. Imagine if the military were told to prepare for “risks from Russia” but did not differentiate between cyberattacks and harassment of U.S. Navy destroyers in the Black Sea.

On top of that, the risks are poorly understood, and that is not standard practice at the Pentagon. If natural hazards do not emerge as predicted, the U.S. military may find that building forces, bases, and plans for climate change was a waste of effort. At a minimum, the dollars for climate crisis programs will have to compete with dollars for the development and acquisition of technologies needed for the U.S. to dominate in all-domain operations.

Nevertheless, there are surprises in this discussion. For example, the Department of Defense is by no means neglecting climate change. To the contrary: It has decades of experience with environmental impact studies, improving base resilience, and investing in sustainability and green energy research. That said, however, prioritizing climate change risks weakening the Pentagon’s preparations to face near-term threats. Policymakers face a difficult task in trying to develop policies that address climate change concerns while also maintaining U.S. military dominance.

No definitive answers will be provided here. Rather, this essay sets out several areas to consider for a better grasp of how the quest for climate change policies may impact U.S. military capabilities.

Climate Change and Defense Planning Guidance

The rise of climate as a new policy direction for the Pentagon did not happen overnight.

Discussion and assessments of climate date back over 15 years. Most recent defense reviews from the Administrations of Presidents Donald Trump and Barack Obama added a section on climate concerns.

However, the Biden–Harris Administration’s 2021 executive order went much further than previous policy guidance. As noted, the DOD was directed to perform a Climate Risk Analysis and then to include climate risk findings in “the National Defense Strategy, Defense Planning Guidance, Chairman’s Risk Assessment, and other relevant strategy, planning, and programming documents and processes.” Every January, starting in 2022, the Secretary of Defense and Chairman of the Joint Chiefs of Staff must report to the National Security Council on how they have included climate matters in key planning processes.⁶

This was not just a heads up; it was a mandate to inject responses to climate change into the most crucial defense planning processes. “This means that climate considerations must become an integral element in resource allocation and our operational decision-making process,” confirmed Deputy Secretary Hicks.⁷

Bringing a rigorous discussion of climate change into defense planning will not be easy because the threat analysis that is so central to military planning is at an elementary stage in this area. Typically, the military has years of analysis of threats to back its decisions. Analysis centers on weapons systems capabilities and adversary tactics. Convene a discussion of missile defense or China’s Taiwan strategy and you will get tactical and technological detail along with informed analysis and contrasting opinion on the best options. The climate change discussion has not yet met the rigorous standards demanded for national security dialogue.

Contrast that with the state of play seen in the 2019 unclassified Worldwide Threat Assessment released by the Director of National Intelligence. It noted threats to low-lying military installations and remarked on the general risks in language not so different from that of past Administrations: “Climate hazards such

as extreme weather, higher temperatures, droughts, floods, wildfires, storms, sea level rise, soil degradation, and acidifying oceans are intensifying, threatening infrastructure, health, and water and food security.”⁸

Such an estimate, while startling, does not provide clear direction for defense programs. Nor does it help decision-makers balance climate initiatives with meeting challenges from nation-state adversaries, terrorism, and so forth. In short, the DOD has a tremendous analytic task ahead if leaders want to take on climate change and make their budget and policy recommendations stick after scrutiny by Congress.

Climate Change and Military Disaster Relief Missions

One of the easiest areas to evaluate should be requirements for disaster relief. U.S. military forces engage regularly in relief missions both small and large. Current climate change policy anticipates increased deployment of U.S. forces for international disaster relief and for support to civil authorities at home. However, it is not always the climate—atmospheric and temperature conditions—that drives disaster relief missions. Earthquakes are a big factor.

Consider recent experience. On January 12, 2010, a 7.0 magnitude earthquake in Haiti left 220,000 dead.⁹ The capital city of Port Au Prince was devastated. U.S. special forces set up air traffic control at the airport’s one working runway. Roads from the neighboring Dominican Republic were few because of problematic political relationships. Aid from the international community poured in, but 10 years later, Haiti was still rebuilding.

A 9.0 magnitude earthquake hit Japan on March 11, 2011, causing a tsunami with a wave height measured at 133 feet. The tsunami swamped the power supply to Japan’s Fukushima nuclear reactor and killed 20,000 Japanese.¹⁰ “At the peak,” according to the Congressional Research Service, “approximately 24,000 personnel, 189 aircraft, and 24 Navy vessels were involved in the humanitarian assistance and relief efforts. Major assets in

the region were redirected to the quake zone, including the USS *Ronald Reagan* Carrier Strike group.”¹¹

The U.S. military brings specialized assets including command and control, airlift, air traffic control, and others to international disaster relief. The services already have both doctrine on disaster relief and prudent planning to keep joint task force resources at the ready.

Put in context, climate change projections may not be the right framework for estimating military contributions to disaster relief missions. Even a cursory look at historic disasters from the Great Chinese Famine of 1958–1962 or the 1815 eruption of the volcano at Mount Tambora, Indonesia, shows that factors other than climate can drive disaster relief. By projecting climate change, especially on a global scale, the U.S. military could oversize its relief forces at the expense of combat capability. Natural and man-made disasters will occur, and the U.S. military may well respond, but the climate change set of disasters is not a good sizing tool.

Ultimately, the decision to deploy military forces for worldwide disaster relief comes down to politics. Key ally Japan merited and welcomed assistance after the 2011 tsunami. The situation might be very different in flood-prone China or if the victim country did not want much help from U.S. forces. The bottom line is that climate change alone is not the driver of intervention; in the end, the choice is a political one. Focusing on climate change may not improve the forecasting and related preparation for disaster relief missions.

Connecting Climate Change and Causes of Wars

Another very difficult area to evaluate is the connection between climate change and the causes of wars. It has become almost an article of faith that climate change stokes conflict, in the words of Deputy Secretary Hicks, by “actually increasing risks of conflict from terrorism and civil wars.”¹² “Already, significant conflicts are being fueled by high temperatures

contributing to water shortages and crop failures in Africa, the Middle East, and South Asia,” commented retired Admiral and former NATO Supreme Allied Commander James Stavridis. “Wars in Syria, Iraq, Mali and Afghanistan are all examples of that.”¹³

Climate change as an accelerant of conflict is not a new idea. The 2010 Quadrennial Defense Review stated that “[w]hile climate change alone does not cause conflict, it may act as an accelerant of instability or conflict” and increase the “burden...on civilian institutions and militaries around the world.”¹⁴ President Obama’s 2015 National Security Strategy sharpened the point and called climate change “an urgent and growing threat to our national security, contributing to increased natural disasters, refugee flows, and conflicts over basic resources like food and water.”¹⁵

But the evidence is much more complicated. One clear connection is the Arctic. Thawing ice has led to open sea-lanes and increased competition among Arctic powers. The B-2 flights of 2020 were part of a coordinated show-of-presence mission to deter Russian activity in the Arctic.¹⁶

Some have attempted to link worsening climate conditions with the outbreak of wars, but scholarly debate is still raging. Take Syria’s civil war, which began in 2011. In 2015, Secretary of State John Kerry told an audience in Norfolk, Virginia, that “it’s not a coincidence that immediately prior to the civil war in Syria, the country experienced its worst drought on record.”¹⁷ President Obama also suggested that “the droughts that happened in Syria contributed to the Syrian civil war.”¹⁸

The claims did not hold up. Scholars differed with respect to the impact of the drought and the complex causes of the civil war such as the actions of Bashar al-Assad’s regime. A paper published by the National Academy of Sciences linked a rise in global sea temperature in the Mediterranean to a period of drought from 2007–2010.¹⁹

However, a contrasting study showed that rainfall in Syria was at the drought level of 80 percent of average rainfall only for 2008.

Drought alone was not sustained and did not cause the civil war; bad agricultural policies, which induced more migration to cities, were found to be more likely contributors.²⁰ Another academic study was even more direct:

We find that there is no clear and reliable evidence that anthropogenic climate change was a factor in northeast Syria’s 2006/07–2008/09 drought; we find that, while the 2006/07–2008/09 drought in northeast Syria will have contributed to migration, this migration was not on the scale claimed in the existing literature, and was, in all probability, more caused by economic liberalisation than drought; and we find that there is no clear and reliable evidence that drought-related migration was a contributory factor in civil war onset.²¹

While the DOD seeks to improve its modelling of climate threats, presuming that a climate crisis will drive certain types of conflicts is a risky proposition. Part of the problem comes from scaling up data on smaller, isolated conflicts. For example, a 2016 U.S. intelligence community report found specific cases of small riots over water access in Mexico, Nigeria, and Mauritania.²² This suggests that there may be a direct relationship between climate change and small-scale internal conflict, but there are few, if any, data to suggest that the same relationship exists in much larger country or regional-level events. On the contrary, another study predicted increasing demands for water to 2040 but noted that “historically, water tensions have led to more water-sharing agreements than violent conflicts.”²³

It would therefore be prudent for future modelling to appreciate the limits of data relevance.

Policy Clashes with Military Allies

Putting so much emphasis on climate change could also strain military alliances if allies disagree on decarbonization goals. Take the case of Australia. At the April 2021 Climate

Summit,²⁴ Australia opted to stick with its goals of reducing carbon emissions by about 26 percent.²⁵ Its goals are in line with the Paris Climate Accords, and Australia leads the world in solar panel capacity at 591 watts per person—eight times the world average.²⁶ This would seem to be a good thing worthy of praise.

Australia was also the world's second-largest exporter of coal at 395 metric tons in 2019 compared to Indonesia at 455 metric tons. Interestingly, China and India were the biggest coal buyers that year. Trade coal accounts for only about one-fifth of global coal consumption, implying that coal-produced energy occurs mostly with domestically produced coal and further implying that China and India produce huge quantities of coal. Despite a ban from China that was implemented in late 2020, Australia's coal exports recovered by feeding the markets of India and other countries. China produces, purchases, and consumes more coal than any other nation per year.²⁷

However, senior Biden Administration officials chose to criticize Australia, saying that it was “insufficient for Australia to follow the existing trajectory and hope that they will be on a course to deep decarbonization and getting to net zero emissions by mid-century.” The U.S. made no reference to China and its prodigious consumption of coal and production of greenhouse gases. This prompted a rebuttal from Angus Taylor, Australia's Energy and Emissions Reduction Minister, who said that “emissions reductions across the globe are what's necessary here to achieve outcomes.”²⁸

Consider, however, that Australia is one of America's most crucial military allies in the Pacific and, indeed, the world. Australia hosts U.S. forces for training; maintains hypersonic missile test ranges; joined U.S.-led operations in Afghanistan, Iraq, and Syria; opposes China's 5G intrusions; and figures in every scenario for keeping peace in the Pacific. In short, the U.S.–Australia relationship is of paramount importance. Clouding defense cooperation with criticism because of climate change goals could put larger U.S. defense strategy goals at risk.

Vulnerable Bases

One slam-dunk area for analysis should be U.S. base vulnerability. In 2021, the DOD adopted an Army climate risk tool and put it to work evaluating the more than 5,000 U.S. military installations at home and abroad.

The fiscal impacts of climate change can be seen clearly in the recent repair bills. Together, Hurricane Michael and Hurricane Florence, which hit the Carolinas in September 2018, created a bill of almost \$9 billion, primarily for the Air Force (costs of approximately \$5 billion) and the Marine Corps (\$3.3 billion from damage to Camp Lejeune and other facilities).²⁹ While many military construction projects are chronically underfunded, the mechanism to identify and characterize them does provide transparent funding for base repair.

The problem arises when one tries to project how hurricanes may increase funding needs in the future. Hurricanes are very costly but notoriously difficult to predict, especially years into the future.

For one thing, the historical baseline for big storms is spotty. According to data from the National Oceanic and Atmospheric Administration (NOAA), just four Category 5 hurricanes have made landfall in the United States since 1851: the 1935 Labor Day storm, Hurricane Camille in 1969, Hurricane Andrew in 1992, and Hurricane Michael in 2018. The number of hurricanes making landfall in the continental United States did not increase in either frequency or intensity from 1900 through 2017. What did increase were the populations along U.S. coastlines and the overall damage costs.³⁰

Looking at the data another way, one study determined that warming temperatures affected the global spatial distribution of hurricanes from 1988 to 2018 but did not affect their frequency. Intriguingly, this same study projected that increasing greenhouse gas emissions would lead to fewer hurricanes in coming years.³¹

What defense official would want to explain a hurricane disaster budget line to Congress with data this disparate? Storm repair

even in a bad year remains a tiny percentage of the overall defense budget. The DOD has a workable method for major disaster repair appropriations and completes them in a single fiscal year.

Keep in mind that money to rebuild military bases is just one part of the federal response to weather disasters. In contrast, other government departments fall behind on their storm mitigation. The National Flood Insurance Program, for example, “was about \$21 billion in debt to the Department of the Treasury as of April 2019,” and “the Congressional Budget Office estimated in May 2019 that federal crop insurance would cost the federal government an average of about \$8 billion annually from 2019 through 2029.”³² By wider federal standards, the DOD has a more efficient mechanism for coping with damage from climate change. Why, then, this imperative for the DOD to start accounting for the potential consequences of severe weather as if it has been negligent or unaware?

Impact on Research and Development

Of course, the DOD does more than spend money on base repair. Laced throughout the defense budget are many programs that take on climate problems. For example, the Defense Advanced Research Projects Agency (DARPA) has a project called the Reelfence program, “which aims to develop novel hybrid biological and engineered reef-mimicking structures to mitigate wave and storm damage and reduce the ecological impact of current coastal protection measures.”³³

Energy programs have often taken the lead. In 2015, the U.S. Navy used 78 million gallons of biofuel to help power the USS *John C. Stennis* Carrier Strike Group.³⁴ Ten years earlier, the U.S. Air Force flew a B-52H bomber using biofuels in all eight engines.³⁵

The Department of Defense operates about 170,000 non-tactical vehicles, a number second only to the number operated by the U.S. Postal Service. As a result, Deputy Secretary of Defense Kathleen Hicks has called for smart investment in electrification for that fleet.³⁶

Combat vehicles are another matter, but research is underway. The Army has been investing in research into electric vehicles for years. In early 2021, a defense contractor developed an electric vehicle prototype for Army officials in just 12 weeks. The Army will spend \$50 million in fiscal year 2022 on electric and mobility vehicle development, although with caution. “If you took the amount of batteries with current technology that you would need to move an Abrams tank purely electrically,” according to Brigadier General Glenn Dean, Program Executive Officer for Ground Combat Systems, “it’s bigger than the tank, so we have a packaging and storage problem when it comes to pure electric.”³⁷

There is no reason why the DOD should not leverage commercial development of electric vehicles as part of climate response, but taken as a whole, programs like these run the risk of depleting investment needed to face higher priorities such as great-power competition. Surely, the men and women of America’s military should not be asked to fight with equipment for which green energy and sustainability were dominant design factors. Carbon footprint reduction should not become a key performance parameter for major military systems. Such a course would inevitably put combat performance at risk.

Climate, War Games, and Modelling Uncertainty

Injecting climate concerns into formal modelling of conflict is a tall order. The DOD counts on highly refined analysis to back up its internal budget choices and justify them to Congress. For nearly a century, American military planning has employed scenarios as tools for the assessment of tactics and systems for future combat. The 1930s “color plans” like War Plan Orange set out detailed plot lines for war with Japan and even Great Britain.³⁸ The Army and Navy used these scenarios to game out moves in battle and learn from the results. Scenario-based planning dominated during the Cold War and has created the basis for analyzing China as a pacing threat.

The current state of climate analysis is nowhere near the level needed, as the DOD has recognized. “We will need to incorporate climate change into our threat assessments,” Deputy Secretary Hicks has noted. “We must update our modeling and simulations to reflect climate change. Warfighting concepts, regional and country engagement plans, and logistics planning also need to be updated.”³⁹

What would a climate scenario for the military look like? Recently, the Office of the Director of National Intelligence produced a set of five scenarios set in 2040, including one titled “Tragedy and Mobilization” that captured climate issues.⁴⁰ In the scenario, a global food catastrophe caused by climate change led to formation of a global coalition led by Europe and China working with non-governmental organizations. Stronger “green” parties won elections and the scenario culminated with the rise of a Human Security Council that distributed food and technology.

Granted, this future scenario was the product of the intelligence community and is designed to stimulate thought. However, it contains little insightful future forecasting for military operations. With climate change not a principal factor in great-power competition, asking the military to put in time on scenarios like this could soon add up to a net loss of analytic capability.

As the DOD proceeds, it is important to note that climate modelling is known for wide swings in uncertainty. A World Bank/United Nations report estimated that a rare, major hurricane might strike the U.S. every 38 to 480 years under 2010 weather conditions but that the probability would shift to every 18 to 89 years with warmer average temperatures.⁴¹ Clearly, such a wild analytic range is not helpful for the refined analysis that the DOD needs to justify more than \$700 billion in annual spending.

It is possible that models can be developed to bring greater fidelity to climate analysis for the DOD, but the process is tricky. Leading insurance firm Lloyds found windstorms easier to model than hurricanes.

Insurers have money on the line and invest heavily in models to control risk, but the models they use are a case study of the numerous difficulties involved in modeling for climate change. One analysis found that climate change could imply a 3 percent–5 percent decrease in the total number of potentially damaging storms but a 10 percent–20 percent increase in the number of larger storms in addition to a shift in storm tracks toward France and Germany.⁴² Insurers point out that even these sophisticated models cannot cover every peril in every region.

Conclusion: The DOD’s Long History with Climate Consequences

The new guidance for the Department of Defense sets out extremely ambitious targets for including climate change as a national security priority, but the evidence indicates clearly that building up a proper analytic foundation will not be easy. For too long, casual discussion of climate and conflict has led proponents to skim the surface but neglect the tough choices.

What is needed is spadework to bring the climate “threat analysis” up to the high standards necessary for decisions on national defense—if possible. Likewise, the DOD must acknowledge that every bit of attention given to climate change comes with a risk of distracting it from the pressing problems of China and Russia (among many others).

Yet the Department of Defense also deserves credit for its solid, quiet work on environmental protection, energy efficiency, and base resilience, all of which enhance its overall mission.

Sometimes the DOD does not get enough credit for activities already underway such as providing a “climate-ready force.”⁴³ The DOD defines this as a force that is ready to train and operate in extreme temperatures. In this case, the department is well ahead of climate policy prescriptions.

Not surprisingly, weather has figured in equipment development for a very long time. For example, the Air Force operates the world’s largest indoor weather facility at Eglin Air

Force Base.⁴⁴ The McKinley Climatic Laboratory creates sandstorms, blizzards, and any conditions needed to test aircraft and equipment—and has been doing so since 1947. The analytic rigor needed for analyzing a climate-ready force should start with getting to know what that force already has to offer.

The United States military has been measuring sea levels, tracking erosion, improving energy efficiency, rebuilding bases after hurricanes, and trying to anticipate conflict trends from the Arctic to the sub-Saharan region for years. For example, the work of the Army Corps of Engineers stretches back decades and even centuries. In 1892, officers of the Corps took a grand jury on a boat tour of Pittsburgh harbor and obtained indictments against 50 firms that were dumping debris into the rivers.⁴⁵ The

Corps, of course, got its start building coastal forts like the one underneath the Statue of Liberty and has measured sea-level rise as a matter of routine from the late 1790s.

As for the 17 F-22s trapped in the hangar at Tyndall, none were destroyed. All were back in the air within a month. Despite being caught by surprise, the Air Force had taken proper precautions to protect the irreplaceable jets. The F-22s rode out the storm. Four had damage to multiple areas including coatings, doors, canopies, leading edge, and engine inlet, but their stealth features were fully restored by the summer of 2019.⁴⁶

That was a tribute to something far beyond climate discussion: the resilience and ingenuity of the men and women who serve in America's military.

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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 can support U.S. military operations.

When assessing an operating environment, one must pay particular attention to any U.S. treaty obligations with countries 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 partnership 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 for future U.S. military operations. The relationships and knowledge gained through any of these factors would undoubtedly ease future U.S. military operations in a region and contribute greatly to a positive operating environment.

In addition to U.S. defense relations with in a region, additional criteria—including the quality of the local infrastructure, the political stability of the area, 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 occur infrequently but, when they do happen, can radically alter conditions in ways that affect U.S. interests. Massive natural disasters like Typhoon Tip in 1979¹ or the explosion of Mount Tambora in 1816² 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 level of dependence on electrical power across our world. Scientists, analysts, planners, and officials in

public and commercial ventures study such things but seldom take concrete action to mitigate their potential impact.

For the past couple of years, 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 the economic impact on their countries. The economic and societal stresses stemming from the pandemic have put terrific pressures on political establishments. They also have caused funding for such essential government functions as defense to be reallocated to meet the more immediate demands of the pandemic and—given the threat of contagion—mitigation measures to be adopted at the expense 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 2021, the COVID-19 pandemic is still having an impact. Training activities that would normally keep military forces in a ready status

and related financial accounts that have come under tremendous pressure have caused problems for allied countries that would otherwise work to ensure that their military forces are able to work together effectively. The impact of the pandemic on specific countries is 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 *2022 Index*.

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

Endnotes

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Europe

Daniel Kochis

The past year saw steady U.S. reengagement on European defense. A proposed large-scale withdrawal of troops from Germany was cancelled; an important agreement on enhanced defense cooperation was signed with Poland; an increased focus on Arctic security came more clearly into view; and investments in exercises, infrastructure, and rotational deployments continued. A poorly planned and executed withdrawal from Afghanistan in August tarnished U.S. credibility. European allies remain upset over a lack of U.S. consultation and communication as well as ongoing downstream impact.

NATO underwent a strategic reflection process and continues to operationalize new decisions, exercises, and structures to bolster collective defense and address the emerging challenges of an evolving security landscape. The Wuhan coronavirus pandemic affected defense exercises, making it necessary to repurpose military resources for pandemic response. It also showcased new propaganda vectors to be used by adversaries but did not affect NATO's collective defense posture.

Admiral Robert Burke, Commander of U.S. Naval Forces Europe, U.S. Naval Forces Africa, and Allied Joint Forces Command Naples has described the European and African theaters as "the forefront of great power competition."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 posed by Chinese investments, technology, and propaganda efforts to the transatlantic alliance have begun to move toward center stage.

The 50 countries in the U.S. European Command (USEUCOM) area of responsibility include approximately one-fifth of the world's population, over 10 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 in defense of 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, and both Europeans and Americans have benefited economically. The member states of the European Union (EU), along with the United States, account for approximately half of the global economy, and the U.S. and EU 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 allows U.S. forces 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, and 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, U.S. Joint Chiefs of Staff Chairman General Joseph Dunford 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 it is in the European operating environment.

U.S. Reinvestment in Europe. Russia's continued aggression 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 (approximately 6,000 soldiers take part in OAR missions and training at any one time across 19 nations),⁴ invested in European basing infrastructure and in prepositioned stocks and equipment and supplies; engaged in enhanced multinational training exercises; and negotiated agreements for increased cooperation with NATO allies.

European Deterrence Initiative. Despite the Trump Administration's proposal to reduce U.S. force levels in Europe, its FY 2021 request for the EDI, although less than the \$6

billion requested in FY 2020 and the \$6.5 billion requested in FY 2019, was still \$4.5 billion.⁵ In FY 2020, EDI-funded requests included (among others):

- "Continued 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);"
- "Upgrade[d] Theater Anti-Submarine Warfare infrastructure";
- "Retain[ed] F-15C fighter aircraft in Europe" along with continued prepositioning of equipment; and
- "Enhanced scale and scope of rotational and deployed force element participation in exercise and training events in support of USEUCOM priority lines of effort."⁶

Testifying in April 2021, General Tod Wolters, Commander, U.S. European Command (EUCOM), and NATO's Supreme Allied Commander Europe (SACEUR), highlighted the importance of EDI funding in returning the United States to a posture of deterrence:

EDI enhances our theater posture to deter adversaries and compete in a contested logistics environment, while assuring Allies and Partners. Increases in forward stationed and rotational forces strengthen our contact, blunt, and surge layer capabilities, providing us the ability to compete and win in a multi-domain crisis or conflict. EDI investments improve our response using more robust theater infrastructure and prepositioned stocks. Funding for exercises, training, and building partner capacity bolster the readiness and interoperability of U.S. and Alliance forces. Together, these advances enable our deterrence and defense efforts through rapid deployment and sustainment of forces.⁷

European Deterrence Initiative in Decline

The European Deterrence Initiative (EDI) bolsters NATO collective defense by funding U.S. rotational troop deployments to Europe and critical military infrastructure, as well as exercises and capacity-building with allies.



NOTE: Figures for 2021 and 2022 are budget requests.

SOURCES: U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), *Department of Defense Budget, Fiscal Year (FY) 2022: European Deterrence Initiative*, June 2021, p. 2, https://comptroller.defense.gov/Portals/45/Documents/defbudget/FY2022/FY2022_EDI_JBook.pdf (accessed September 2, 2021), and Frederico Bartels and Daniel Kochis, “Congress Should Transform the European Deterrence Initiative into an Enduring Commitment,” The Heritage Foundation *Backgrounder* No. 3319, May 29, 2018, <https://www.heritage.org/europe/report/congress-should-transform-the-european-deterrence-initiative-enduring-commitment>.

 heritage.org

The 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 Landstuhl’s importance is illustrated by the fact that in early March 2020, it was one of the first two overseas U.S. laboratories to be capable of testing for coronavirus.⁹

In addition to the EDI, the Department of State has awarded \$277 million in grants since 2018 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 procurement of Black Hawk helicopters 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 July 2021, the 1st Armored Brigade Combat Team (ABCT) of the 1st Infantry Division from Fort Riley, Kansas, replaced the outgoing BCT in the eighth armored rotation in support of Operation Atlantic Resolve. The BCT included “approximately 3,800 Soldiers, 80 tanks, 130 Bradley Fighting Vehicles, 15 Paladins, more than 500 tracked vehicles and more than 1,500 wheeled vehicles and equipment.”¹¹

Former Army Chief of Staff General Mark Milley 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 As of March 2021, 1st Combat Aviation Brigade, 1st Infantry Division from Fort Riley, Kansas, was to be the seventh aviation rotation with 1,800 troops, 10 CH-47 Chinooks, 25 AH-64 Apaches, 50 UH-60 and HH-60 Black Hawk helicopters, and “1,800 wheeled vehicles and pieces of equipment.”¹⁴ The majority of the brigade is “stationed in Germany, with a forward presence in Latvia, Romania and Poland.”¹⁵

The Biden Administration cancelled plans put in place in July 2020 to withdraw nearly 12,000 troops from Germany. Instead, in April 2021, Secretary of Defense Lloyd Austin announced an increase of 500 U.S. troops to be stationed permanently at Wiesbaden.¹⁶ The U.S. also announced that it will retain three facilities that under the previous plan were to be turned back over to the German government.

In May 2018, the U.S. began to fly MQ-9 Reaper drones on unarmed reconnaissance flights out of Miroslawiec Airbase 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.”¹⁷ In June 2020, runway work at Miroslawiec caused drones to be moved temporarily to Ämari Air Base in Estonia, marking the first-time that unmanned U.S. aircraft have operated out of Estonia.¹⁸

In the past, runway work has led to MQ-9s operating out of Campia Turzii Air Base in Romania. In January 2021, the U.S. announced that 90 USAF personnel and an unspecified number of MQ-9s would be based at Campia Turzii “to conduct intelligence, surveillance and reconnaissance missions in support of NATO operations.”¹⁹ According to General Jeffrey Harrigan, Commander of U.S. Air Forces in Europe, U.S. Air Forces Africa, and Allied Air Command, the base’s location 300 miles from the coast “really facilitates our ability to compete in the Black Sea.”²⁰ The Air Force has declined to say whether the deployment is permanent.²¹ In addition to Miroslawiec and

Campia Turzii, the U.S. also operates MQ-9s out of Lask Air Base in Poland.²²

In August 2020, the U.S. and Poland signed the Enhanced Defense Cooperation Agreement, which entered into force in November 2020. The agreement increases U.S. rotational forces in Poland by 1,000 people (for a total of 5,500) and provides for more exercises and infrastructure development that will be able to support a deployment of 20,000 U.S. troops if necessary in the future.²³ In addition:

[The agreement] covers matters such as the establishment of a forward division command in Poznan, stationing of a rotationally-present armoured brigade in Żagań-Świętoszów, deployment of Reaper UAVs squadron to Łask, the establishment of a Polish-US combat training centre (CTC) in Drawsko Pomorskie, the establishment of an airlift cargo hub for USAF in Wrocław-Starachowice, the establishment of the presence of an Army Aviation Brigade on a rotational basis, and a logistics battalion as well as special ops facility in Powidz, and another special ops facility in Lubliniec.²⁴

The agreement also ironed out legal and cost-sharing arrangements for the increased U.S. presence.²⁵ On November 9, 2020, the U.S. Army’s V Corps, which had been deactivated in 2013, was reactivated, to be fully operational in November 2021.²⁶ Forward deployed at Poznan, Poland, it will remain headquartered at Fort Knox, Kentucky.²⁷

The U.S. has strengthened its presence in Norway as well. In April 2021, the two nations signed the Supplementary Defense Cooperation Agreement, which allows the U.S. to build additional infrastructure at Rygge and Sola Air Stations in southern Norway, as well as Evenes Air Station and Ramsund Naval Station above the Arctic Circle.²⁸ Construction at Evenes will support Norwegian and allied maritime patrol aircraft monitoring of Russian submarine activity. According to Norwegian Foreign Minister Ine Eriksen Soereide, “The agreement

reaffirms Norway's close relationship with the U.S. and confirms Norway's key position on the northern flank of NATO.”²⁹

In August 2020, the Marine Corps announced the end of heel-to-toe rotations of 700 Marines to Norway, which began in 2017, opting for shorter, more sporadic deployments.³⁰ The first new deployment in October 2020 consisted of 400 Marines, and in the second, 1,000 Marines were deployed to Setermoen, Norway, from January–March 2021 for Arctic warfare training.³¹ Major General Patrick J. Hermesmann, former Commander of U.S. Marine Corps Forces Europe & Africa, has noted the growing relationship between Norway and the U.S. through “shared hardship of tough, realistic training in this austere environment.”³²

In addition to ground forces, in February and March 2021, four B-1 Lancers were based out of Ørland Air Station in southern Norway, marking the first time the aircraft have been based in Norway.³³ The Lancers conducted training exercises with allies Denmark, Germany, Italy, Norway, and Poland while also practicing landing and refueling at Bodø Air Base above the Arctic Circle.³⁴

In October 2020, at the behest of the United States, Norway announced the reopening of Olavsværn bunker, a mountainside submarine base near Tromsø with “9,800ft of deep water underground docks that can house and refit nuclear submarines.”³⁵ The base, which had been closed in 2002, is now open to U.S. Seawolf-class nuclear submarines.³⁶

The U.S. also continues to rotate a Sustainment Task Force “comprised of nearly 1,000 personnel and 200 pieces of equipment” from “11 active duty, U.S. Army Reserve and National Guard units.” The units that make up the task force are varied and “include ammunition, fuel, movement control, transportation, maintenance, ordnance, supply, and postal services.”³⁷

Operation Atlantic Resolve’s naval component has consisted partly of increased deployments of U.S. ships to the Baltic and Black Seas since 2014. However, in 2020, the U.S. spent 82 days in the Black Sea, which is 27 less than the 109 days it spent in 2019.³⁸

Russian undersea activity continues at an elevated level. The U.S. Navy reestablished the 2nd Fleet, which is “responsible for the northern Atlantic Ocean,” in May 2018 nearly seven years after 2011 when it had been disbanded.³⁹ The 2nd Fleet reached full operational capability at the end of 2019.⁴⁰ The fleet was reestablished because of Russian militarization of the Arctic.⁴¹ “This is where the fight is...where the competition is,” according to Vice Admiral Andrew Lewis, Commander of the 2nd Fleet. “Specifically in the Atlantic [and] the undersea capability of the Russians.”⁴² In March 2021, in a statement exercise, three Russian ballistic missile submarines punched through ice in the Arctic near the North Pole.⁴³

For Vice Admiral Lewis, “Anti-submarine warfare is a primary mission for everybody in the United States Navy, regardless of what you wear on your chest.”⁴⁴ Admiral Burke has stated that the 6th Fleet keeps units operating “nearly continuously” in the Arctic and that U.S. submarines “really dominate that area.”⁴⁵ The U.S. also has capable partners in patrolling Arctic waters:

“UK [and] France to name two extremely reliable [and] capable partners. Canada... Norway...all contribute significantly to the theater of undersea warfare fight. Denmark is expanding their capabilities. Now almost every one of those nations that I’ve mentioned now have significant airborne maritime patrol reconnaissance aircraft, if not the P-8A version, closely resembling the P-8 capabilities. Many have bought versions similar to the P-8. Their surface combatants today are incredibly capable too.”⁴⁶

In recent years, the U.S. has also made a point of publicly acknowledging the surfacing of nuclear-powered submarines in Arctic waters as a message of deterrence. One such example occurred in May 2021, when the Virginia-class submarine USS *New Mexico* docked in Tromsø, Norway.⁴⁷

Outside the Arctic, as explained by Admiral Burke, “advances in its submarine fleet and

expanding maritime strategic goals have reinvigorated Russia's access to the broader Atlantic Ocean.”⁴⁸ These changes have led officials to state that the U.S. east coast is no longer “a safe haven.”⁴⁹

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 2021.⁵⁰ The U.S. Air Force, Special Forces, and Marine Corps are strengthening their prepositioned stocks, and the Marine Corps Prepositioning Program in Norway is emphasizing cold-weather equipment.⁵¹ The services’ Force Design 2030 could change what is stored in the depot with an emphasis on rocket artillery, air-defense systems, and long-range unmanned aircraft while deemphasizing helicopters and tanks.⁵² DOD’s FY 2021 budget proposal includes “funding to 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.”⁵³

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 set for Europe.⁵⁴ In April 2021, General Wolters testified that:

[W]e expect to establish a U.S. division-sized capability through the combination of forward-stationed forces, rotational forces, and Army Prepositioned Stocks (APS). APS equipment facilitates increased agility and lethality by enabling rapid integration of rotational combat units into operations. During Exercise DEFENDER-Europe 20, U.S. Army Europe and NATO Allies successfully exercised at the battalion and brigade levels, and we plan to assemble a divisional formation on NATO’s Eastern flank in Exercise DEFENDER-Europe 24, the first since the end of the Cold War.⁵⁵

In May 2021, General Christopher Cavoli, Commander of U.S. Army Europe and Africa, noted a difference in focus between Defender Europe 2020 (northeastern Europe) and Defender Europe 2021 (southeastern Europe): “[With] Defender 2021 we have decided to exercise the ports, and the airports, and the rail lines, and the roadways throughout southeastern Europe.”⁵⁶ Defender Europe 21 will involve 26 nations, including the U.S., and around 28,000 multinational forces in addition to several smaller exercises including:

Swift Response, which involves airborne operations in Estonia, Bulgaria and Romania; Immediate Response, which involves more than 5,000 troops from eight nations conducting live-fire training in 12 different countries; Saber Guardian, which includes more than 13,000 service members doing live-fire training as well as air and missile defense operations; and a command post exercise with 2,000 personnel exercising the ability of a headquarters to command multinational land forces.⁵⁷

Impact of COVID-19. The impact of COVID-19 was felt across the alliance, but it did not alter the alliance’s ability to carry out the vital work of collective defense. In November 2020, NATO Secretary General Jens Stoltenberg stated that:

NATO Allies and our militaries have been supporting each other and our partners throughout this pandemic—transporting critical medical supplies, patients and experts; setting up military field hospitals and securing borders; supporting civilian efforts and helping to save lives. At the same time, we remain vigilant and ready, because NATO’s main responsibility is to make sure this health crisis does not become a security crisis.⁵⁸

NATO’s Euro-Atlantic Disaster Response Coordination Centre (EADRCC) helped to

coordinate assistance based on requests and the availability of supplies. In April 2020, 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.⁵⁹ NATO's Strategic Airlift Capability (SAC), "a multinational programme that provides assured access to strategic military airlift capability for its 12 member nations,"⁶⁰ was leveraged for pandemic response. The NATO secretary general's 2020 annual report specifies that military forces of NATO allies had flown more than 350 flights to transport medical personnel, transported more than 1,500 tons of equipment, and helped to build almost 100 field hospitals.⁶¹ NATO also established a Pandemic Response Trust Fund, located in Romania and managed out of Taranto, Italy, which stockpiles medical equipment and supplies for allies and partners.⁶²

In addition to NATO facilitation, allies have assisted one another during the pandemic in numerous ways.⁶³ Because of U.S. overseas basing, despite a poor vaccine rollout in most of Europe, thousands of Europeans who are employed by the U.S. military or who are eligible dependents received vaccines at U.S. bases on the continent.⁶⁴ Additionally:

NATO assisted local authorities to fight COVID-19 where the Alliance is deployed. For example, in Afghanistan, the NATO-led Resolute Support Mission contributed to fighting the pandemic with the provision of critical supplies to Afghan security forces in 14 provinces, with several Allies providing essential equipment. In Iraq, essential medical equipment was delivered in coordination with NATO Mission Iraq. In Kosovo, the NATO-led Kosovo Force donated personal protective equipment to hospitals and delivered more than 50 donations of food and clothing to 14 Kosovo municipalities, in coordination with local charities and the Red Cross of Kosovo.⁶⁵

Another important impact of the pandemic was cancellation, postponement, or modification of exercises. Defender 2020, 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 will be deployed from the United States to Europe,"⁶⁶ and drawing heavily on prepositioned equipment, was significantly scaled back, and linked exercises "Dynamic Front, Joint Warfighting Assessment, Saber Strike and Swift Response" were cancelled.⁶⁷ Another linked exercise, Allied Spirit, was postponed from May 2020 to June 2020 and scaled back. The U.S. and Poland were the only participating countries, only 6,000 of a planned 10,000 soldiers took part, and "NATO's strategic airlift capability [was] no longer included."⁶⁸

Despite these changes, the scaled back Defender 2020 was an important exercise that "brought more than 6,000 soldiers and 3,000 pieces of equipment from the US to Europe via air and sea and saw 9,000 pieces of equipment drawn from Army prepositioned stocks on the continent."⁶⁹

Because of coronavirus-related concerns, BALTOPS 2020, which took place in June 2020, for the first time did not include amphibious landings. The lack of amphibious landings, however, allowed for a focus on other areas including testing the ability of NATO's maritime headquarters in Lisbon "to coordinate with 6th Fleet headquarters in Naples, Italy, NATO operation centers and forces in the Baltic Sea."⁷⁰

U.S. Nuclear Weapons in Europe. In his 2021 EUCOM posture statement, General Wolters reaffirmed that "[a]s long as nuclear weapons exist, NATO must remain a nuclear Alliance. NATO's nuclear capability preserves peace, prevents coercion, deters aggression, and instills confidence in the transatlantic bond. The Alliance's strategic forces guarantee security and backstop U.S. operations in Europe."⁷¹

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 out across bases in Belgium, Italy, Germany, the Netherlands, and Turkey.⁷²

In October 2019, reports surfaced that the U.S. was considering moving the approximately 50 tactical nuclear weapons stored at Incirlik Air Base in Turkey in light of ongoing tensions, but this does not appear to have happened.⁷³ All of these weapons are free-fall gravity bombs designed for use with U.S. and allied dual-capable aircraft. Although tactical nuclear weapons are forward deployed to Incirlik, “there are no aircraft capable of delivering the B-61 gravity bombs co-located at Incirlik Airbase.”⁷⁴ The U.S. has nuclear sharing agreements with Belgium, Italy, Germany, and the Netherlands that allow for U.S. tactical nuclear weapons to be delivered by allied aircraft, but no such agreement is in force with Turkey: “The weapons at Incirlik Air Base in Turkey are solely for use on U.S. aircraft.”⁷⁵

The B61 nuclear gravity bomb that is “deployed from U.S. Air Force and North Atlantic Treaty Organization (NATO) bases” is undergoing a life extension program that is expected to add at least 20 years to its service life and “improve the bomb’s safety, security, and effectiveness.”⁷⁶ The B61-12 bomb, according to U.S. officials, is “intended to be three times more accurate than its predecessors.”⁷⁷ The first production unit is slated for FY 2022 with production completed in 2025.⁷⁸ In November 2020, the U.S. tested the B61-12 successfully with an F-35A following tests with the F-15E and B-2 bomber.⁷⁹

China. At NATO’s 2019 leaders meeting in London, the alliance “recognize[d] that China’s growing influence and international policies present both opportunities and challenges that we need to address together as an Alliance.”⁸⁰ Issues of concern include budding Russian and Chinese military cooperation as well as Chinese technology, propaganda, offensive cyber capabilities, and control of critical infrastructure in Europe, all of which affect NATO’s member states. In an interview, Admiral Burke noted the potential risk to U.S. and alliance interests from Chinese infrastructure acquisitions in Europe:

Today, the Chinese have a controlling interest in 12 European ports. So, are NATO countries going to be able to count on those ports for Free Trade, and if NATO has to defend Europe, will they allow us into those ports to refuel, resupply, do repairs, rearm? We don’t know if we can count on that. It’s a troubling pattern and our European partners are increasingly aware and awakened to this potential threat.⁸¹

In the same interview, he observed that the Chinese are “increasingly present” in the Mediterranean not just with investments, but also with warships.⁸²

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.

North Atlantic Treaty Organization.

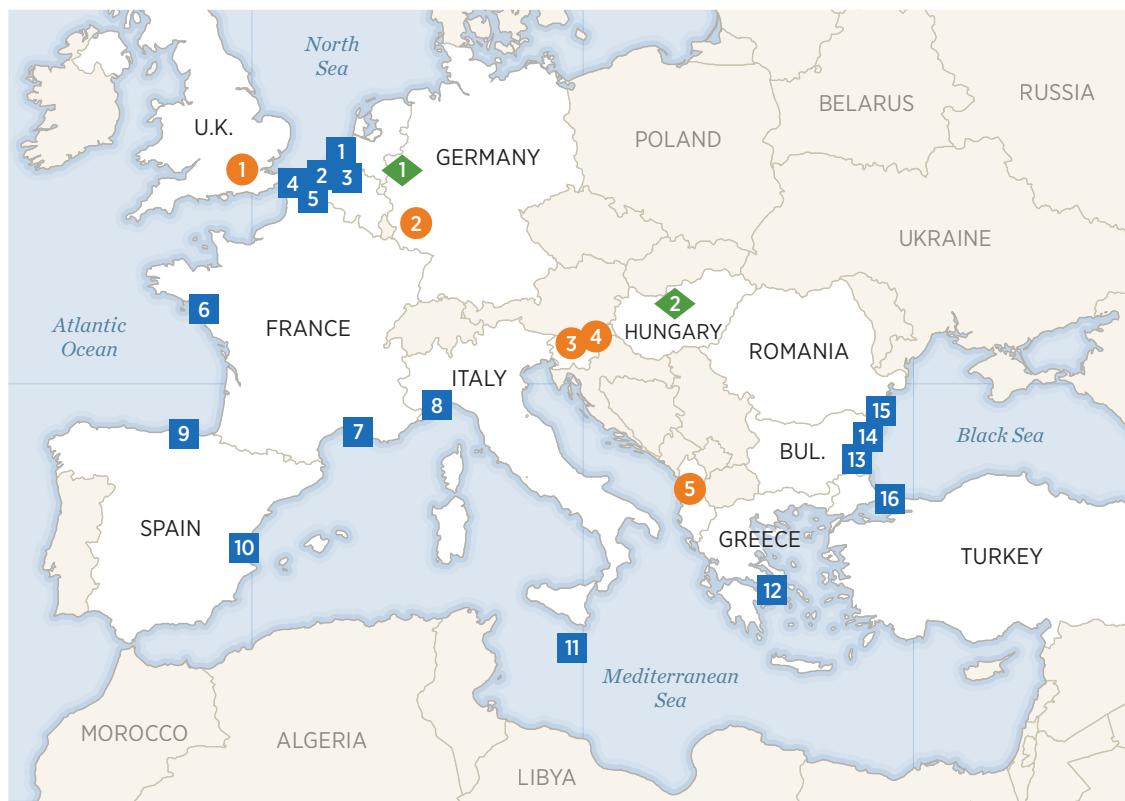
NATO is an intergovernmental, multilateral security organization that was designed originally to defend Western Europe from the Soviet Union. It anchored the U.S. firmly in Europe, solidified Western resolve during the Cold War, and rallied European support following the 9/11 terrorist attacks. NATO has been the bedrock of transatlantic security cooperation ever since its creation in 1949 and is likely to remain so for the foreseeable future.

In April 2021, following a U.S. decision to withdraw forces from Afghanistan, NATO declared “that there is no military solution to the challenges Afghanistan faces”⁸³ and ended Operation Resolute Support, a non-combat operation intended to provide “training, advice and assistance to Afghan security forces and institutions.”⁸⁴ The withdrawal of alliance forces began on May 1, 2021.⁸⁵

Two ongoing NATO operations are Kosovo Force (KFOR) and Operation Sea Guardian in the Mediterranean to maintain “maritime

MAP 1

China's Ownership Stake in European Ports, Airports, and Railways



PORTS

- 1 Netherlands—Euromax Terminal (Rotterdam)
- 2 Belgium—Zeebrugge (Bruges)
- 3 Belgium—Antwerp Gateway
- 4 France—Terminal des Flandres (Dunkirk)
- 5 France—Terminal de France (Le Havre)
- 6 France—Terminal du Grand Ouest (Nantes)
- 7 France—Eurofoss Terminal (Marseille)
- 8 Italy—Vado Reefer Terminal (Genoa)
- 9 Spain—Noatum Container Terminal (Bilbao)
- 10 Spain—Noatum Container Terminal (Valencia)
- 11 Malta—Malta Freeport Terminal (Birzebbuga)
- 12 Greece—Piraeus Container Terminal
- 13 Bulgaria—Port of Burgas
- 14 Bulgaria—Port of Varna
- 15 Romania—Port of Constanta
- 16 Turkey—Kumport Sea Terminal (Istanbul)



AIRPORTS

- 1 U.K.—Heathrow Airport
- 2 Germany—Frankfurt-Hahn Airport
- 3 Slovenia—Ljubljana Airport
- 4 Slovenia—Maribor Airport
- 5 Albania—Tirana Airport

RAILWAYS

- 1 Germany—Port of Duisburg
- 2 Hungary—BILK Kombiterminal



* Includes Terminaux Nord and Terminal de France
SOURCE: Heritage Foundation research.

situational awareness, counter-terrorism at sea and support to capacity-building.”⁸⁶ Additional operations include Airborne Surveillance and Interception Capabilities to meet Iceland’s Peacetime Preparedness Needs; NATO Air Policing over the Baltics, Albania, Bulgaria, Montenegro, Romania, and Slovenia;⁸⁷ and support to the African Union Mission in Somalia through occasional air and sealifts while helping to train and build capacity in the African Standby Force.⁸⁸

Finally, there is NATO Mission Iraq (NMI), a non-combat mission to train and build the capacity of Iraqi Security Forces. In February 2021, following an Iraqi government request in late 2020, NATO defense ministers agreed to increase the size of NMI and expand the scope of training activities beyond the Baghdad region.⁸⁹ NATO Secretary General Jens Stoltenberg stated that an incremental increase could raise the number of NATO troops participating in NMI from 500 to around 4,000.⁹⁰

In recent years, NATO has focused strongly 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.”⁹¹

In June 2018, NATO defense ministers agreed to the Four 30s plan to improve the 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.⁹² According to Secretary General Stoltenberg, “Allies contributed all of the combat forces required for this initiative” in 2019 “and are now working to build and maintain the level of readiness of these forces and organize them into larger formations.”⁹³

At the 2019 London Summit, space was recognized as an operational domain.⁹⁴ Subsequently, in October 2020, NATO agreed to launch a space center, to “be located within existing facilities at Allied Air Command” at

Ramstein Air Base and charged with “support[ing] NATO operations, missions and activities in order to increase NATO Space Domain Awareness through the co-ordination of data, products and services with Allies.”⁹⁵

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

- The U.S. serves as the framework nation in Orzysz, Poland, near the Suwalki Gap. The U.S.-led battlegroup consists of 691 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.⁹⁶
- In Estonia, the United Kingdom serves as the framework nation, headquartered in Tapa with 828 troops in an armored infantry battalion with main battle tanks and armored fighting vehicles along with “self-propelled artillery and air defence assets, engineers, an intelligence, surveillance and reconnaissance group and logistic support elements”; one Icelandic strategic communications civilian; and 337 French troops with main battle tanks and armored fighting vehicles.⁹⁷
- In Adazi, Latvia, Canada is the framework nation with 527 troops and armored fighting vehicles augmented by 21 troops from Albania, 56 from the Czech Republic, one civilian from Iceland, 200 troops from Italy with tanks and armored fighting vehicles, 10 from Montenegro, 175 from Poland with tanks, 97 from Slovakia, 40 from Slovenia, and 346 from Spain with tanks and armored fighting vehicles.⁹⁸

- In Rukla, Lithuania, Germany serves as the framework nation with 583 troops augmented by another 198 from Belgium, 36 from the Czech Republic, 270 from the Netherlands, 195 from Norway with main battle tanks and infantry fighting vehicles, a contribution from Luxembourg,⁹⁹ and one Icelandic public affairs civilian.¹⁰⁰

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.¹⁰¹ In February 2017, the Baltic States signed an agreement to facilitate the movement of NATO forces among the countries.¹⁰² Some EFP host nations have called for additional assets—importantly, enablers to be added to the battalions. Latvia, for example, views it as “extremely important to strengthen allied presence with long-range components, such as fire support, air defence support and on-shore (port)/off-shore components.”¹⁰³

NATO also 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.”¹⁰⁴

At its July 2016 Warsaw summit, NATO agreed to “develop tailored forward presence in the southeast part of the Alliance territory.” Specifically:

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 [HQ MND-SE], 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.¹⁰⁵

The land component of this presence is a multinational framework brigade based in Craiova, Romania, under the control of HQ MND-SE in Bucharest.¹⁰⁶ HQ MND-SE achieved final operational capability in March 2018.¹⁰⁷ NATO’s tailored forward presence is supported by units from Bulgaria, Canada, France, Germany, Hungary, Italy, Luxembourg, Poland, Portugal, Romania, Spain, and Turkey.¹⁰⁸

The U.S. and Romania jointly organize the biannual Saber Guardian exercise, which is “designed to improve the integration of multinational combat forces.”¹⁰⁹ In the 2021 iteration, scheduled to take place in Bulgaria, Hungary, and Romania,¹¹⁰ “more than 13,000 service members from 19 countries will conduct live fire and air and missile defense operations, plus a large scale medical evacuation.”¹¹¹ Saber Guardian 21 is one of several exercises linked with DEFENDER-Europe 21, which has a regional focus. According to General Cavoli, “DEFENDER-Europe 21 provides us the best opportunity to hone our abilities alongside our allies and partners in the strategically important Balkans and Black Sea region so that collectively, we are ready to respond to any crisis that may arise.”¹¹²

NATO continues air policing missions over Bulgarian and Romanian airspace. In September and October of 2020, six U.S. F-16s took part in a four-week air policing mission over Bulgaria with Bulgarian air force units and Canadian F-18s flying from Romania.¹¹³ In 2020, the alliance saw a modest uptick in Russian aircraft approaching or violating NATO airspace. Jets were scrambled 400 times across domains, and 350 of these incidents involved Russian military aircraft.¹¹⁴

In October 2019, addressing a NATO capability gap in aerial refueling, the Czech

Republic, Belgium, Germany, Luxembourg, the Netherlands, and Norway jointly procured A330 air-to-air refueling aircraft, to be deployed from 2020–2024; the fourth of nine aircraft was delivered in April 2021.¹¹⁵ Five of the aircraft are planned to operate out of Eindhoven airbase in the Netherlands, and three will operate out of Germany’s Cologne–Wahn airbase.¹¹⁶ The U.S. currently accounts for 90 percent of NATO air-to-air refuelings.¹¹⁷

Additionally, in November 2019, NATO announced a \$1 billion package to upgrade its Airborne Warning and Control System (AWACS) planes, coupled 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.”¹¹⁸

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.¹¹⁹ These commands consist of a total of 1,500 personnel, with the logistics command headquartered in Ulm, Germany.¹²⁰ 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.”¹²¹ Former U.S. Commander of European Command Lieutenant General Ben Hodges has described the importance of military mobility for deterrence: “We need to think how fast the Russians are moving. We must be able to move as fast [as] or faster than them so that they do not make the mistake of thinking that they could launch an attack of some sort in an area before we could respond.”¹²²

Continued shortfalls in the alliance’s ability to move soldiers and equipment swiftly and efficiently include “limitations of road surface weight capacity, bridges capacity and railway traffic limits” as well as differences in rail gauges and continued legal, procedural, and regulatory slowdowns.¹²³ NATO has focused heavily

on overcoming these barriers, working with the European Union, which retains competencies that are critical to improving military mobility, particularly with regard to overcoming legal and regulatory hurdles. In March 2018, the EU published an Action Plan on Military Mobility that “identifies a series of operational measures to tackle physical, procedural or regulatory barriers which hamper military mobility.”¹²⁴ Cooperation has brought about some beneficial legal and regulatory changes,¹²⁵ but notable challenges persist.

Cyber Capabilities. “A secure cyberspace is essential to everything the Alliance does,” according to NATO’s secretary general. “This is why cyber defence is part of NATO’s core task of collective defence. NATO has made clear that a severe cyber attack could lead it to invoke Article 5 of the Washington Treaty.”¹²⁶ 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 Cyber-space Operations Center (CYOC) in Mons, Belgium, that will include 70 cyber experts when it becomes fully operational in 2023¹²⁷ and “will provide situational awareness and coordination of NATO operational activity within cyberspace.”¹²⁸ In 2020, NATO published its first cyber doctrine.¹²⁹

In 2017, NATO announced a planned \$1.85 billion expansion of its satellite communications capabilities.¹³⁰ 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.¹³¹ 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, highlights 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.¹³²

Through the NATO Industry Cyber Partnership, NATO has also invested in a stronger relationship with industry. As described by NATO's secretary general:

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.¹³³

Areas of further cooperation within NATO include the NATO Intelligence on Cyberspace Community of Interest "to more regularly exchange information, assessments and best practices—improving NATO's ability to prevent and respond to cyber threats," and the NATO Communications and Information Agency, which "continued to facilitate information exchanges between NATO Allies on cyber threats and incidents through its Cyber Collaboration Network. Twenty-one Allies have joined the network to date."¹³⁴

With respect to the likely effects of Chinese 5G technology on intelligence sharing in Europe, U.S. officials have said that utilizing Chinese state-controlled companies for next-generation wireless networks would be "nothing short of madness."¹³⁵ A Chinese presence in European telecommunications networks could decisively compromise the communications integrity of the military and intelligence community. The London Declaration stated that "NATO and Allies, within

their respective authority, are committed to ensuring the security of our communications, including 5G, recognizing the need to rely on secure and resilient systems."¹³⁶

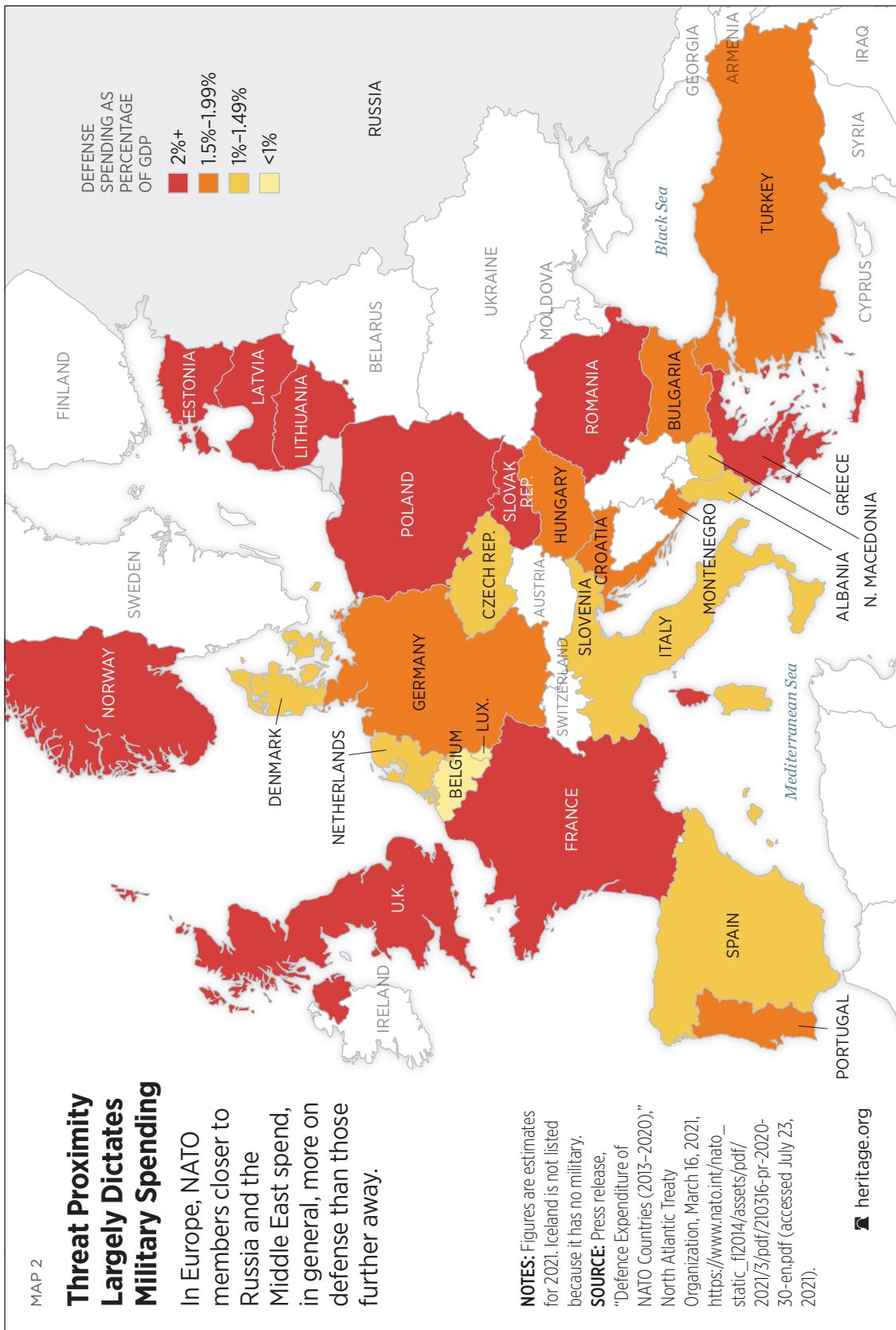
The landscape in Europe for key decisions regarding Chinese technology in next-generation wireless networks remains in limbo; many nations have taken decisions in recent years to restrict Chinese vendors from 5G networks, but these threat perceptions are not uniform. The impact of the emerging patchwork approach toward Chinese 5G technology on the European operating environment will become clearer in the coming years.

Ballistic Missile Defense. NATO's ballistic missile defense (BMD) achieved initial operational capability in July 2016, offering 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 upgrades were completed in August 2019.¹³⁷
- 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.¹³⁸
- BMD-capable U.S. Aegis-equipped ships are forward deployed at Rota, Spain.¹³⁹ Two additional destroyers will be based out of Rota by 2025 or 2026, bringing the total to six; Rota's four current destroyers are the "workhorses of deterrence" according to General Wolters.¹⁴⁰
- A second Aegis Ashore site in Redzikowo, Poland, that broke ground in May 2016 has faced delays but was commissioned in September 2020 and will begin operations in 2022.¹⁴¹

MAP 2 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.



NOTES: Figures are estimates for 2021. Iceland is not listed because it has no military.

SOURCE: Press release, "Defence Expenditure of NATO Countries (2013–2020)," North Atlantic Treaty Organization, March 16, 2021, https://www.nato.int/nato_static_fly2014/assets/pdf/2021/3/pdf/210316-pr-2020-30-en.pdf (accessed July 23, 2021).

- Ramstein Air Base in Germany hosts a command and control center.¹⁴²
- The U.K. operates an early warning BMD radar at RAF Fylingdales in England. The U.K. continues to consider upgrades to its Type 45 Destroyers with BMD capable missiles.¹⁴³
- In May and June 2021, 10 nations—Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, the United Kingdom, and the United States—took part in the biannual BMD exercise Formidable Shield.¹⁴⁴ Formidable Shield 21 features 15 ships, 10 aircraft, and 3,300 participants¹⁴⁵ and “is designed to improve allied interoperability in a live-fire joint IAMD [Integrated Air and Missile Defense] environment, using NATO command and control reporting structures.”¹⁴⁶

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.”¹⁴⁷ Norway operates four *Fridtjof Nansen*-class Aegis-equipped frigates that are not currently BMD capable.¹⁴⁸ A fifth Aegis-equipped frigate, the *Helge Ingstad*, collided with an oil tanker and sustained so much damage that the government has decided to scrap it.¹⁴⁹

Denmark, which agreed in 2014 to equip at least one of its *Iver Huitfeldt*-class frigates with radar to contribute to NATO BMD, reaffirmed this commitment in the Defence Agreement 2018–2023.¹⁵⁰ 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.”¹⁵¹

In March 2019, the first of four Dutch *De Zeven Provinciën*-class frigates received a SMART-L Multi-Mission/Naval (MM/N) D-band long-range radar upgrade that is

“capable of BMD mission (surveillance and tracking of ballistic missiles) up to 2000 km while simultaneous[ly] maintaining the air defence capability.”¹⁵² All four Dutch frigates will receive the radar upgrade and carry SM-3 surface-to-air missiles.¹⁵³ In December 2020, the Royal Netherlands and German navies signed an agreement to work jointly to develop a replacement for the Dutch *De Zeven Provinciën*-class frigate and Germany’s three *F124 Sachsen*-class frigates.¹⁵⁴

Belgian Admiral Jan de Beurme stated in April 2021 that “we are studying the feasibility of integrating ballistic missile defense shooter capabilities into the new frigates.”¹⁵⁵ 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 2024.¹⁵⁶

Spain currently operates four Aegis-equipped F-100 *Alvaro de Bazan*-class frigates, but they are not yet BMD capable.¹⁵⁷ In April 2019, Spain signed an agreement to procure five F-110 multi-mission frigates; the first F-110 will likely be deployed in 2026. The Aegis-equipped frigates “will host the first naval solid-state S-band radar for the Spanish Navy.”¹⁵⁸

The Italian Navy is procuring seven multi-role offshore patrol vessels (PPAs) that are to be delivered from 2021–2026.¹⁵⁹ The first of two PPAs in full configuration that are BMD capable will be delivered in 2024.¹⁶⁰

Quality of Armed Forces in the Region

Article 3 of the 1949 North Atlantic Treaty, NATO’s founding document, states that at a minimum, members “will maintain and develop their individual and collective capacity to resist armed attack.”¹⁶¹ Regrettably, only a handful of NATO members are living up to their Article 3 commitments.

In 2020, 11 countries—Estonia (2.33 percent); France (2.04 percent); Greece (2.68 percent); Latvia (2.27 percent); Lithuania (2.13 percent); Norway (2.00 percent); Poland (2.31 percent); Romania (2.07 percent); the Slovak

Republic (2.00 percent); the United Kingdom (2.32 percent); and the United States (3.73 percent)—spent the required minimum of 2 percent of gross domestic product (GDP) on defense,¹⁶² and 18 NATO allies spent 20 percent of their defense budgets on “major new capabilities.”¹⁶³ NATO defense spending continues to trend upward: “2020 marked the sixth consecutive year of growth in defence spending by European Allies and Canada, with an increase in real terms of 3.9% from 2019 to 2020.”¹⁶⁴

Germany. Germany remains an economic powerhouse that punches well below its weight in terms of defense. In 2020, it spent only 1.56 percent of GDP on defense and 16.9 percent of its defense budget on equipment.¹⁶⁵ In November 2019, German defense Minister Annegret Kramp-Karrenbauer announced that the nation may not attain the 2 percent benchmark until 2031.¹⁶⁶ German defense spending is rising, however: The \$63.8 billion budget for 2021 is a 3.2 percent increase over the budget for 2020.¹⁶⁷

Despite the positive momentum, 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.’”¹⁶⁸

Germany continues to serve as the framework nation for NATO’s EFP battalion in Lithuania, with 583 troops stationed there.¹⁶⁹ Germany is also spending \$110 million through 2021 to upgrade facilities in Lithuania that include barracks used by the multinational battalion.¹⁷⁰ The Luftwaffe has taken part in Baltic Air Policing 13 times—more than any other nation’s armed forces—most recently out of Šiauliai air base in Lithuania in the summer of 2020¹⁷¹ and out of Ämari Air Base in Estonia from September 2020 to May 2021.¹⁷²

Germany maintains 70 troops in Kosovo as part of NATO’s Kosovo Force¹⁷³ and had been the second-largest contributor to NATO’s Resolute Support Mission in Afghanistan with 1,300 troops.¹⁷⁴ In April 2021, the Bundestag extended the mandate for Germany’s

participation in NATO’s Sea Guardian maritime security operation, as well as Germany’s participation in United Nations Mission in South Sudan, extending both mandates through March 31, 2022.¹⁷⁵ German forces also participate in a number of additional U.N. peacekeeping missions including missions in Lebanon and Mali.¹⁷⁶

In October 2020, Germany extended its non-combat training mission in Iraq and its air-to-air refueling and air surveillance radar missions in support of the counter-ISIS coalition, but it ended its Tornado reconnaissance mission on March 31, 2020.¹⁷⁷ Germany maintains 90 soldiers in Iraq helping to train Kurdish forces.¹⁷⁸

In April 2017, the Bundeswehr established a new cyber command, which will have a staff of approximately 14,500 by the time it becomes fully operational this year.¹⁷⁹ Germany also led NATO’s Very High Readiness Joint Task Force (VJTF) in 2019 and will do so again in 2023, with “the earmarked units prioritised for modernisation and upgrades.”¹⁸⁰

Although Germany’s forces have taken on additional roles in recent years, its overall military continues to suffer serious equipment and readiness issues. As of December 2020, the Federal Ministry of Defence estimated that readiness for all major weapons systems was 74 percent—only a slight improvement since June 2020’s 71 percent.¹⁸¹

Deployments often strain the military for years. In one example, following deployment of TIGER combat helicopters to Mali in 2017–2018, “the concentration of all available resources in training, personnel, special tools and spare parts on this 15-month deployment halted the process chain in domestic operations to such an extent that this continued to have a significant disruptive impact on materiel readiness in 2020.”¹⁸² Even Germany’s robust contribution to Baltic Air Policing “takes everything it has, often at the expense of training initiatives.”¹⁸³

Significant problems identified in a February 2021 parliamentary report include just 13 operational LEOPARD 2 battle tanks being

CHART 2

Less than Half of 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 nine other nations do both.

DEFENSE SPENDING AS A PERCENTAGE OF GDP, 2021



NOTE: Figures are estimates for 2021. Iceland is not listed because it has no military.

SOURCE: Press release, “Defence Expenditure of NATO Countries (2013–2020),” North Atlantic Treaty Organization, March 16, 2021, https://www.nato.int/nato_static_fl2014/assets/pdf/2021/3/pdf/210316-pr-2020-30-en.pdf (accessed July 23, 2021).

 heritage.org

available for training in 2020 (well under the target of 35)¹⁸⁴ and procurement knots such as those that resulted in a lack of cold-weather suits and flight helmets for the Navy.¹⁸⁵ In September 2020, a tender to replace Germany’s CH-53G heavy transport helicopters was

cancelled because of high cost, although a replacement is still being sought.¹⁸⁶ However, there also was some small progress in readiness; for instance, six more Eurofighters were available for flight operations every day in 2020 than were available in 2019.¹⁸⁷

Equipment problems are creating downstream pilot issues. Nearly half of the Luftwaffe's pilots are unable to meet NATO training requirements because a shortage of available planes has caused a lack of flight time.¹⁸⁸ As a result, more pilots are leaving the armed forces.¹⁸⁹ Only 106 of the air force's 220 jet pilot positions are filled, and only 44 out of 84 helicopter pilot positions are filled.¹⁹⁰

The situation is not much better for the navy. Problems with naval submarines include "long yard periods, difficulties with main batteries and the practice of 'controlled removal' from some submarines in order to keep others operational."¹⁹¹ Reports surfaced in March 2021 that more than 100 German vessels including submarines rely on a Russian navigation system that does not meet NATO standards and that "[d]uring a worst-case cyberattack, navigation data could be hacked and the ship could fully lose operability."¹⁹²

In December 2017, Germany's F-125 *Baden-Württemberg*-class frigate failed sea trials because of "software and hardware defects."¹⁹³ The frigate reportedly had "problems with its radar, electronics and the flameproof coating on its fuel tanks," was "found to list to the starboard," and lacked sufficiently robust armaments as well as the ability to add them.¹⁹⁴ Concerns have been raised about whether the frigate's ability to defend against aerial attack is so deficient that the ship is fit only for "stabilization operations."¹⁹⁵ In addition, the lack of sonar and torpedo tubes makes the ship vulnerable to attack by submarines.¹⁹⁶

Germany returned the ship to the shipbuilder following delivery.¹⁹⁷ The redesigned *Baden-Württemberg* was belatedly commissioned in June 2019, and Germany took delivery of the third of four F-125s in March 2021.¹⁹⁸ In January 2020, Germany announced a \$6.7 billion contract with a Dutch and German shipbuilder to build the next-generation MKS 180 frigate, with the first of four (with the possibility of another two) to be delivered in 2027.¹⁹⁹

The number of personnel on active duty in Germany's army rose from 176,000 in 2016 to 183,500 in 2020.²⁰⁰ According to

the International Institute for Strategic Studies (IISS):

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.²⁰¹

However, partially because of the pandemic, Germany recruited 19 percent fewer people in 2020 than it recruited in 2019; "around 20,200 military personnel positions above the junior ranks were vacant" at the end of 2020; and the average age of career soldiers has risen three years since 2012 to 33.4 years.²⁰² In April 2021, Germany started a yearlong "voluntary military service in homeland security" program that mixes combat training with specialist training to prepare 1,000 young Germans per year to deal with pandemics or natural disasters and protect critical infrastructure.²⁰³

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.²⁰⁴ It will cost almost €9 billion to keep Germany's Tornados in the air until their scheduled retirement in 2031.²⁰⁵ Their replacement will need to be able to carry both nuclear and conventional weapons, as the Tornados are dual-capable aircraft equipped to carry B61 tactical nuclear weapons in addition to conventional payloads.²⁰⁶ The U.S. and Germany have already tested the Tornado's ability to carry the new B61-12 tactical nuke.²⁰⁷

Although the Super Hornets are not yet certified to carry the B61 tactical weapons, Germany is planning on the Super Hornets as their dual-capable aircraft.²⁰⁸ Of the 45 Super Hornets, 15 will be an EA-18 Growler electronic warfare variant.²⁰⁹ However, the Defence Ministry's announcement is a "recommendation and not a commitment. According to MoD statements, the government currently plans

to introduce supporting documents to parliament in 2022 or 2023.”²¹⁰

The next German government will decide on the fate of the nation’s sharing posture. Germany, France, Italy, and Spain plan to acquire a collective fleet of Eurodrones.²¹¹ The Bundestag approved funding for the program in April 2021, but the nation cannot purchase ammunition for the drones, and operators cannot receive “tactical weapons training,” which leaves German drones, once procured, “weaponless for now.”²¹²

In March, the Ministry of Defence announced plans to upgrade its Patriot missiles to keep them in service until 2030 and to invest in drone technology rather than a next-generation air defense platform.²¹³

Germany operates the largest fleet of heavy transport aircraft in Europe²¹⁴ and has taken delivery of 35 of 53 A400M cargo aircraft ordered.²¹⁵ Germany is upgrading its fleet with funds made available in December 2020. According to the Ministry of Defence, “Aircraft that were previously only usable for logistical missions are to be made capable of tactical missions through additional equipment and preparations.”²¹⁶

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.²¹⁷ A new joint training center for both aircraft in Normandy will break ground in 2021 and begin operations in 2024.²¹⁸ In June 2020, Germany announced an end to its P-3C ORION maritime patrol aircraft (MPA) modernization program.

In March 2021, the U.S. approved the sale of the P-8A Poseidon to Germany. As this book was being prepared for publication, a decision had not been made, but German procurement of the P-8 seems likely.²¹⁹

France. France has one of the most capable militaries within the NATO alliance and retains an independent nuclear deterrent capability. France rejoined NATO’s Integrated Command Structure in 2009 but remains outside the alliance’s nuclear planning group.

In 2020, France spent 2.04 percent of GDP on defense and 26.5 percent of defense spending on equipment, meeting both NATO benchmarks.²²⁰ France has safeguarded planned defense spending increases of \$2 billion in 2021. According to *Defense News*:

The €49.7 billion French defense budget for 2021 includes payment appropriations of €39.2 billion, which is an increase from the previous year, as planned in the 2019–2025 military program law. Of this, a record €22.3 billion is earmarked for modernizing equipment and buildings; €12.3 billion will go toward wages; and €4.6 billion is appropriated for operating costs.²²¹

While France has been increasing defense spending, one-third of the planned increases are not set to take effect until 2023 after the next general election, and a budgetary review set for this year. One major project is an upgrade to the French sea-based and air-based nuclear deterrent. The nation test fired the M51.2, the current three-stage, sea-land strategic ballistic missile (without a warhead) in April 2021 as part of a development program for the M51.3, which is expected in 2025.²²²

France’s sea-based deterrent is provided by four *Le Triomphant*-class ballistic missile submarines.²²³ The government launched the country’s third-generation ballistic missile submarine program in February 2021. Delivery of the first submarine is planned for 2035, with three additional subs to be delivered every five years thereafter.²²⁴ Armed Forces Minister Florence Parly has described the third-generation submarines in colorful terms as able to “hear better and defend themselves better whilst at the same time being more silent: They will not make more noise than a school of shrimp.”²²⁵

Other major naval procurements include \$1.09 billion through 2025 for the design phase of a new nuclear-powered aircraft carrier that will deploy 30 future combat aircraft systems and is planned to enter service in 2038.²²⁶ The

Suffren, the first of six new fifth-generation Barracuda-class nuclear-powered attack submarines, was commissioned in November 2020.²²⁷ France is procuring five defense and intervention frigates, with the first due in 2024 and the second and third in 2025.²²⁸ The *Alsace*, a FREMM multi-mission frigate delivered in April 2021, and the *Lorraine*, which is to be delivered in 2022, will have enhanced air defense capabilities in addition to the focus on anti-submarine warfare that characterizes the six FREMMs that were delivered between 2012 and 2019.²²⁹

In November 2020, Armed Forces Minister Parly announced the overhaul of the entire mine countermeasures systems by 2029.²³⁰ In the same month, France and the U.K. signed a production contract for the joint Maritime Mine Counter Measure (MMCM) autonomous minehunting system.²³¹

Army procurements include Kochi HK416 Assault Rifles,²³² 300 ANAFI USA micro-drones,²³³ and Serval Armored Vehicles, with 108 of the 364 Servals that have been procured to be delivered by 2022.²³⁴

Air Force procurements include an upgrade to the aerial refueling and airlift fleet. In February 2020, France received the second of two KC-130J Super Hercules.²³⁵ It also has been introducing new A330 MRTT Multi-Role Tanker Transport aircraft and as of April 30, 2021, had received three of a dozen ordered.²³⁶ France received its 18th A400M Atlas military transport aircraft in April 2021 and plans to have 25 in service by 2025.²³⁷ In October 2020, the government announced that the final 10 NH90 Tactical Troop Helicopters on order for delivery in 2025 and 2026 would be upgraded to meet special forces requirements.²³⁸

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 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.”²³⁹ The 28 Rafales,

to be delivered in 2025, “will include some F4 functionalities.”²⁴⁰ An additional 30 Rafales at full F4 configuration will be delivered by 2030.²⁴¹ It is expected that “[t]he F4 version will significantly improve the 4.5-generation fighter’s stealth capabilities, which although present in earlier versions to some extent failed to compete with fifth-generation combat aircraft.”²⁴²

In February 2021, France signed a contract to procure an additional 12 Rafales at the F3R standard by 2025 to replace fighters that had recently been sold to Greece.²⁴³ In May 2021, France, Germany, and Spain signed an agreement on the Future Combat Air System, which is to begin entering service in 2040.²⁴⁴

France established a 220-person Space Command under the Air Force in September 2019 and has committed to investing \$4.78 billion in its space capabilities by 2025.²⁴⁵ In January 2021, NATO approved a Center of Excellence for Military Space to be located alongside French Space Command in Toulouse.²⁴⁶ The first researchers arrived in 2021, and the center is to be fully staffed by 2025.²⁴⁷

France intends to have a “fully capable” system to defend its assets in space in place by 2030. “If our satellites are threatened,” Armed Forces Minister Parly has said, “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.”²⁴⁸ In March 2021, with German and U.S. space forces also participating, France launched its first military exercise in space “to evaluate its ability to defend its satellites and other defense equipment from an attack.”²⁴⁹

In December 2016, France opened a cyber-operational command.²⁵⁰ 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.”²⁵¹

France, which has the third-largest number of active-duty personnel in NATO,²⁵² withdrew the last of its troops from Afghanistan at the end of 2014, although all French combat troops had left in 2012. France continues to remain engaged in the fight against the Islamic State, deploying 600 troops in Operation Chammal.²⁵³ In February 2021, the *Charles de Gaulle* Carrier Strike Group deployed on a four-month operational deployment that includes support to Operation Chammal.²⁵⁴ In April 2021, the *Charles de Gaulle* Carrier Strike Group and *Dwight D. Eisenhower* Carrier Strike Group conducted dual operations in the Arabian Sea.²⁵⁵

France's contributions to NATO deterrence missions in Eastern Europe include deployment of 337 soldiers to Estonia as part of NATO's Enhanced Forward Presence.²⁵⁶ France also has taken part in Baltic Air Policing eight times, most recently flying out of Estonia beginning in April 2020,²⁵⁷ and is preparing for high-intensity warfare with a full-scale divisional exercise Orion for 2023 that could involve up to 10,000 troops in addition to air and naval units.²⁵⁸

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, 950 in Côte d'Ivoire, 350 in Gabon, and 350 in Senegal.²⁵⁹ In addition, France has a close relationship with the United Arab Emirates. It has 650 troops stationed in the UAE,²⁶⁰ 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 in response to human smuggling and other migration-related problems and is involved in other maritime missions across the globe.²⁶¹ It organized the April 2021 Le Pérouse naval exercise in the Bay of Bengal, which also included ships from Australia, Japan, India, and the U.S.²⁶² France also conducts occasional freedom-of-navigation operations in the Pacific. In February 2021, for example, it announced that it was sending

a nuclear-propelled attack submarine and warship on an eight-month mission to the Indian and Pacific Oceans.²⁶³

The French-led Awareness Strait of Hormuz initiative to help patrol the waters near Iran, based out of Abu Dhabi, became operational on February 25, 2020. The mandate for the initiative's military mission, Operation Agenor, was extended through 2021.²⁶⁴

Operation Sentinelle, launched in January 2015 to protect the country from terrorist attacks, is the largest operational commitment of French forces. Sentinelle and Operation Resilience, launched in March 2020 to help combat coronavirus,²⁶⁵ together represent a domestic commitment of 13,000 French forces.

In response to a series of terrorist attacks in southern France in October 2020, President Macron increased the number of troops deployed for Operation Sentinelle from 3,000 to 7,000.²⁶⁶ This decision could have a negative impact on overall readiness as one analysis notes. The IISS has noted that in "mid-2020, the army issued a strategy document, 'Operational Superiority 2030', which called for improved readiness in light of the risk of high-intensity conflict" but that "these plans could be affected by the decision, in October, to deploy more troops on the domestic Operation Sentinel mission."²⁶⁷ Frequent deployments, especially in Operation Sentinelle, have placed significant strains on French forces and equipment.²⁶⁸

The United Kingdom. America's most important bilateral relationship in Europe is its Special Relationship with the United Kingdom. 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. spent 2.32 percent of GDP on defense and 23.0 percent of its defense budget on equipment.²⁶⁹ In November 2020, the government announced plans to spend an additional "projected total of nearly \$22 billion" on defense across the next four years. "[T]his additional funding is on top of a

previous commitment to add \$2 billion more to the country's defense budget, with the combined planned increase being approximately \$24.1 billion through 2024.”²⁷⁰ The new funding will be used in part for acquisitions, including frigates, Type 32 warships, and the U.K.'s Future Combat Air System. The U.K. is also standing up a Space Command and an Artificial Intelligence Center.²⁷¹

A 2020 report from the National Audit Office, however, warned that the U.K.'s 10-year defense modernization program could face a budget shortfall of as much as £13 billion (\$15 billion).²⁷² Defence Secretary Ben Wallace stated that the U.K. would need to make some “tough choices”:

The decades of funding deferrals were about to hit the buffers. Bogus efficiencies, savings targets, hollowing out, and the lasting impacts of fighting the Iraq and Afghanistan conflicts are all things that continue to drain away precious resources long after the political leadership that directed them have exited the stage.²⁷³

In March 2021, the U.K. released its Integrated Review of Security, Defence, Development and Foreign Policy as well as a Defence Command Paper.²⁷⁴ The Defence Ministry's Command Paper, which lays out a plan for military modernization, includes plans for the creation of a new special operations Army Ranger Regiment that will “be able to operate discreetly in high-risk environments and be rapidly deployable across the world” and a new naval surveillance ship “aimed at protecting Britain's undersea cables and other critical national infrastructure.”²⁷⁵

The paper also specifies significant cuts in capability, including a likely reduction in the planned procurement of 138 F-35s and the early retirement of C-130J transport aircraft. In addition, the U.K. army would be reduced from its current 82,000 troops to 72,500 troops by 2025—the smallest it has been since 1714.²⁷⁶ However, one analysis argues that the Army

reduction “is less than might appear” because “the Army has been well below its planned personnel numbers for some years.”²⁷⁷ The loss of the C-130J will be felt as “[t]hese aircraft had been particularly favoured for Special Forces roles, which will now fall to the considerably larger A400M Atlas.”²⁷⁸

Although the number of its active-duty servicemembers is small in comparison to the militaries of France and Germany, the U.K. maintains European NATO's most effective armed forces. Nevertheless, the Army admitted in October 2020 that it would miss targets set down in the 2015 Strategic Defence and Security Review (SDSR) to field a fully capable division with three brigades by 2025 (this will not take place now until the early 2030s).²⁷⁹ Because of procurement delays and funding issues, the Army will “only be able to deploy a combat division consisting of just a single armoured infantry brigade and an interim manoeuvre support brigade.”²⁸⁰ As explained by Ben Barry of the IISS:

The Army was mandated [in the 2015 review] to deliver two armored infantry brigades, whereas they are now saying they can only generate one. They have enough vehicles for three infantry armored brigades, but my very strong suspicion is they haven't been spending money on spares. If they haven't got sufficient spare parts they will only risk sending one brigade on operations.²⁸¹

In early 2021, the Defence Ministry announced that it had been granted observer status for the Franco-German Main Ground Combat System program, which is slated to replace French and German Main Battle Tanks “around 2035.”²⁸² In April 2019, the U.K. reported that it was planning to upgrade only 148 of its 227 remaining Challenger 2 main battle tanks, cutting its fleet by a third.²⁸³ The 79 other tanks would be scavenged for spare parts.²⁸⁴ Because Challenger tanks are not currently manufactured, sourcing spare parts is a continual problem.²⁸⁵ The British Army had

previously cut its tank forces by 40 percent in 2010.²⁸⁶ The Defence Command Paper laid out plans to spend £1.3 billion on upgrades to elevate the Challenger 2 to the Challenger 3.²⁸⁷ One former U.K. tank officer recently wrote that the small number of U.K. tanks available means that “our armoured brigades can only play a bit part in someone else’s military in alliance or coalition.”²⁸⁸

In March 2021, the U.K. announced that it would no longer upgrade its Warrior armored vehicles, but that they would remain in service through the mid-2020s.²⁸⁹ In 2019, the U.K. signed a £2.8 billion deal to procure around 500 Boxer armored vehicles.²⁹⁰ As a result of the decision to stop upgrading the heavier Warriors, the Army is “conducting an analysis on potential lethality enhancements of Boxer vehicle.”²⁹¹

As of March 2021, the U.K. had taken delivery of 21 F-35Bs of 48 ordered.²⁹² The total number of F-35s that will be procured may not be known until 2025.²⁹³ RAF F-35s based at Akrotiri, Cyprus, flew operational sorties for the first time in June 2019.²⁹⁴ In 2019, the U.K. took delivery of the last of 160 Typhoon aircraft, all of which were expected to stay in service until 2040.²⁹⁵ However, in March, the U.K. announced that 24 Tranche 1 Typhoons will be retired by 2025.²⁹⁶ 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 and enabled the U.K. to retire its fleet of Tornado aircraft.²⁹⁷ The U.K. recently detailed a £2 billion investment over the next four years in development of the Tempest, a sixth-generation fighter to be delivered in 2035.²⁹⁸

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.²⁹⁹ 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 already seen service in Mali, Nigeria, and Iraq and is now part of the RAF fleet.³⁰⁰

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. By April 2021, Britain had taken delivery of 20 of 22 A400M heavy transport aircraft ordered.³⁰¹

The Sentinel R1, an airborne battlefield and ground surveillance aircraft, flew its last operational flight in February 2021.³⁰² That same month, the U.K. took delivery of the fifth of nine P-8 Poseidon maritime patrol aircraft (MPA) that are to be based at RAF Lossiemouth in Scotland. The order will be completed by the end of the year.³⁰³ In 2018, retired Air Vice-Marshal Andrew Roberts testified to Parliament 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.”³⁰⁴

The U.K. reportedly also plans to procure approximately 45 medium helicopters to remain in service until the mid-2040s. This platform will replace four different helicopter platforms currently in service.³⁰⁵

The Royal Navy has lost 40 percent of its fleet since the end of the Cold War.³⁰⁶ Of the 55 ships lost since the early 1980s, half are frigates, and the U.K. now operates only 13.³⁰⁷ In five years, the Royal Navy will have only 10 frigates.³⁰⁸ According to one analyst, such a force “can’t possibly handle all of [the] tasks [required of it]. Especially considering that, at any given time, just a third of the vessels will be available for operations. The others will be in maintenance or refit or working up for deployments.”³⁰⁹ However, as construction of destroyers and frigates picks up steam, “the ambition is to rebuild to more than 20 by the end of the decade.”³¹⁰

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.³¹¹ The Type-26 Global Combat Ships are meant to handle a flexible range of tasks, but it remains unclear whether all of their weapons capabilities will be funded.³¹² The U.K.

announced a procurement of five T31e frigates, which are scheduled to enter service in 2023,³¹³ the year the first of the Type-23 frigates is slated to be phased out of service.³¹⁴

HMS *Queen Elizabeth* set sail on its first operational deployment in May 2021.³¹⁵ The Carrier Strike Group deployment, which includes a U.S. destroyer and a Dutch frigate, will “last for 28 weeks and cover 26,000nm” and “will include visits to the waters of more than 40 countries” and “a wide range of exercise and joint operations.” Specifically, “Queen Elizabeth is scheduled to conduct dual-carrier operations in the Mediterranean with the French carrier Charles de Gaulle, as well as exercise with a number of navies, including that of Israel. Elements of the CSG will also conduct maritime security operations in the Black Sea.” In addition:

F-35B fighters from the carrier are expected to fly combat missions over Syria and Iraq from the eastern Mediterranean as part of Operation Shader, the UK’s contribution to the anti-Daesh campaign. The CSG will then move further east to the Indian and Pacific Oceans, exercising with the UAE along the way and visiting India. Further visits are planned to Japan, South Korea, and Singapore, underlining the United Kingdom’s new shift in defense focus towards the Pacific. The group will participate in Exercise Bersama Lima with forces from Australia, Malaysia, New Zealand, and Singapore. The exercise coincides with the 50th anniversary of the Five Powers Defence Agreement between the five nations.³¹⁶

The U.K.’s *Queen Elizabeth*-class carriers are the largest operated in Europe. A second in this class, HMS *Prince of Wales*, will be the larger of the two carriers and was commissioned in December 2019.³¹⁷ However, the *Prince of Wales* has been beset by a series of leaks that have cost £3.3 million and necessitated the cancellation of planned fixed-wing sea trials with F-35s off the U.S. east coast that

were scheduled for January 2021.³¹⁸ The *Prince of Wales* returned to the sea in May 2021 after five months of repairs.³¹⁹ Each carrier is capable of supporting 36 F-35s, but the U.K. currently plans to procure only 48.³²⁰

The Royal Navy is also introducing seven *Astute*-class attack submarines as it phases out its older *Trafalgar*-class subs. The fifth *Astute*-class submarine was launched in April 2021.³²¹ Crucially, the U.K. 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 2020.³²²

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 U.K. plans to procure four new *Dreadnought*-class ballistic missile submarines, which are expected to have a 30-year life span, at a cost of £31 billion (plus an additional contingency funding stream of £10 billion for any potential cost overruns), with a completion date of the early 2030s for the first, HMS *Valiant*.³²³ In May 2021, the Ministry of Defence ordered a review of the program because of delays that continue to push back the date of completion.³²⁴

U.K. defense forces have been plagued in recent years by vacancies. “The personnel strength of the British armed forces continues to decrease,” according to the IISS, “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.”³²⁵ However, initial reports suggest that the pandemic may have helped to fuel an increase in military recruitment in 2020.³²⁶

Despite these issues, the U.K. remains a leader inside NATO, serving as the framework

nation for NATO's EFP in Estonia and a contributing nation for the U.S.-led EFP in Poland. The Royal Air Force has taken part in Baltic Air Policing six times since 2004, most recently in May–August 2020.³²⁷ In April 2021, four RAF Typhoons were deployed to Romania to take part in NATO's enhanced Air Policing (eAP), the third time the RAF has participated in eAP since 2017.³²⁸ From November–December 2019, four U.K. typhoons and 120 personnel took part in Icelandic Air Policing.³²⁹

Before its withdrawal early in 2021, the U.K. maintained a force of 750 troops in Afghanistan as part of NATO's Resolute Support Mission.³³⁰ It also contributes to NATO's Kosovo Force;³³¹ NATO's Mine Countermeasures Group One;³³² and, as an active part of the anti-ISIS coalition, Operation Shader.³³³ In February 2021, the U.K. announced that it planned to increase the number of British troops (currently “about 100 soldiers”) engaged in training Iraqi security forces.³³⁴

Italy. Italy hosts some of the U.S.'s most important bases in Europe, including the headquarters of the 6th Fleet. It also has NATO's fifth-largest military³³⁵ and one of its more capable despite continued lackluster defense investment. In 2020, Italy spent only 1.39 percent of GDP on defense, but it did spend 24.6 percent of its defense budget on equipment, meeting the second NATO spending benchmark.³³⁶ Italy will increase its defense budget by 9.6 percent in 2021, a \$1.7 billion year-over-year increase. Procurement spending will increase about 26 percent in 2021 over 2020 levels, and “Maintenance and Operations rises 23 percent to €2.15 billion.”³³⁷

Key procurements include 150 Centauro II 8x8 tank destroyers, 650 Lince 2 light multi-role vehicles, 156 VBM Freccia 8x8 infantry combat vehicles, T-345 and T-346 jet trainers, Italy's first HH-101 Combat Search and Rescue helicopter, and 16 CH-47F helicopters.³³⁸ Italy also plans to purchase 60 F-35As for the air force and 30 F-35Bs; the F-35Bs will be divided equally between the air force and navy.³³⁹ A government-owned plant for final assembly of the F-35 is located in Cameri, Italy.

In December 2020, Italy signed the Future Combat Air System (FCAS) Cooperation agreement with Sweden and the U.K. The agreement covers “the cooperation for research, development, and ‘joint-concepting’” of the sixth-generation *Tempest* fighter.³⁴⁰ In April, Italy's Military Chief of Staff General Enzo Vecciarelli suggested that the *Tempest* might possibly employ directed energy weapons to defeat hypersonic missiles.³⁴¹

Key naval procurements include plans for four U212A submarines, “a special operations & diving operations/Submarine Rescue Ship,” and a new anti-ship missile system.³⁴² Italy launched the last of 10 new FREMM frigates in January 2020.³⁴³ For the Italian Navy, “[t]he expected retirement of much of the naval fleet has triggered a long-term replacement plan which includes the potential acquisition of two next-generation destroyers to replace the aging Luigi Durand de la Penne-class vessels.”³⁴⁴

The Ministry of Defence's “Multi-year Planning Document 2020–2022,” released in November 2020, launched “de-risking studies for two next generation destroyers under the DDX program to replace the Navy's two *Admiral*-class destroyers,” with the new destroyers to be delivered in 2028.³⁴⁵ Other defense priorities include acquiring a “multi-mission, multi-sensor” Gulfstream G-550 jet for “command-and-control, ‘electronic superiority’ and ‘electronic protection of forces.’”; the launch of new surveillance and communications satellites; and needed munitions.³⁴⁶

Italy's focus is the Mediterranean region where it participates in a number of stabilization missions including NATO's Sea Guardian,³⁴⁷ the EU's Operation Sophia,³⁴⁸ and the Italian Navy's own Operation Mare Sicuro (Safe Sea) off the Libyan coast.³⁴⁹ Additionally, 400 Italian troops are part of the bilateral Mission of Assistance of Support in both Misrata and Tripoli.³⁵⁰

Despite a southern focus, Italy contributes to Standing NATO Mine Countermeasures Group Two³⁵¹ as well as the EFP battalion in Latvia (200 troops);³⁵² previously NATO's Resolute Support mission in Afghanistan

(895 troops);³⁵³ and Operation Prima Parthica (600 troops, partly to help train Iraqi Security Forces).³⁵⁴ Italian Tornado jets operating out of the Ahmed Al Jaber airbase in Kuwait are performing reconnaissance missions in support of the coalition to defeat the IS.³⁵⁵ With 542 troops, Italy is the second largest contributor to KFOR after the United States.³⁵⁶

The Italian Air Force has taken part in Baltic Air Policing five times, most recently with Italian Typhoons operating out of Lithuania from September 2020–April 2021.³⁵⁷ In April 2021, Italy deployed four F-35As to Estonia, marking the first time the F-35 has taken part in Baltic Air Policing.³⁵⁸ 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.”³⁵⁹ The Italian Air Force has deployed to Iceland to perform air patrols six times since 2013, most recently in June–July 2020 when six F-35As were deployed to Iceland.³⁶⁰

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 liberating the Baltic States in the event of a Russian invasion reportedly rely heavily on Polish troops and ports.³⁶¹

Poland has an active military force of 114,050 including a 58,500-person army with 808 main battle tanks.³⁶² Poland also has a Territorial Defense Force (TDF) that is intended “to increase the strength of the armed forces and the defense capabilities of the country,” according to former Minister of Defense Antoni Macierewicz, and “is also the best response to the dangers of a hybrid war like the one following Russia's aggression in Ukraine.”³⁶³ 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.”³⁶⁴ Its planned 17 brigades will be distributed across the country.³⁶⁵ The force, which will number 53,000 by 2026,³⁶⁶ constitutes the fifth branch of the Polish military, subordinate to the Minister of Defense.³⁶⁷ National Defense Minister Mariusz Blaszcza has stated that the TDF's performance combating COVID-19 has “impeccably proved their importance and effectiveness.”³⁶⁸

Poland is also investing in cyber capabilities. “Plans for a 2,000-strong cyberdefence force were also unveiled in 2019,” according to the IISS *Military Balance*. “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.”³⁶⁹ In November 2020, the U.S. and Poland signed an enhanced defense cooperation agreement that increased the number of U.S. forces stationed in Poland by 1,000.

In 2019, Poland spent 2.31 percent of GDP on defense and 29.0 percent of its defense budget on equipment, reaching both NATO benchmarks.³⁷⁰ Pursuant to increases in defense spending adopted in October 2017, Poland should be spending 2.5 percent of GDP on defense in 2030.³⁷¹ In January 2021, Minister Blaszcza stated that Poland remained committed to 2 percent but that “[t]he COVID-19 pandemic will most likely have an impact on national security policies, including defense budgets.”³⁷²

Poland is making major investments in military modernization and is planning to spend \$133 billion on new capabilities by 2035, as envisioned in the Defense Ministry's Technical Modernization Plan for 2021–2035, which was signed in October 2019.³⁷³ In addition, several major acquisitions have been announced in recent years. For example:

- In January 2020, Poland signed a \$4.6 billion deal to purchase 32 F-35As with “deliveries from 2026.”³⁷⁴ A group of 24 Polish pilots completed F-35 simulator training in Arizona early in 2021.³⁷⁵ Poland has announced that the F-35s will be based in Lask.³⁷⁶

- In March 2018, in the largest procurement contract in its history, Poland signed a \$4.75 billion deal for two Patriot missile batteries.³⁷⁷ The Patriot batteries are scheduled for delivery between 2022 and 2025.³⁷⁸
- In February 2019, Poland signed a \$414 million deal to purchase 20 high-mobility artillery rocket systems from the U.S. for delivery by 2023.³⁷⁹
- In April 2019, it signed a \$430 million deal to buy four AW101 helicopters that will provide anti-submarine warfare and search-and-rescue capabilities and are to be delivered by the end of 2022.³⁸⁰
- In February 2018, Poland joined an eight-nation “coalition of NATO countries seeking to jointly buy a fleet of maritime surveillance aircraft.”³⁸¹
- Poland has been in negotiations to purchase 180 Javelin anti-tank weapons. In March 2020, the State Department approved the potential sale, which would be worth \$100 million.³⁸²
- In April 2021, the U.S. and Poland signed an agreement for Poland to acquire five retrofitted C-130H Hercules transport aircraft (decommissioned by the U.S. in 2017) by 2024, with the first to arrive by the end of 2021.³⁸³
- In July 2021, Poland announced a deal to procure 250 M1A2 Abrams SEPv3 tanks with deliveries to begin in 2022.³⁸⁴

Although Poland’s focus is territorial defense, it had 290 troops deployed in Afghanistan as part of NATO’s Resolute Support Mission.³⁸⁵ Poland’s air force has taken part in Baltic Air Policing nine times since 2006, most recently operating four F-16s out of Ämari Air Base in Estonia from January–April 2020.³⁸⁶ In 2020, Poland was the lead for NATO’s VJTF,

and approximately half of the 6,000 troops in the VJTF’s Spearhead Force were Polish.³⁸⁷ Poland also is part of NATO’s EFP in Latvia³⁸⁸ and has 229 troops in NATO’s KFOR mission in Kosovo.³⁸⁹

In addition, “up to 350 soldiers and employees” are deployed to Iraq, Jordan, Kuwait, and Qatar as part of Operation Inherent Resolve.³⁹⁰ In April 2021, around 80 Polish soldiers deployed to Turkey as part of a NATO assurance mission to assist Turkey by providing additional maritime patrols over the Black Sea and the Mediterranean.³⁹¹ Finally, Poland’s commitment to NATO’s tailored forward presence in Bulgaria and Romania includes about 250 soldiers and civilians.³⁹²

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 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. Specifically, according to a Reuters account, “some 80,000 people were held pending trial and some 150,000 civil servants, military personnel and others were sacked or suspended. More than 20,000 people have been expelled from the Turkish military.”³⁹³ In May 2019, according to Deutsche Welle, observers estimated that “3,000 inmates are being held in isolation.”³⁹⁴

The post-coup crackdown has had an especially negative effect on the military. As noted, 20,000 members have been dismissed since 2016 with deleterious effects on those remaining.³⁹⁵ The IISS reported that “[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.”³⁹⁶ In April 2021, Turkish authorities detained 10 former admirals that were part of a group of more than 100 retired naval officers who, in an open letter, criticized a government plan to construct a canal in Istanbul.³⁹⁷

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, greatly exacerbated existing pilot shortages.³⁹⁸ A third of the dismissed pilots were in the leadership echelon, commanding squadrons, fleets, or bases.³⁹⁹ A request to the U.S. to send trainers was denied, as was a Turkish plan to utilize Pakistani trainers to fly the F-16.⁴⁰⁰ Furthermore, as one analyst notes, “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.”⁴⁰¹

The dilapidated condition of its air force is partly why Turkey has decided to acquire new ground-based air defense systems.⁴⁰² In December 2017, Turkey signed a \$2.5 billion agreement with Russia to purchase S-400 air defense systems, and delivery began in July 2019.⁴⁰³ “The decision to purchase two S-400 air-defence systems from Russia,” reports the IISS, “was made by the president without detailed consultation with the armed forces about the possible technical and strategic repercussions.”⁴⁰⁴ U.S. officials have expressed grave concerns about this purchase and 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.”⁴⁰⁵

Turkey tested the system against its F-16s in November 2019 and further tested the system at Sinop near the Black Sea in October 2020.⁴⁰⁶

In December, a U.S. official stated, “We object to Turkey’s purchase of the system and are deeply concerned with reports that Turkey is bringing it into operation.”⁴⁰⁷ That same month, in response to Turkey’s purchase of the S-400 systems, the U.S. announced sanctions that would take effect in April 2021.⁴⁰⁸ Fearful of the likely effect of these sanctions, Turkey has been stockpiling spare F-16 parts since 2019.⁴⁰⁹

Turkish defense firms make “more than 800 components...for the F-35 as part of a nine-nation consortium,” and Turkey’s suspension from the program could cost the Turkish defense industry as much as \$10 billion.⁴¹⁰ (The U.S. Government Accountability Office specifies more precisely that 1,005 parts are produced by Turkish firms.⁴¹¹) Despite Turkey’s removal from the program, components of the F-35 will continue to be built in Turkey until 2022.⁴¹² In his posture statement to Congress, General Wolters downplayed the lasting potential of the Turkish–Russian rapprochement: “Turkey retains a pivotal role in countering Russia. Ankara’s relationship with Moscow remains competitive and transactional, with Turkish engagement often aimed at constraining Russian behavior.”⁴¹³

Partly because of its manned aircraft issues, Turkey is investing heavily in armed drones. These drones, of which it has approximately 130, have played a significant role in Turkish operations in Syria.⁴¹⁴ Here too, however, the country remains reliant on foreign companies. “While Turkish companies have assembled the drones,” according to the Congressional Research Service, “they apparently rely on Western countries for some key components, including engines, optical sensors, and camera systems.”⁴¹⁵

In October 2019, Turkey launched a major offensive in Syria against the Kurdish-led Syrian Democratic Forces (SDF), partly to create a buffer zone near the Turkish border. The largest Kurdish armed faction within the SDF is the People’s Protection Units (YPG), 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 Presidents Erdogan and Putin in Sochi.

In February 2020, Russian-backed Syrian regime forces launched an attack on Idlib, the last remaining stronghold of forces opposed to Assad. Turkish forces opposed the offensive and lost 36 soldiers before Turkey and Russia agreed to a cease-fire.⁴¹⁶ The cease-fire was extended in February 2021.⁴¹⁷

Turkish threats to renege on a 2016 agreement with the EU under which the EU paid Turkey to stop the flow of migrants to Europe are a consistent and enduring source of friction.⁴¹⁸ In addition, Turkey and Greece remain at odds over maritime boundaries and drilling rights between their two nations in the eastern Mediterranean as well as drilling rights off the Cypriot coast. Tensions flared in 2020, and maritime talks between Turkey and Greece are ongoing. Turkey is reportedly scouting a location in the Turkish Republic of Northern Cyprus for a naval base⁴¹⁹ and began flying UAVs out of Geçitkale Airport in December 2019.⁴²⁰

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. 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,” for example, “saw U.S. forces use a base in Iraq instead of the much closer Incirlik, requiring a round trip of many hours.”⁴²¹ The U.S. reportedly began reviewing plans to remove nuclear weapons from Incirlik in 2019, but no such decision has yet been made.⁴²²

U.S. officials, however, have sought to focus on the positive aspects of U.S.–Turkish bilateral relations. In December 2019, General Wolters noted that he “saw no cracks in the armor in Turkey’s willingness to work side by side as

a NATO partner with us.”⁴²³ Two positive signs have been the use of Turkey’s Konya Air Base to support NATO AWACS aircraft involved in counter-ISIS operations⁴²⁴ and Spain’s operation of a Patriot system in the Turkish city of Adana under NATO auspices.⁴²⁵ Turkey also hosts a crucial radar at Kurecik, 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.⁴²⁶

In January 2021, Turkey took over command of NATO’s Very High Readiness Joint Task Force. According to NATO:

Built around Turkey’s 66th Mechanised Infantry Brigade of around 4,200 troops, a total of around 6,400 soldiers will serve on the VJTF. Units from Albania, Hungary, Italy, Latvia, Montenegro, Poland, Romania, Slovakia, Spain, the UK, and the United States will also serve on the force, which is part of the alliance’s larger NATO Response Force. Turkey has made substantial investments into the unit—amongst the most mobile in NATO—particularly in its logistics and ammunition requirements planning. The latest models of Turkish armed vehicles, anti-tank missiles and howitzers have been allocated to the force.⁴²⁷

Before May of 2021, Turkey maintained more than 600 troops in Afghanistan as part of NATO’s Resolute Support Mission.⁴²⁸ The Turks also have contributed to a number of peacekeeping missions in the Balkans, still maintain 317 troops in Kosovo,⁴²⁹ 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 currently contributes to the Standing NATO Mine Countermeasures Group Two⁴³⁰ and Standing NATO Maritime Group Two.⁴³¹

Turkey has a 355,200-strong active-duty military,⁴³² 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.⁴³³

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.⁴³⁴ 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."⁴³⁵

Another challenge is 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 May 2020, is indefinitely delayed. The tank relies on a German-made engine and transmission, as well as French armor, but the technology transfer was not approved. Turkey has sought alternative suppliers such as South Korea and is looking to produce domestic components, but procurement remains delayed.⁴³⁶

Similarly, Turkey's procurement of 50 T-129 attack helicopters will likely be delayed for more than four years to wait for production of a domestic engine to replace one produced by American and British firms.⁴³⁷ Because of a lack of engines, Turkey has been unable to deliver 30 T129s to Pakistan as part of a 2018 deal, and Pakistan granted a further six-month extension in March 2021.⁴³⁸ Also in March 2021,

Turkey announced plans to produce a larger T929 helicopter gunship using a Ukrainian engine, but the helicopter "is not expected to make its first flight until 2024, and won't enter service until the end of the decade."⁴³⁹

Additionally, the French government has blocked development of anti-ballistic missiles because of Turkey's actions in Syria.⁴⁴⁰ President Erdogan has personally lobbied French President Macron to allow Turkey to purchase Eurosam's SAMP/T missile-defense systems.⁴⁴¹ After its removal from the F-35 program, Turkey is purportedly planning to produce a domestic fifth-generation jet, the TF-X National Combat Aircraft, by 2023.⁴⁴²

Other major procurements include 350 T-155 Fırtına 155mm self-propelled howitzers⁴⁴³ and six Type-214 submarines, the first of which will enter service in 2022 and the last of which is to be delivered in 2027.⁴⁴⁴

In February 2019, Turkey announced upgrades of four *Prevezë*-class submarines, to take place from 2023–2027.⁴⁴⁵ In 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."⁴⁴⁶ In December 2019, the SSB released its "Strategic Plan 2019–2023," which in part sets targets of 75 percent of Turkish military needs being supplied domestically by 2023 and defense exports being increased to \$10.2 billion by 2023. The latter target is almost certainly not likely to be met.⁴⁴⁷ In 2020, Turkish exports declined by 17 percent to \$2.279 billion, down from \$2.74 billion in 2019.⁴⁴⁸

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, the Baltic States have been staunch supporters of the transatlantic relationship. Although small in absolute terms, the three countries contribute significantly to NATO in relative terms. In 2021, the U.S. will provide \$169 million in military aid to the Baltics.⁴⁴⁹

Estonia. Estonia has been a leader in the Baltics in terms of defense spending, with

defense spending equal to 2.33 percent of GDP and 25.4 percent of defense spending on new equipment in 2020,⁴⁵⁰ and will spend 2.29 percent of GDP on defense in 2021 after a defense budget increase of nearly \$36 million.⁴⁵¹ Estonia's Ministry of Defence Development Plan 2022–2025, released in March 2021, includes planned investments of €135 million for ammunition along with improved personal protection for soldiers, continued development of a modular field hospital, and continued procurement of self-propelled artillery, coastal defenses, and anti-tank weapons.⁴⁵²

Munitions are a major component of Estonian procurement. Estonia's Defense Investments Center, according to the head of its procurements department, will "concentrate on procuring long-range anti-tank missiles Spike, Mistral air defense missiles and small caliber munitions in the near future."⁴⁵³

Although the Estonian armed forces total only 7,100 active-duty service personnel (including the army, navy, and air force),⁴⁵⁴ they are held in high regard by their NATO partners and punch well above their weight inside the alliance. Between 2003 and 2011, 455 Estonians served in Iraq. Perhaps Estonia's most impressive deployment has been to Afghanistan: More than 2,000 Estonian troops were deployed between 2003 and 2014, and they 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.⁴⁵⁵ The number of Estonian conscripts will increase from 3,200 to 4,000 by 2026.⁴⁵⁶

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. Estonia is acquiring a total of 18 South Korean-built K9 self-propelled howitzers at a total cost of €66 million.⁴⁵⁷ It received the first units in October 2020, and the remaining units are scheduled to arrive by 2023.⁴⁵⁸ Estonia has prioritized anti-tank weapons and took

delivery of 128 Javelins from the United States in February 2020.⁴⁵⁹

In October 2020, Estonia withdrew from a joint armored vehicle development program with Latvia and Finland for financial reasons, putting off new armored vehicle acquisition until the end of the decade.⁴⁶⁰ In 2019, it received two C-145A tactical transport aircraft donated by the U.S.⁴⁶¹ In July 2019, Estonia signed a \$24 million deal to purchase 16,000 rifles from an American arms company, allowing the nation to phase out older Soviet and Israeli weapons.⁴⁶² Estonia has earmarked €46 million for mines and short-range to medium-range coastal defenses and has indicated an interest in joint procurement with Latvia.⁴⁶³

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."⁴⁶⁴ In addition, Estonia's cyber command became operational in August 2018 and is expected to include 300 people when it reaches full operational capability in 2023.⁴⁶⁵ U.S. and Estonian cyber commands train together. In the fall of 2020, for example, they trained in Estonia to help search for and block incoming cyber threats from Russia.⁴⁶⁶

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.⁴⁶⁷ Estonian forces have participated in a number of operations including 45 soldiers in Resolute Support before its end,⁴⁶⁸ a vessel as part of the Standing NATO Mine Countermeasures Group One,⁴⁶⁹ about 95 troops in the French-led Operation Barkhane in Mali,⁴⁷⁰ and a Special Forces contribution to France's Task Force Takuba in the Sahel, which began in the latter half of 2020.⁴⁷¹ Estonian troops also take part in the U.S.-led Operation Inherent Resolve in Iraq along with NATO Mission Iraq.⁴⁷²

Latvia. Latvia's recent military experience also has been centered on operations in Iraq and Afghanistan with NATO and U.S. forces.

Latvia deployed more than 3,000 troops to Afghanistan and between 2003 and 2008 deployed 1,165 troops to Iraq. In addition, it has contributed to a number of other international peacekeeping and military missions. A recent analysis notes that “Latvia has no requirement and therefore no capacity to independently deploy and sustain forces beyond its national boundaries, although the armed forces have taken part in a range of NATO and EU missions.”⁴⁷³

Today, despite a military that consists of only 6,250 full-time servicemembers,⁴⁷⁴ Latvia contributes to operations abroad. It deployed troops to NATO’s Resolute Support Mission until the mission’s completion⁴⁷⁵ and participates in Operation Inherent Resolve in Iraq, where the mandate for Latvian soldiers taking part runs until February 2022,⁴⁷⁶ and NATO’s VJTF⁴⁷⁷ as well as a number of EU flagged missions.

Latvia’s National Defence Concept 2020–2024 states that “the National Guard must reach at least 10,000-men mark by 2024.”⁴⁷⁸ Latvia “is investing \$56 million annually through 2022 on military infrastructure, with two-thirds of this amount being spent to upgrade Ādaži military base, headquarters of the Canadian-led EFP battlegroup.”⁴⁷⁹

In 2020, Latvia spent 2.27 percent of GDP on defense and 26.0 percent of its defense budget on equipment, exceeding both NATO benchmarks.⁴⁸⁰ In February 2019, Latvia purchased four UH-60M Black Hawk helicopters from the United States.⁴⁸¹

In 2018, Latvia signed a \$133 million agreement to purchase Spike precision-guided tactical missiles, the first of which were delivered in February 2020.⁴⁸² A new team trainer for the missiles was installed in October 2020.⁴⁸³ Latvia has also expressed interest in procuring a medium-range ground-based air-defense system (GBADS). Joint procurements include Carl Gustav M-4 anti-tank rifles with Estonia in 2020 and armored vehicles with Finland, which is slated to begin manufacturing in 2021.⁴⁸⁴

Lithuania. Lithuania is the largest of the three Baltic States, and its armed forces total

22,000 active-duty troops.⁴⁸⁵ It reintroduced conscription in 2015 and lowered the age for compulsory service in December 2019.⁴⁸⁶

Lithuania has shown a 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 served in Afghanistan. Lithuania continues to contribute to NATO’s KFOR and contributed to its Resolute Support Mission until the alliance’s withdrawal of forces.

In 2020, Lithuania spent 2.13 percent of GDP on defense and 26.2 percent of its defense budget on equipment.⁴⁸⁷ In April 2019, the U.S. and Lithuania signed a five-year “roadmap” defense agreement.⁴⁸⁸ 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.”⁴⁸⁹ A new “Mobilisation and Host Nation Support law” took effect in January 2021.⁴⁹⁰

In November 2020, Lithuania signed a \$213 million deal to purchase four UH-60M Black Hawk helicopters, beginning in late 2024.⁴⁹¹ The U.S. is contributing approximately \$30 million to help in the acquisition.⁴⁹² In October 2020, Lithuania received a Norwegian-made NASAMS mid-range air defense system armed with U.S.-made missiles.⁴⁹³ Lithuania plans to spend an additional \$104 million through 2030 to purchase Javelin anti-tank weapons to supplement the 124 that it already has.⁴⁹⁴ Additional procurements include Boxer Infantry Fighting Vehicles and €145 million for 200 U.S. made Oshkosh Joint Light Tactical Vehicles.⁴⁹⁵

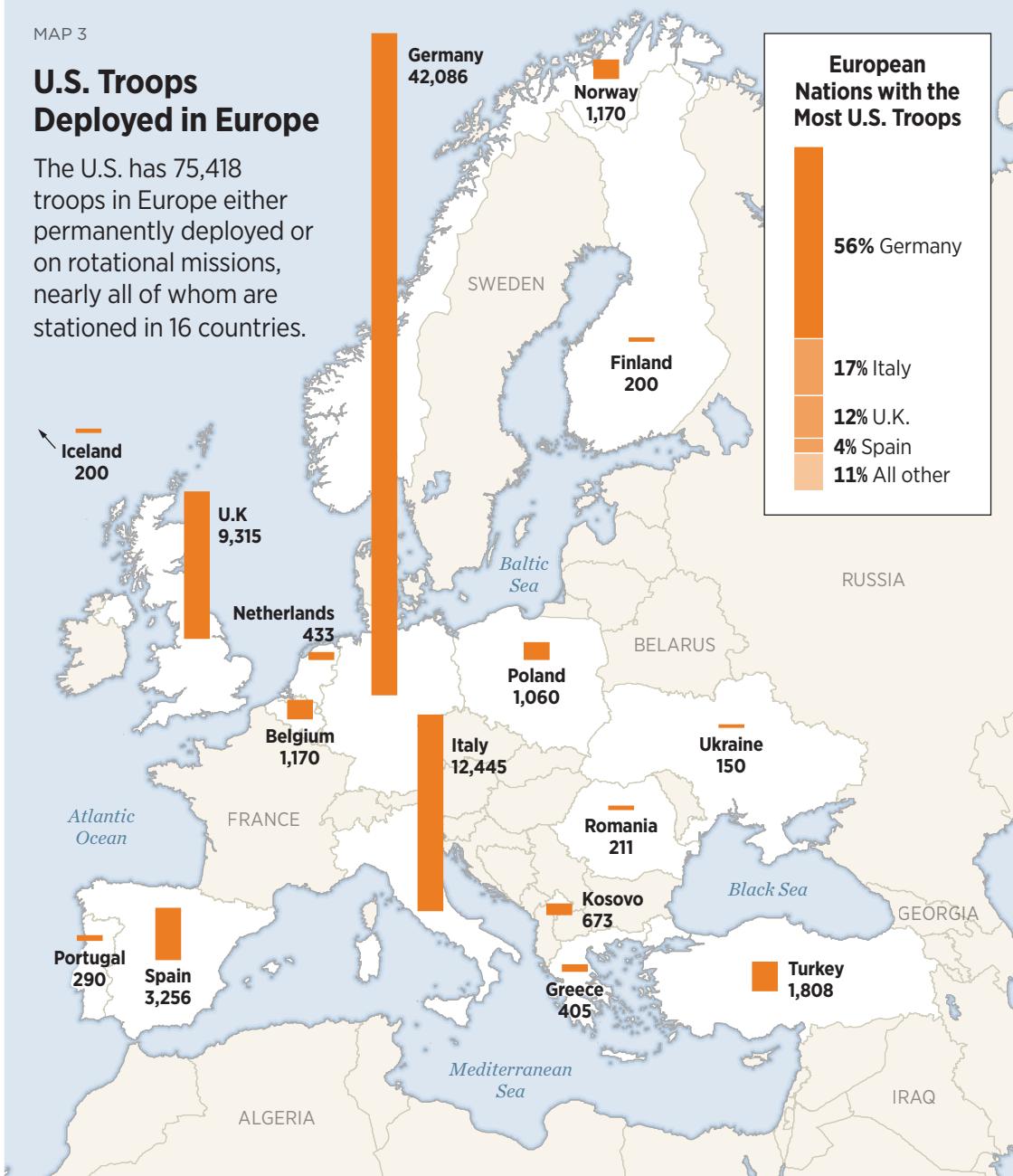
Current U.S. Military Presence in Europe

At its peak in 1953, because of the Soviet threat to Western Europe, 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

MAP 3

U.S. Troops Deployed in Europe

The U.S. has 75,418 troops in Europe either permanently deployed or on rotational missions, nearly all of whom are stationed in 16 countries.



NOTES:

- **Germany.** Rotational troops as part of Operation Atlantic Resolve are often deployed further forward to Bulgaria, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, and Slovakia.
- **Norway.** About 1,000 rotational troops were deployed from January to April 2021 for cold-weather training, on what is becoming a consistent winter deployment.
- **Kosovo.** Nearly all U.S. forces are part of NATO's Kosovo Force.
- **Romania.** Rotational forces have deployed from permanent bases in Italy.
- **Iceland.** Nearly all of these forces are temporarily deployed from permanent bases in the United Kingdom and taking part in Icelandic Air Policing.

SOURCE: Heritage Foundation research.

 heritage.org

peace dividend following the end of the Cold War, U.S. troop numbers in Europe were slashed. Today, fewer than 66,000 active-duty forces are permanently stationed in Europe.⁴⁹⁶

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 and Africa [USAREUR-AF]; U.S. Air Forces in Europe [USAFE]; 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. 6th 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.⁴⁹⁷ In February 2020, General Wolters highlighted the importance of CSG deployments: "In the maritime domain, 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."⁴⁹⁸

U.S. Army Europe and Africa. In November 2020, U.S. Army Europe and U.S. Army Africa were consolidated into U.S. Army Europe and Africa (USAREUR-AF), headquartered in Wiesbaden, Germany.⁴⁹⁹ According to USAREUR-AF, "The consolidation of these two Army service component commands under one four-star commander will play a vital role in supporting missions across two interconnected theaters of operation" and will "enhance efficiency by streamlining the headquarters' ability to execute functions and improving global and regional contingency response efforts."⁵⁰⁰

The former USAREUR was established in 1952. Then, as today, the U.S. Army formed the bulk of U.S. forces in Europe. USAREUR-AF includes "approximately 73,000 U.S. Army personnel assigned and deployed throughout Europe and Africa."⁵⁰¹ Permanently deployed forces include the 2nd Cavalry Regiment, based in Vilseck, Germany, 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. In addition:

Operational and theater enablers such as the 21st Theater Sustainment Command, 10th Army Air and Missile Defense Command, 7th Army Training Command, 79th Theater Sustainment Command, 66th and 207th Military Intelligence Brigades, 2nd Theater Signal Brigade, U.S. Army NATO Brigade, Installation Management Command-Europe and Regional Health Command-Europe provide essential skills and services that support our entire force.⁵⁰²

Reactivated in September 2019, the 1st Battalion, 6th Field Artillery, 41st Field Artillery Brigade is currently the only U.S. rocket artillery brigade in Europe and represents the first time in 13 years that USAREUR has had the Multiple Launch Rocket System in its command.⁵⁰³ A second field artillery battalion

was reactivated in the fall of 2020.⁵⁰⁴ The 5th Battalion, 4th Air Defense Artillery Regiment, was activated in November 2018 and is now based in Ansbach.⁵⁰⁵ The regiment will be the first in the Army to be fully operational with the Maneuver Short Range Air Defense system having already received four of the systems by the end of April 2021 and with more on the way.⁵⁰⁶ The U.S. Army in recent years has reinstated a number of snap deployments to Europe to hone readiness.⁵⁰⁷ Each year, USAREUR-AF takes part in more than 60 exercises with 80,000 multinational participants from 75 countries.⁵⁰⁸

U.S. Air Forces in Europe. USAFE 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. USAFE describes itself as “direct[ing] 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.”⁵⁰⁹

Headquartered at Ramstein Air Base, USAFE has seven main operating bases along with 114 geographically separated locations. 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.⁵¹⁰ Terrorist attacks against these installations remain a threat. In March and April 2020, five Tajik nationals who had come to Germany seeking refugee status were arrested for plotting terrorist attacks against U.S. Air Force bases and personnel on behalf of ISIS.⁵¹¹

Strategic bomber deployments continue periodically. In March 2021, U.S. B-1 and B-2 bombers flying from the U.S. deployed out of Orland Air Base in Norway and Lajes Field in Portugal, respectively.⁵¹² According to the U.S. Air Force, “Strategic bomber deployments to Europe provide theater familiarization for

aircrew members and demonstrate U.S. commitment to allies and partners.”⁵¹³

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 included 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 300 of the more than 1,500 Marines based in Europe are assigned to MARFOREUR.⁵¹⁴ 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,”⁵¹⁵ and the Norwegian government covers half of the costs of the prepositioned storage. The prepositioned stock’s proximity to the Arctic region is particularly important geopolitically. In October 2018, Marines used the prepositioned equipment in NATO’s Trident Juncture 18 exercise, the largest NATO exercise in 16 years, which included 50,000 troops from 31 nations.⁵¹⁶ The prepositioned stocks were to factor heavily into the cancelled Cold Response 2020 exercise.⁵¹⁷

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 “based in Moron, Spain, although it frequently operates from NATO bases throughout the Mediterranean, to include most often Sigonella, Sicily,”⁵¹⁸ and provides a response force of 850 Marines, six MV-22 Ospreys, and three KC-130s.⁵¹⁹ The SPMAGTF helped with embassy evacuations in Libya and South Sudan and conducts regular drills with embassies in the region and exercises with a host of African nations’ militaries.⁵²⁰

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, 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" in a move that is expected to take a few years.⁵²¹

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 and since June 2014 has maintained an almost continuous presence in the Baltic States and Poland in order to train special operations forces in those countries. A new special operations base in Latvia that opened in December 2020, for example, "includes a vehicle servicing facility, ammunition storage and two helipads for U.S. CV-22 aircraft from the United Kingdom-based 352nd Special Operations Wing," all of which "are designed to allow special operations forces to move rapidly in and out of the area and conduct maintenance."⁵²²

According to General Tod Wolters, SOF "provide invaluable contributions in sensing the operational environment, enhancing our ability to deter through enhanced indications and warnings."⁵²³ 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.⁵²⁴

Key Infrastructure and Warfighting Capabilities

One of the major advantages of having U.S. forces 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.⁵²⁵

Europe is a mature and advanced operating environment. Because of its decades-long presence in Europe, the U.S. benefits from tried and tested systems that involve moving large numbers of matériel and personnel into, within, 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 roads in Europe 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, both conventionally and unconventionally, but Chinese propaganda, influence operations, and investments in key sectors present a new threat that needs to be addressed. NATO and many European countries apart from those in the alliance have taken increased interest in the behavior and ambitions of both countries, although an agreed upon, collective way to address 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 continued increases in European allies' defense budgets and capability investments. 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, particularly with respect to Europe's relationship with China. NATO utilized a host of resources to assist with the response to COVID-19 while continuing to ensure that the pandemic did not enervate 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, ranging from "very poor" to "excellent" conditions and covering 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 in the region 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 provide insight into the strength or health of an alliance. These 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 such questions as 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 enhances 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 helps the U.S. to maintain

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

Nicole Robinson

Stategically 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 among religious extremists, are central to many of the region's current challenges. In some cases, these sectarian divides have persisted for 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 region's Arab countries.

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 lack of religious shrines, as the reason for the rapid spread of the virus in Iran.³ Sunni extremist organizations like 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 Although oil exporters Russia and Saudi Arabia eventually agreed to reduce production by 12 percent, the plummet in oil prices over 2020 caused significant shocks for exporters and importers. Saudi Arabia's economy—the largest in the region—shrank by 4.1 percent in 2020, with a 3.3 percent decline in oil output during the first quarter alone.⁸ This decline in oil production will cause long-term damage to importers who now face reduced foreign investment, remittances, tourism, and grants from exporters.⁹

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 largest importer of liquefied natural gas (LNG).¹⁰ 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 has had massive repercussions for the entire region, affecting economies and shaking political systems in the aftermath of the crisis. Over 2020, the regional economy experienced a 5 percent decline in GDP growth, with declines across the region fluctuating between 2 percent (Qatar) and almost 20 percent (Lebanon).¹¹ Recovery will likely take years, exacerbating tensions already present in many Middle East countries. For example, the pandemic has already added to Lebanon's political instability, fueling conflict between rival political factions competing to secure scarce medical resources for their supporters and aggravating tensions between Lebanese citizens and desperate refugees who have flooded in from neighboring Syria.¹²

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 of the region's countries,¹³ but 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 region's economic and political outlooks remain bleak. In some cases, self-interested elites have prioritized regime survival over real investment in human capital, aggravating the material deprivation of youth as unresolved issues of endemic corruption, high unemployment, and the rising cost of living have worsened. In response to this lack of progress, large-scale protests reemerged in 2019 in Lebanon, Iraq, Egypt, Sudan, Algeria, and other countries.¹⁴ Despite COVID-19 lockdowns and curfews, protests also resumed in Lebanon and Iraq in 2021.¹⁵ The protests in Lebanon and Iraq could even affect the operational environment for U.S. forces in the region.¹⁶

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),¹⁷ for example, Iran has exploited 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.¹⁸ A year later, in May 2019, Iran announced that it was withdrawing from certain aspects of the JCPOA.¹⁹ U.S. economic sanctions have been crippling Iran's economy as part of the former Trump Administration's "Maximum Pressure Campaign." The sanctions are meant to force changes in Iran's behavior, particularly with regard to its support for terrorist organizations and refusal to renounce a nascent nuclear weapons program.²⁰

While many of America's European allies publicly denounced the Trump 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.²¹ With the arrival of the Biden Administration in 2021, Iran has been mounting its own maximum-pressure campaign to force President Joseph Biden to lift sanctions and unconditionally return to the 2015 agreement. Indirect talks brokered by the European Union have been ongoing between U.S. and Iranian diplomats in Vienna since April 2021, but as of the time this study was being prepared, a deal had not been reached.²²

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, have 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 Donald Trump ordered an air strike that killed General Qassem Suleimani, leader of the Iranian Quds Force, and Abu Mahdi al-Muhandis, leader of the Iraqi Shia paramilitary group, both of whom had been responsible for carrying out attacks against U.S. personnel in Iraq. Suleimani's and Muhandis's deaths were a huge loss for Iran's regime and its Iraqi proxies. They also were a major operational and psychological victory for the United States.²³

In Afghanistan, Tehran's influence on some Shiite groups is such that thousands have volunteered to fight for Bashar al-Assad in Syria.²⁴ Iran also provided arms to the Taliban after it was ousted from power by a U.S.-led coalition²⁵ 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.²⁶ 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.²⁷

In Syria, the Assad regime's brutal repression of peaceful demonstrations early in 2011 ignited a fierce civil war that killed more than half a million people and created a major humanitarian crisis: according to the United Nations High Commissioner for Refugees, "13.4 million people in need of humanitarian and protection assistance in Syria"; "6.6 million Syrian refugees worldwide, of whom 5.6 million [are] hosted in countries near Syria" like Turkey, Lebanon, and Jordan; and "6.7 million internally displaced persons" within Syria.²⁸ The large refugee populations created by this civil war could become a source of recruits for extremist groups. For example, both the Islamist Hay'at Tahrir al-Sham, formerly known as the al-Qaeda-affiliated Jabhat Fateh al-Sham and before that as the al-Nusra Front, and the self-styled Islamic State (IS), formerly known as ISIS or ISIL and before that as al-Qaeda in Iraq, 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.²⁹

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.

At the end of 2020, the signing of the Abraham Accords caused a brief spark of hope. These U.S.-brokered agreements normalizing relations between Israel and the UAE and between Israel and Bahrain are important milestones in the diplomatic march toward a broader Arab-Israeli peace.³⁰ However, in May 2021, a real estate dispute in the East Jerusalem neighborhood of Sheikh Jarrah escalated into active conflict between Israel and Hamas. Violent riots intensified in the city of Jerusalem, and Hamas threatened to attack if Israel did not withdraw its police by the evening of May 10. When Israel ignored this ultimatum, Hamas unleashed a barrage of almost 4,300 rockets at Jerusalem and southern Israel according to the Israeli military. Israel's Iron Dome air defense system was able to stop most of these rockets. Following 11 days of fighting, a cease-fire brokered by Egypt was reached between Hamas and Israel. At least 243 people were killed in Gaza, and 12 people were killed in Israel.³¹

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): Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United

Arab Emirates. Because the historical and political circumstances that led to the creation of NATO have been largely 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.³² 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.³³ 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 UAE, 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.³⁴ All commercial land, air, and sea travel between Qatar and these nations was severed, and Qatari diplomats and citizens were evicted. In January 2021, Saudi Arabia, the UAE, Bahrain, and Egypt agreed to restore ties with Qatar during the 41st Gulf Cooperation Council Summit. Per the agreement, Saudi Arabia and its GCC allies lifted the economic and diplomatic blockade of Qatar, reopening their airspace, land, and sea borders. This diplomatic victory from Washington paves the way toward full reconciliation in the GCC and, at least potentially, a more united front in the Gulf.³⁵

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 (U.K.) and France—that are active in the region.

Military training is an important part of these relationships. These exercises are intended principally 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.³⁶ 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.³⁷ On January 28, 2020, President Trump unveiled his Israeli-Palestinian peace proposal.³⁸ The plan accorded Israeli security needs a high priority, recognized Israel's vital interest in retaining control of the border with Jordan, and cleared the way for U.S. recognition of Israeli sovereignty over many settlements and Jewish holy sites in the disputed territory of the West Bank.³⁹

So far, the Biden Administration has shown little interest in taking an active role in Israeli-Palestinian peace negotiations. However, if the conflict between the two sides continues to escalate, President Biden may be pressured to become more involved.

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 approximately 2 million Muslims participate in the annual Hajj pilgrimage to the holy city of Mecca. Riyadh has been a key partner in efforts to counter the influence of 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 GCC's member countries are located close to the Arab-Persian fault line and are therefore strategically important to the U.S.⁴⁰ 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.

GCC 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 problem.

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 six Arab countries that maintain diplomatic relations with Israel (the others are Jordan, Bahrain, the UAE, Sudan, and Morocco), 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 difficult 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 detentions followed in a massive crackdown.⁴¹ 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. Saudi Arabia is by far the region's largest military spender in terms of budget size. As a percentage of GDP, Oman leads the way, spending 11 percent on defense, followed by Saudi Arabia at 8.4 percent in 2020, the most recent year for which data are available.⁴²

Historically, figures on defense spending for the Middle East have been very unreliable, and the lack of data has worsened. For 2020, there were no available data for Qatar, Syria, the United Arab Emirates, and Yemen according to the Stockholm International Peace Research Institute.⁴³

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 threat to its existence is now an Iranian regime that has called for Israel to be “wiped off the map.”⁴⁴ 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.⁴⁵ 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 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 resulting “arms race” could threaten Israel’s qualitative military effectiveness (QME). Iran is steadily improving its missile capabilities and, due to the expiration of the U.N. conventional arms embargo in October 2020, now has access to the global arms trade.⁴⁶ In response, other Arab countries are procuring and upgrading their weapons capability while establishing officer training programs to improve military effectiveness.⁴⁷

Israel funds its military sector heavily and has a strong national industrial capacity that is 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.⁴⁸ 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.⁴⁹

In 2010, Israel signed a \$2.7 billion deal with the U.S. to acquire about 20 F-35I “Adir” Lightning fighter jets, a heavily modified version of the Lockheed Martin F-35 stealth fighter.⁵⁰ In the 2021 conflict with Hamas, these jets were deployed in a major combat operation that targeted dozens of Hamas rocket launch tubes in northern Gaza.⁵¹

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 GCC countries. 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 its 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

450 U.S.-made M1A2s. Its air force is built around American-built and British-built aircraft and consists of more than 443 combat-capable aircraft that include F-15s, Tornados, and Typhoons.⁵²

In fact, air power is the strong suit of most GCC members. Oman, for example, 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.⁵³ Qatar operates French-made Mirage fighters and is buying 24 Typhoons from the U.K.⁵⁴

In November 2020, the U.S. State Department notified Congress that it had approved the sale of a \$23.4 billion defense package of F-35A Joint Strike Fighters, armed drones, munitions, and associated equipment to the UAE. After a temporary freeze on arm sales by the Biden Administration, the sale moved forward in April 2021.⁵⁵ The sale is somewhat controversial, however, because of Israeli concerns about other regional powers also possessing the most modern combat aircraft, potentially challenging an important Israeli advantage.

Middle Eastern countries have shown a willingness to use their military capability under certain and limited circumstances. The navies of GCC member countries 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.⁵⁶ 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. To varying degrees, all six GCC members also joined the U.S.-led anti-ISIS coalition, with the UAE contributing the most in terms of air power.⁵⁷ 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.⁵⁸ 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.⁵⁹ 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.⁶⁰

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. Although 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 on border and internal security in recent years.

Considering Jordan's size, its conventional capability is significant. Jordan's ground forces total 86,000 soldiers and include 182 British-made Challenger 1 tanks and four French-made Leclerc tanks. Forty-seven F-16 Fighting Falcons form the backbone of its air force,⁶¹ 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.⁶² 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.⁶³ It is unclear whether Prime Minister Mustafa al-Kadhimi will follow the same model, but both Iranian Foreign Minister Mohammad Javad Zarif and the United States have welcomed the appointment.⁶⁴

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 undermine the effectiveness of Iraq’s armed forces. In June 2014, for example, the collapse of as many as four divisions that were routed by vastly smaller numbers of Islamic State fighters led to the fall of Mosul.⁶⁵ 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, 2017.⁶⁶

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,⁶⁷ 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 1983.⁶⁸

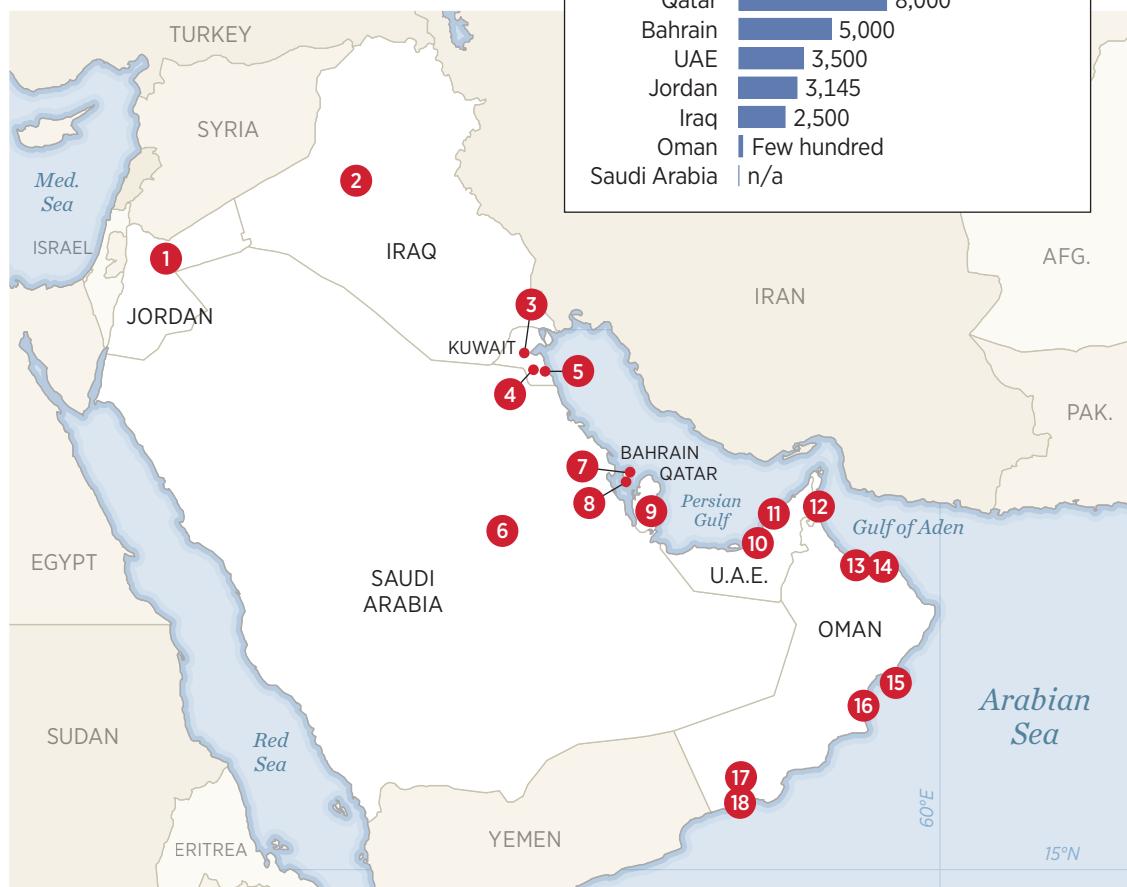
Until the late 1980s, America’s “regional strategy still largely focused on the potential threat of a massive Soviet invasion of Iran.”⁶⁹ After the collapse of the Soviet Union, Saddam Hussein’s Iraqi regime became the chief threat to regional stability. Iraq invaded Kuwait in August 1990, and the United 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 737,000.⁷⁰ 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 192,000,⁷¹ 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 150,000.⁷²

In December 2011, the U.S. officially completed its withdrawal of troops, leaving only 150 personnel attached to the U.S. embassy in Iraq.⁷³ 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 to 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.”⁷⁴ According to U.S. Central Command, U.S. force levels in Iraq declined from 5,200 to 3,000 in August 2020, and in November 2020,

MAP 4

U.S. Access to Bases and Facilities in the Middle East



JORDAN

- 1 Muwaffaq Salti Airbase

IRAQ

- 2 al-Asad Air Base

KUWAIT

- 3 Ali al-Salem Air Base
- 4 Ahmad al-Jabir Air Base
- 5 Camp Arifjan

SAUDI ARABIA

- 6 Eskan Village Air Base

BAHRAIN

- 7 Khalifa bin Salman Port
- 8 Shaykh Isa Air Base

QATAR

- 9 Al Udeid Air Base

UNITED ARAB EMIRATES

- 10 Al-Dhafra Air Base
- 11 Jebel Ali Port
- 12 Fujairah Naval Base

OMAN

- 13 Musnannah Air Base
- 14 Muscat International Airport
- 15 RAFO Masirah
- 16 Al Duqm Port
- 17 RAFO Thumrait
- 18 Salah Port

SOURCE: Heritage Foundation research.

 heritage.org

“President Trump directed a further drawdown to 2,500 by January 2021.”⁷⁵

The U.S. also 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 2020.⁷⁶ The decision perhaps indicated a shifting strategy to counter Iran or an assessment by U.S. officials of a reduced risk as Iran continued to mitigate the economic and political effects of COVID-19.

As of early 2020, “approximately 14,000 U.S. military personnel had been added to a baseline of more than 60,000 U.S. forces in and around the Persian Gulf...and those in Iraq and Afghanistan.”⁷⁷ Although their exact disposition is hard to triangulate because of the fluctuating nature of U.S. military operations in the region,⁷⁸ information gleaned from open sources reveals the following:

- **Kuwait.** More than 13,500 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.⁷⁹
 - **UAE.** About 3,500 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. In addition, the United States 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.⁸⁰
- **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 a few hundred, mostly from the U.S. Air Force. According to the Congressional Research Service, “the United States reportedly has access to 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.⁸¹
- **Bahrain.** Approximately 5,000 U.S. military personnel are based in Bahrain. Because Bahrain is home to Naval Support Activity Bahrain and the U.S. Fifth Fleet, 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.⁸²
- **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. Department of Defense 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.⁸³ 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 had been deployed during the troop buildup.⁸⁴ 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.⁸⁵

- **Qatar.** More than 8,000 U.S. personnel, mainly from the U.S. Air Force, are deployed in Qatar.⁸⁶ 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.”⁸⁷ 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 3,145 U.S. military personnel are deployed to Jordan to support Defeat-ISIS operations, enhance Jordan’s security, and promote regional stability.”⁸⁸

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.”⁸⁹ 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 USCENTCOM’s maritime component. 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 that encompasses approximately 2.5 million square miles of water.

- **U.S. Army Forces Central Command.**

USARCENT is USCENTCOM’s land component. Based in Kuwait, it 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 USCENTCOM’s air component. Based in Qatar, it 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 USCENTCOM’s designated Marine Corps service component. Based in Bahrain, it is responsible for all Marine Corps forces in the region.

- **U.S. Special Operations Command**

Central. SOCSENT is a subordinate unified command under USCENTCOM.

Based in Qatar, it 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.

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.⁹⁰

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. In addition, there generally are frigates or destroyers in the Gulf or Arabian Sea performing maritime security duties,⁹¹ and 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.⁹² 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.⁹³

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 it is expected that they 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.⁹⁴ 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.⁹⁵ The French have 700 personnel based in the UAE, along with eight Rafale jets, as well as military operations in Kuwait and Qatar.⁹⁶ 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 because of the impact of COVID-19.⁹⁷ However, as of February 2021, the French Armed Forces had resumed their operations. France has 650 troops stationed in the UAE, 600 stationed in Syria and Iraq, and 700 stationed in Lebanon.⁹⁸ The U.K. temporarily redeployed troops back to the U.K. as a result of COVID-19 but announced in February 2021 that the 500 troops would be sent back alongside an additional 3,500 extra troops to boost its counterterrorism training mission in Iraq.⁹⁹ Additional troops will help to prevent the IS from returning and manage threats from Iran-backed militias more effectively.

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.¹⁰⁰ 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 as many as 4,000 personnel and is the only permanent U.S. military base in Africa.¹⁰¹

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.¹⁰²

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, including 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."¹⁰³

The condition of the region's roads varies from country to country. The most recent available data reflect that 100 percent of the roads in Israel, Jordan, and the UAE are paved. Other nations—for example, Oman (49.3 percent); Saudi Arabia (21.5 percent); and Yemen (8.7 percent)—have poor paved road coverage.¹⁰⁴ 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 a particular air base is available to the U.S. today, however, does not necessarily mean that it will be 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.¹⁰⁵ The UAE's commercial port of Jebel Ali is open for visits from U.S. warships and the prepositioning of equipment for operations in theater.¹⁰⁶ 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."¹⁰⁷ 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 Effect of the Suez Canal Blockage on the U.S. Navy

Suez Canal operations were suspended March 23–29 due to the grounding of a container ship, which created a 360-ship traffic jam. The *Eisenhower* Carrier Strike Group (CSG) transited the canal April 2 and arrived on station in the Arabian Sea 10 days later. If the *Eisenhower* CSG had had to circumnavigate Africa, the trip would have taken about three weeks.



SOURCE: U.S. Naval Institute News, “USNI News Fleet and Marine Tracker,” <https://news.usni.org/category/fleet-tracker> (accessed August 19, 2021).

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- **The Suez Canal.** In 2020, more than 19,000 ships transited the Suez Canal, averaging 51.5 ships each day.¹⁰⁸ 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 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.¹⁰⁹

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.¹¹⁰ These security protocols, however, are not foolproof. In April 2021, the Suez Canal was closed for over 11 days after a container ship blocked the waterway, creating a 360-ship traffic jam that disrupted almost 13 percent of global maritime traffic. This crisis proves that ever-larger container

ships transiting strategic choke points are prone to accidents that can lead to massive disruptions of both global maritime trade and U.S. maritime security.¹¹¹

- **Strait of Hormuz.** According to the U.S. Energy Information Administration, the Strait of Hormuz, which links the Persian Gulf with the Arabian Sea and the Gulf of Oman, “is the world’s most important oil chokepoint because of the large volumes of oil that flow through the strait. In 2018, its daily oil flow averaged 21 million barrels per day (b/d), or the equivalent of about 21% of global petroleum liquids consumption.” In addition, “China, India, Japan, South Korea, and Singapore were the largest destinations for crude oil moving through the Strait of Hormuz to Asia, accounting for 65% of all Hormuz crude oil and condensate flows in 2018.”¹¹² Given the extreme narrowness of the passage and its proximity to Iran, shipping routes through the Strait of Hormuz are particularly vulnerable to disruption. Iran attacked oil tankers repeatedly in May and June 2019 and continues to harass U.S. naval ships.¹¹³

- **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.¹¹⁴

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 since 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.¹¹⁵ Although the regional dispute with Qatar is now resolved, U.S. relations in the region will remain complex and difficult to manage, although this 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 has already exacerbated 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 the tried-and-tested procedures needed to operate 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 that are regularly attended by officers (and often royals) from the Middle East provide an opportunity for 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 helps the U.S. to remain familiar with its characteristics and the various actors that might either support or try to 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.¹¹⁶

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 America’s 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

Jeff Smith, Dean Cheng, Bruce Klingner, and Walter Lohman

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 235 years since then, the United States has held to the strategic assumption that allowing any single nation to dominate Asia would be inimical to American interests. Asia is too important a market and 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 2021, seven of America's top 15 trading partners were found in Asia:

- China (third);
- Japan (fourth);
- South Korea (sixth);
- Vietnam (eighth);

- India (ninth);
- Taiwan (11th); and
- Malaysia (14th).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 2020, for example, has wreaked havoc on the global economy, disrupting supply chains and defense budgets across the region, and has led to the cancellation of several series of military exercises.

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 Kurils (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 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 Asian equivalent of NATO 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 groupings like 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 U.S.–Japan–Australia–India quadrilateral security dialogue popularly known as “the Quad.”

Nor is Asia undergirded by any significant economic architecture. 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 same 5.56 mm

ammunition; they also field F-15 and F-16 combat aircraft and employ LINK-16 data links among their naval forces. 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. Partners like India and Australia operate American-made P-8 maritime surveillance aircraft and C-17 transport aircraft.

Consequently, in the event of conflict, the region’s various air, naval, and even land forces would 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. In addition, “enabling” military agreements allow the United States and several of its regional partners to access each other’s military facilities, share intelligence and encrypted communications and equipment, and refuel 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 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. In 2021, the leaders of the four nations held a virtual summit, marking a new level of interaction.

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, provides for a deep alliance between two of the world's largest economies and most sophisticated military establishments. 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 was 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 that enables 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 its 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 America's 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 (DOD) 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 with which 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

During bilateral Special Measures Agreement negotiations, the Trump Administration sought a 400 percent increase in Japanese contributions for renumeration above the cost of stationing U.S. troops in Japan. In April 2021, the Biden Administration signed a one-year extension of the existing agreement, freezing Japanese contributions at the current level, to allow for continued negotiations.

The United States has long 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 Seoul then 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 to support U.N. forces in Korea. In concrete terms, however, it oversaw only 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 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 announced unilaterally that he was cancelling major bilateral military exercises because he thought they were provocative and expensive.⁹ This decision was made without consulting the DOD, U.S. Forces Korea, or allies South Korea and Japan. During the next two years, the U.S. and South Korea cancelled numerous exercises and imposed constraints on additional exercises.

North Korea did not reciprocate with any diplomatic gesture or military constraints in response to the unilateral U.S. concession. 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.

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 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 and threatened to reduce or remove U.S. forces from South Korea. In April 2021, the Biden Administration signed an agreement accepting an incremental increase in Seoul's contribution in line with previous agreements, defusing tensions within the alliance.

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.¹⁰

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. 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, thereby 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,¹¹ and these advisers remain there as part of a continuing advise-and-assist mission. The operation's final quarterly report describes its activities:

Through ISR support, U.S. forces aim to facilitate AFP and Philippines National Police (PNP) ground operations in areas with high concentrations of terrorist targets. This included helping the AFP develop six target packages. Of these,

the AFP took action against four targets on Mindanao and in the Sulu archipelago. U.S. military personnel conducted two advise and assist missions to help clear violent extremists in western Mindanao this quarter, conducted four subject matter exchanges, and assisted two local medical staffs with patient assessments and transfers, according to U.S. Special Operations Command-Pacific (SOCPAC).¹²

This on-the-ground assistance and other U.S. military activity have continued even though the future legal basis for the U.S. presence is uncertain. The Visiting Forces Agreement (VFA) that serves to operationalize the alliance was extended indefinitely in July 2021 with the retraction of the termination notice that President Duterte first issued in February 2000. It had been renewed on a six-month rolling basis. The VFA is now on stronger footing. It remains controversial in the Philippines, however, and could re-emerge as a political issue. 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 approximately 280 U.S.–Philippine annual exercises. If it is terminated as scheduled, 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, but not as many as it does with the Philippines. 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 2014 U.S.–Philippine Enhanced Defense Cooperation Agreement (EDCA), and it will complicate situations in which the U.S. must respond quickly in collaboration 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—for example, by China—would be covered under the MDT treaty.¹³ This makes it incumbent on the U.S., consistent with its constitutional procedures, to come to the defense of the Philippines. U.S. Secretary of State Antony Blinken has made this commitment explicit in two separate calls with the Philippine Secretary of Foreign Affairs.¹⁴ Termination of the VFA will make this more difficult at a time of increasing Chinese pressure on claims and territories under the jurisdiction of the Philippines in the South China Sea.

The history of U.S.–Philippines defense ties illustrates both Philippine vulnerability and the relationship’s resilience. In fact, the U.S. and the Philippines continue to work productively through political difficulties in their relationship. Termination of the VFA would be a setback to that effort, but both the long history of U.S.–Philippines collaboration and the vagaries of domestic politics offer hope for a solution that will continue to facilitate close military cooperation between the two countries.

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.¹⁵ These were supplemented by the 2012 Joint Vision Statement for the Thai–U.S. Defense Alliance.¹⁶ In addition, Thailand gained improved access to American arms sales in 2003 when it was designated a “major, non-NATO ally.”

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, initiated in 1982. This builds on a partnership that began with the dispatch of Thai forces to the Korean War, during which more than 1,200 Thai troops died out of some 6,000 deployed. The Cobra Gold exercise is the world's longest-running international military exercise in the world,¹⁷ and one of its largest. The 39th iteration, conducted in 2020, was the biggest to date,¹⁸ and involved close to 10,000 troops from seven countries, including 5,400 U.S. troops, 64 U.S. aircraft, two U.S. ships, and (for the first time) the new F-35B.¹⁹

In contrast to the close relations between their militaries, U.S.–Thailand political relations have been strained since 2006. A coup that year and another in 2014 limited military-to-military relations for more than 10 years. This was due partly to standing U.S. law prohibiting assistance to governments that result from coups against democratically elected governments and partly 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 and now look to normalize relations. This has been made possible by two developments: first, elections in 2019 that led to a new civilian government and, second, Washington's new strategic focus on great-power competition with China. As a result, during the Trump Administration, the U.S. accepted the flawed Thai electoral model as an opportunity to boost the relationship. After the new Thai government was installed in July 2019, the Trump Administration moved forward with at least \$575 million in new arms sales, including 60 Stryker armored vehicles (with more to come) and four Black Hawk helicopters,²⁰ as well as hellfire missiles and other munitions, launchers, and equipment.²¹

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 builds on the 2012 version. It is a messaging document intended to stress the relevancy of

the military alliance, the founding documents of which can seem anachronistic when read alone. There are some indications that the Biden Administration may not share this priority,²² particularly in light of a re-energized democracy movement and the government's repression of it.

Geopolitically, amid uncertainty in the U.S. disposition, Thailand has been drifting from the U.S. and toward China. 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 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 concern.

Relations between the Thai and Chinese militaries have improved steadily 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 2015.²³ The Thais conduct more bilateral exercises with the Chinese than any other military in Southeast Asia.²⁴

The Thais also have been buying Chinese military equipment for many years. Purchases in recent years have included significant buys of battle tanks and armored personnel carriers.²⁵ According to the Stockholm International Peace Research Institute (SIPRI), from 2006–2020, China has been a bigger supplier than the U.S., behind only Sweden.²⁶ Among its latest purchases, the acquisition of three submarines is currently stalled at just one by a combination of budget restraints, the priority of COVID-19 response, and public protest.²⁷ 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 they 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 of Australian security were codified in the Australia–New Zealand–U.S. (ANZUS) pact of 1951.

The U.S. is now into its 10th deployment of Marine Rotational Force-Darwin, a set of annual exercises carried out in northern Australia’s six-month dry season. Having reached its intended size of 2,500 Marines, it was scaled back in 2020 due to COVID-19 disruptions. In 2021, it was back to nearly full force. Approximately 2,200 Marines took part. Assets involved included “a tilt-rotor MV-22 Osprey squadron, a detachment of UH-1Y Venom utility and AH-1Z Viper attack helicopters, and a detachment of RQ-21A Blackjack drones.”²⁸ In April 2021, the Australian government announced plans to upgrade bases and training areas used by the U.S. rotational forces.²⁹

The annual Marine rotation goes hand-in-hand with another recent alliance initiative, the Enhanced Air Cooperation, which involves the U.S. Air Force and also operates out of northern Australia.³⁰ Both take place in the context of a wide range of other combined activity that helps to integrate U.S. and Australian forces. These include the massive biannual Talisman Sabre exercises, which involved 34,000 American and Australian troops in 2019,³¹ and the presence of “approximately 580 Defence personnel in the United States, spread across 31 states, and the District of Columbia,” the majority of whom “are embedded into the US military.”³²

The two nations’ chief defense and foreign policy officials meet annually (most recently in August 2020) 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 also has 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-allied partner in the Western Pacific. The agreements that 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 principal logistics support node for the U.S. Seventh Fleet.

Singapore trains “approximately 1,000 military personnel in the United States each year” on such American-produced equipment as F-15SG and F-16C/D fighter aircraft and CH-47 Chinook and AH-64 Apache helicopters.³⁷ Along with American allies Australia, Japan, and South Korea, Singapore also has ordered

and been approved to buy the F-35.³⁸ Like others of its assets, the F-35s will be housed at training facilities in the U.S.³⁹ and perhaps on Guam under an agreement reached in 2019.⁴⁰

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, however, 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 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.⁴¹ As part of this warming of relations, New Zealand rejoined the multinational U.S.-led RIMPAC (Rim of the Pacific) naval exercise 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.⁴² At the time of the visit in November 2016, both sides claimed to have satisfied their respective legal requirements.⁴³ 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 November 2016 visit occurred in a unique context, including an international naval review and relief response to the Kaikoura earthquake. 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.

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, 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.”⁴⁴ 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.”⁴⁵ 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.”⁴⁶ 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.⁴⁷

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 consultations with the PRC on arms sales to Taiwan;*
3. *will not play any mediation role between 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.*⁴⁸

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. However, with the 2018 Taiwan Travel Act and successive NDAAAs, Congress has sent 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. On a region-wide basis, the U.S. has two major ongoing defense-related initiatives to expand its relationships and diversify the geographical spread of its forces. The Maritime Security Initiative is intended to improve the security capacity of U.S. partners, and the Pacific Deterrence Initiative (PDI) bolsters America’s military presence and makes it more accountable.

Among the most important of the bilateral partnerships in this effort, beyond those listed above, are Vietnam, Malaysia, and Indonesia. None of these relationships is as extensive and formal as America’s relationship with Singapore, India, and U.S. treaty allies, but all are of growing significance.

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. In 2015, the MOU was updated with the Joint Vision Statement on Defense Cooperation, which includes a reference to “cooperation in the production of new technologies and equipment” and was implemented under a three-year 2018–2020 Plan of Action for United States–Viet Nam Defense Cooperation that was agreed upon in 2017.⁴⁹

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 provision under the Excess Defense Articles (EDA) program of two decommissioned *Hamilton*-class cutters and 24 Metal Shark patrol boats as well as infrastructure support.⁵⁰ By 2022, Vietnam is scheduled to take delivery of six unmanned Boeing-made Scan Eagle aerial vehicles (UAVs) for its Coast Guard.⁵¹ The U.S. is also providing T-6 turboprop trainer aircraft.⁵² Agreement has yet to be reached with respect to sales of bigger-ticket items like refurbished P-3 maritime patrol aircraft, although they have been discussed.

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 This is a sensitive issue for Vietnam and is not often referenced publicly, but it was emphasized during Vietnamese Prime Minister Nguyen Xuan Phuc's visit to Washington in 2017 and again during Secretary of Defense James Mattis's visit to Vietnam in 2018. In the same year, Vietnam participated in RIMPAC for the first time. In 2020, it did not participate in a scaled-down COVID-year version of the exercise.⁵⁴

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 underscored very subtly in Vietnam's *2019 Viet Nam National Defence* white paper.⁵⁵

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.”⁵⁶ 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 continued on a positive trajectory under the Trump Administration. In addition to counterterrorism cooperation, the U.S. is focused on helping Malaysia to ensure maritime domain awareness. In 2020, then-Deputy Assistant Secretary of Defense for South and Southeast Asia Reed B. Werner summarized recent U.S. assistance in this area:

[M]aritime domain awareness is important for Malaysia, given where it sits geographically. Since 2017, we have provided nearly US\$200 million (RM853 million) in grant assistance to the Malaysian Armed Forces to enhance maritime domain awareness, and that includes ScanEagle unmanned aerial vehicles (UAV), maritime surveillance upgrades, and long-range air defence radar.⁵⁷

The upgrading of its F-18 fleet is the most significant U.S. defense program currently underway with Malaysia.⁵⁸

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 reform Indonesia’s strategic defense planning processes.

U.S.–Indonesia military cooperation is governed by two agreements, the 2010 Framework Arrangement on Cooperative Activities in the Field of Defense and the 2015 Joint Statement on Comprehensive Defense Cooperation,⁵⁹ as well as the 2010 Comprehensive Partnership. These agreements have encompassed “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.”⁶⁰

The agreements also frame multiple arms transfers. According to the U.S. Department of State, “[t]he United States has \$1.88 billion in active government-to-government sales cases with Indonesia under the Foreign Military Sales (FMS) system.”⁶¹ Perhaps 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. The U.S. government also remains involved in talks with Indonesia to fill its need for new fighter jets.⁶²

The U.S. and Indonesia also have signed two of the four foundational information-sharing agreements that the U.S. maintains with its closest partners: the General Security of Military Information Agreement (GSOMIA) and Communications Interoperability and Security Memorandum of Agreement (CISMOA).

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).⁶³ 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 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 conflict and encourage the group to negotiate with the Afghan government. In February 2020, Ambassador Khalilzad and Taliban co-founder and chief negotiator Abdul Ghani Baradar signed a tentative peace agreement in which the Taliban agreed that it will not allow al-Qaeda or any other transnational terrorist group to use Afghan soil. It also agreed not to attack U.S. forces as long as they provided and remained committed to a withdrawal timeline, eventually set at May 2021. One of the main objectives of this interim agreement was to jump-start intra-Afghan negotiations between the Taliban and the Afghan government.

Intra-Afghan talks did take place but were hampered by continued Taliban attacks on Afghan forces, domestic political turmoil in

Afghanistan following the 2019 presidential elections, disagreements between the Afghan government and the Taliban regarding prisoner exchanges, and the COVID-19 global pandemic.

In April 2021, President Joseph Biden announced that the U.S. would be withdrawing its remaining 2,500 soldiers from Afghanistan by September 11, 2021, remarking that America's "reasons for remaining in Afghanistan are becoming increasingly unclear."⁶⁴ As the final contingent of U.S. forces was leaving Afghanistan in August 2021, the Taliban launched a rapid offensive across the country, seizing provincial capitals and eventually the national capital, Kabul, in a matter of weeks. Amid the Taliban offensive, President Ghani fled the country for the UAE and the Afghan security forces largely abandoned their posts.⁶⁵

Having left the Air Force base at Bagram weeks earlier, the U.S. and other countries were left trying to evacuate their citizens and allies from the Kabul International Airport as the Taliban assumed control of the capital. Amid the chaos, a suicide bombing attack on the airport perimeter on August 26 killed 13 U.S. military personnel and nearly 200 Afghans. The local branch of ISIS, IS-K, claimed responsibility for the attack, and the Biden Administration subsequently launched drone strikes on two IS-K targets.⁶⁶ The Taliban formed a new government in early September comprised almost entirely of hardline elements of the Taliban and Haqqani Network.⁶⁷

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, approximately 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."⁶⁸

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. In 2016, reflecting a trend of growing congressional resistance to military assistance for Pakistan, Congress blocked funds for the provision of eight F-16s. 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 \$108 million in 2018. CSF reimbursements fell to zero in 2017 and remained at that level through 2021.⁶⁹

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."⁷⁰

In addition to suspending aid, the Trump Administration supported both the addition of Pakistan 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 "Country 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.'⁷¹ Pakistan has lobbied to be taken off the FATF grey list, and

others have argued for moving it to the organization's "black list." In a February 2021 meeting, the FATF elected to keep Pakistan on the grey list, noting that although Pakistan has made significant progress in taking action against money laundering and the financing of terrorism, "serious deficiencies" remained.⁷²

Pakistan has made significant progress in combating anti-state extremist groups operating within its borders. Pakistan has long sheltered the Afghan Taliban, Haqqani Network, and other allied extremist groups, but in the late 2000s and early 2010s, several anti-state extremist groups, including the Pakistani Taliban or TTP, began to target Pakistani security forces and civilians. As a result, according to the South Asia Terrorism Portal, the number of terrorism-related incidents within Pakistan surged from 150 in 2000 to 2,204 in 2010.⁷³ The number of incidents peaked in 2013 at 3,923 before Pakistan began a series of military operations against these groups in 2014 and fell nearly every year thereafter, reaching 319 in 2020.⁷⁴ There were some signs in 2021, however, that the TTP is reconstituting itself.⁷⁵

Fatalities from terrorism inside Pakistan have fallen as well. After peaking in 2009 at 11,317, there were 506 fatalities from terrorism (including civilians, security forces, and terrorists) in 2020.⁷⁶

Pakistan–U.S. relations improved modestly from 2018–2021 as Pakistan involved itself as a key player in bringing the Afghan Taliban to the negotiating table with the Afghan government. It remains to be seen how the Biden Administration will approach the often troubled U.S. relationship with Pakistan.

Pakistan's Nuclear Weapons Stockpile.

The *Bulletin of the Atomic Scientists* estimates 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."⁷⁷ The possibility that terrorists could gain effective access to Pakistani nuclear weapons is contingent on a complex chain of circumstances. Concern about the safety and security of Pakistan's nuclear weapons increases when India–Pakistan tensions

increase. 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.

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 might eventually gain access to Pakistan's nuclear arsenal. Pakistan's weapons-grade materials were ranked the 20th least secure in 2018, with only Iran's and North Korea's ranking lower.⁷⁸

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, the Pakistani state is not likely to 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.⁷⁹

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.

The 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 later called off foreign secretary-level talks that were scheduled for August 2014 to express anger over a Pakistani official's meeting with Kashmiri separatist leaders. 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.⁸⁰

On December 25, 2015, a meeting did occur 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.⁸¹

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 (LeT) and Jaish-e-Mohammed (JeM). 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 1989.⁸²

Hafez Muhammed Saeed, LeT's founder and the leader of its front organization Jamaatud-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, charged with financing terrorism, with his trial delayed due to the COVID-19 pandemic.⁸³ Previously, he had operated freely in Pakistan, often holding press conferences and inciting violence against India during large public rallies.

With terrorist groups operating relatively freely in Pakistan and maintaining links to its 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.⁸⁴

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 Khyber Pakhtunkhwa province.⁸⁵ Delhi stressed that the “non-military” operation was designed to avoid civilian casualties and was preemptive in nature because it 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 (LoC) 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.⁸⁶

Skirmishes at the LoC continued and even accelerated in 2020, with India's Home Ministry registering "5,133 instances of ceasefire violations along the Line of Control (LoC) with Pakistan last year, which resulted in 46 fatalities."⁸⁷ In early 2021, however, India and Pakistan experienced at least a partial diplomatic thaw as both countries combated the COVID-19 global pandemic. In February, both countries agreed to observe a strict ceasefire along the LoC,⁸⁸ and in March, Pakistan's Chief of Army Staff, General Qamar Javed Bajwa, called for both sides to "bury the past and move forward."⁸⁹

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, 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 two decades as the two sides have moved toward establishment of a strategic partnership based on mutual concerns about China's increasingly belligerent behavior and converging interests in countering regional terrorism and

promoting a "Free and Open Indo-Pacific." The U.S. has supplied roughly \$20 billion worth of U.S. military equipment to India since 2008, including C-130J and C-17 transport aircraft, P-8 maritime surveillance aircraft, Chinook airlift helicopters, Apache attack helicopters, artillery batteries, and 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 have advanced at an accelerated rate since the election of Prime Minister Narendra Modi in 2014. In 2015, the U.S. and India agreed to renew and upgrade their 10-year Defense Framework Agreement. In 2016, the two governments finalized the text of the Logistics Exchange Memorandum of Agreement (LEMOA), which allows each country to access the other's military supplies and refueling capabilities through ports and military bases, and the U.S. 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.⁹⁰ In October 2020, U.S. P-8 maritime surveillance aircraft were refueled for the first time at an Indian military base in the Andaman and Nicobar Islands.

America's strategic and defense ties with India advanced in several important ways during the Trump Administration. In 2018, India was granted STA-1 status, easing controls on exports of advanced defense technology. India is only the third Asian country after Japan and South Korea to be granted STA-1 status. In 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.

In 2018, the two countries also signed the Communications Compatibility and Security Agreement (COMCASA), which will allow the U.S. to sell India encrypted communications equipment and create secure channels for communication between the Indian and U.S.

militaries. In 2020, the U.S. and India signed the Basic Exchange Cooperation Agreement (BECA), which creates a framework for sharing geospatial intelligence.

Beyond these “foundational” or “enabling” military agreements, in recent years, the two countries have also signed an agreement on Helicopter Operations from Ships Other Than Aircraft Carriers (HOSTAC) and an Industrial Security Annex (ISA) that allows the U.S. to share classified information with private Indian defense firms. During the Trump Administration, the two countries also initiated a new 2+2 defense and foreign ministers dialogue while reviving the Quad grouping (which joins India and the U.S. with Australia and Japan) in 2017.⁹¹ In 2020, the four countries held the first Quad naval exercise since 2007. When a deadly crisis erupted at the China–India border in 2020, the Trump Administration provided India with two advanced surveillance drones and cold-weather gear for Indian soldiers.

In recent years, India has made additional purchases of U.S. military hardware, including C-17 transport aircraft, Apache attack helicopters, MH-60R Seahawk multi-mission helicopters, Sig Sauer assault rifles, and M777 ultralight howitzer artillery guns. It also is reportedly considering the purchase of 30 armed MQ-9 reaper drones (10 each for the three branches of its military) for \$3 billion and a half-dozen highly capable P-8I maritime aircraft (to supplement the dozen currently in operation) for nearly \$2 billion.

New Delhi and Washington regularly hold joint annual military exercises across all services. They include the Yudh Abhyas army exercises, Red Flag air force exercises, and Malabar naval exercise, which added Japan and Australia as permanent participants in 2012 and 2020, respectively. In late 2019, India and the U.S. held their first-ever tri-service military exercise, nicknamed “Tiger Triumph.”

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, the region is characterized by 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 more than 50 years in the past. It is therefore unclear how well Asia’s 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 that are 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 arguably are 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).⁹² Similarly, South Korea fields a larger military of tanks, principal surface combatants, and combat-capable aircraft (2,321, 26, and

563, respectively) than their German counterparts field (225, 15, and 228, respectively).⁹³

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 Terminal High Altitude Area Defense (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.⁹⁴ In June 2020, Tokyo unexpectedly cancelled plans to build two Aegis Ashore missile defense sites, citing the potential for the interceptor missile's first-stage booster to fall onto populated areas. Other likely factors in the decision include the overall cost of the program, inept handling of the site-selection process, and government unwillingness to press national objectives over local resistance.⁹⁵

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 has several operations underway in the region from the Southwest Pacific islands, which are so critically important to it, to its partnership with Malaysia in the North Indian Ocean and South China Sea to the Korean Peninsula.⁹⁶

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 budget⁹⁷ 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)⁹⁸ and six frigates and eight missile-armed corvettes. Its air force has not only F-15E Strike Eagles and F-16s, but also 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.⁹⁹ In January 2020, Singapore was cleared by the U.S. Department of State 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 1.0 percent of GDP on its military in 2020.¹⁰⁰ 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 Philippines is in discussions with South Korea to acquire upgrades to its FA-50 light fighters, as well as other military equipment.¹⁰¹ It is also taking delivery of South Korean-built ships.¹⁰²

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.¹⁰³ It also conducts multiple naval deployments each year out of Metropolitan France. The U.K. is likewise 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.¹⁰⁴

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 sea-lanes and nine of its 10 largest ports. By any meaningful measure, the Indo-Pacific is also the world's most militarized region, with seven of its 10 largest standing militaries and five of its declared nuclear nations.¹⁰⁵

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, Haïti, East Timor, and Bosnia."¹⁰⁶ 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. In 2020, PACAF activated two F-35A squadrons at Eielson Air Force Base in Alaska. Eventually, the base will host a total of 54 "combat-coded" F-35A aircraft.

- **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 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. U.S. forces are in the process of being fully withdrawn from Afghanistan by a September 11, 2021, deadline set by President Biden.
- ### 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 seven more days to get to Guam; seven days to Yokosuka, Japan; and eight days to Okinawa—if ships encounter no interference along the journey.¹⁰⁷
- 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

Hawaii. 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 for satellite ground stations.

Guam. 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 2005.¹⁰⁸ 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.

Guam and Saipan. 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. 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 workforce, 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 at least 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 because 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 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.¹⁰⁹ 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.¹¹⁰ American F-16s based in South Korea deployed there for a 12-day exercise with Philippine fighter jets in 2019¹¹¹ and exercised there again in 2020.¹¹²

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. 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 rotating P-8 aircraft.¹¹³

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.¹¹⁴ 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 the western part of the country.¹¹⁵

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 Military Sealift Command's Maritime Prepositioning Squadron-2 (MPSRON-2), which works with Maritime Prepositioning Squadron-3 (MPSRON-3) "to deliver a strategic power-projection capability for the Marine Corps, Army and Air Force, known as the Maritime Prepositioning Force (MPF)." Specifically, "MPF ships deliver a forward presence and rapid crisis response capability by pre-positioning equipment and supplies to various locations at sea."¹¹⁶ 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 also helps the United States to maintain familiarity with a region's 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.¹¹⁷

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 *2022 Index*.

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. military and political reengagement with the continent along with modest increases in European allies' defense budgets and capability investment. The U.S. military position in Europe is the strongest it has been for several years; efforts in exercises and logistics have continued, and a large withdrawal from Germany was cancelled. 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. However, NATO has maintained its collective defense posture throughout the pandemic.

NATO's renewed emphasis on collective defense has resulted in a focus on logistics. The biggest challenges to the alliance derive from

Global Operating Environment

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

gaps in capability and readiness among 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 2020 (assessed in the *2021 Index*), with no substantial changes in any individual categories or average scores. The *2022 Index* again assesses the European operating environment as “favorable.”

The Middle East. The Middle East region is now highly unstable, in large measure because of the erosion of authoritarian regimes, and a breeding ground for terrorism. Overall, regional security has continued to deteriorate. Although Iraq has restored its territorial integrity since the defeat of ISIS, the 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. U.S. relations in the region will remain complex, but this has not stopped the U.S. military from operating as needed.

The supremacy of the nation-state is being challenged in many countries by non-state actors that wield influence and power comparable to those of small states. The region’s primary challenges—continued meddling by Iran and surging transnational terrorism—are made more difficult by Sunni-Shia sectarian divides, the more aggressive nature of Iran’s Islamist revolutionary nationalism, and the proliferation of Sunni Islamist revolutionary groups. COVID-19 exacerbated these economic, political, and regional crises during 2020 and continued to do so throughout 2021, and the result could be further destabilization of the post-pandemic operational environment for U.S. forces.

In the Middle East, the U.S. benefits from operationally proven procedures that leverage bases, infrastructure, and the logistical processes needed to maintain a large force forward deployed thousands of miles away from

the homeland. The personal links between allied armed forces are also present, and joint training exercises improve interoperability and provide an opportunity for 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.

Although circumstances in all measured areas vary throughout the year, in general terms, the *2022 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 with 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 need to move 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. However, the U.S. has strong relations with allies in the region, and their willingness to host bases helps to offset the vast distances that must be covered. The militaries of Japan and the Republic of Korea are larger and more capable than European militaries, and both countries are becoming more interested in developing missile defense capabilities that will be essential in combatting the regional threat posed by North Korea.

We continue to assess the Asia region as “favorable” to U.S. interests in terms of alliances,

Global Operating Environment: Summary

VERY POOR

UNFAVORABLE

MODERATE

FAVORABLE

EXCELLENT

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 difficulty that would be involved in projecting U.S. 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 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

Because 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, outer space, and cyber-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, and threats to them would not necessarily result in material damage to the

foregoing vital national interests. Therefore, however important these additional American interests may be, they are not used in this assessment of the adequacy of current U.S. military power.

There are many publicly available sources of information on 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 Threat Assessment of the US Intelligence Community” (formerly “Worldwide Threat Assessment of the US Intelligence Community,” or 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 Office of the Director of National Intelligence.

Comparison of our detailed, reviewed analysis of specific countries with both *The Military Balance* and the ODNI’s “Annual Assessment” reveals two stark limitations in these external sources.

- *The Military Balance* is an excellent, widely consulted source, but it is primarily a count of military hardware, often 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*.

Threat Categories

Behavior	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Capability	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL

- The ODNI’s “Annual Assessment” 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 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 ODNI’s annual threat assessments to be of limited value to policymakers, the public, and analysts working outside of the government. Consequently, we do not use the ODNI’s assessment 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, and 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 noted, 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 during the assessed year.

Endnotes

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China

Dean Cheng

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....¹

Until the Biden Administration issues its own National Security Strategy, the United States can probably be expected to adhere to the policies outlined in the 2017 strategy.

Threats to the Homeland

Both 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. As a result, it has the resources to support a comprehensive military modernization program that has been ongoing for more than two decades and spans the conventional, space, and cyber realms as

well as weapons of mass destruction, an area that includes a multipronged nuclear modernization effort.

At the same time, the PRC has been acting more assertively—even aggressively—against more of its neighbors. Unresolved land and maritime disputes have led Beijing to adopt an increasingly confrontational attitude toward territorial disputes in the South China Sea, in the East China Sea, and along the China-India border, 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.

In May 2020, the U.S.–China Economic and Security Review Commission reported that, “[w]ith the world distracted by COVID-19, 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.” The commission 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 Since then, China has been intruding regularly across the median line of the Taiwan Strait with ever-larger groups of aircraft.

Meanwhile, China's attempts to obscure the origins of the COVID-19 pandemic and stifle international investigations into the matter undermined global health efforts. Beijing has also sought to exclude Taiwan from multilateral efforts to combat the pandemic.

Growing Conventional Capabilities.

The Chinese People's Liberation Army (PLA) remains one of the world's largest militaries, but its days of 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, in 2015, the largest reorganization in the PLA's history.³ The PLA has lost 300,000 personnel since those reforms, but its overall capabilities have increased as older platforms have been replaced with newer, much more sophisticated systems.

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. It now also outnumbers the U.S. Navy, with "360 battle force ships, compared with a projected total of 297 for the U.S. Navy at the end of FY2020."⁵ 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.⁶ 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.⁷

The PLAN has been expanding its amphibious assault capabilities as well. 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.⁸ To move this force, the Chinese have begun to build more amphibious assault ships, including Type 071 amphibious transport docks.⁹ 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."¹⁰ 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 the growing Chinese carrier fleet. This currently includes not only

the *Liaoning*, purchased from Ukraine over a decade ago, but a domestically produced copy that recently completed its first exercise.¹¹ Both of these ships have ski jumps for their air wing, but 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.¹²

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 more than 1,700 combat aircraft, is Asia's largest air force. It has shifted steadily from a force focused on homeland air defense to one that is capable of power projection, including long-range precision strikes against both land and maritime targets.

The PLAAF currently has more than 700 fourth-generation fighters that are comparable to the U.S. F-15, F-16, and F-18. They include the domestically designed and produced J-10 as well as the Su-27/Su-30/J-11 system, which is comparable to the F-15 or F-18 and dominates both the fighter and strike missions.¹³ 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. Although the H-6, like the American B-52 and Russian Tu-95, is a 1950s-era design copied from the Soviet-era Tu-16 Badger bomber, the latest versions (H-6K) are equipped with updated electronics and engines and are made of carbon composites. The 2020 U.S. Department of Defense (DOD) report to Congress on China's military also notes that China is developing a flying wing-type stealth bomber that is probably similar to the U.S. B-2.¹⁴

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. China's combat aircraft are also increasingly capable of undertaking mid-air refueling, which allows them to conduct extended, sustained operations, and the Chinese aerial tanker fleet, which is 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 DOD report on Chinese capabilities stated that China had tested a cargo drone, the AT-200, capable of carrying 1.5 tons of cargo.¹⁵ 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 stated that "China's development, production and deployment of domestically-developed reconnaissance and combat UAVs continues to expand."¹⁶

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 Russian 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 mark a substantial improvement in PLAAF air defense capabilities, as the S-400 has both anti-aircraft and anti-missile capabilities.¹⁷ 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.

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. 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.

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: 100–150 weapons on medium-range ballistic missiles

and approximately 60 intercontinental ballistic missiles (ICBMs).¹⁸ Its only ballistic missile submarine (SSBN) conducted relatively few deterrence patrols (perhaps none),¹⁹ and its first-generation submarine-launched ballistic missile (SLBM), the JL-1, if it ever attained full operational capability had 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.

While China's nuclear force remained stable for several decades, it has been part of the modernization effort of the past 20 years. 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).²⁰ 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.

This past year has seen a sudden inflation in the number of strategic nuclear warheads available to the PLA Rocket Force. Imagery analysts at several think tanks discovered at least three fields of silos under construction in western China.²¹ Each appears to contain around 100 silos, which means that China is potentially expanding its land-based nuclear deterrent component by over an order of magnitude.

Notably, the Chinese are also 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.²² Such a system would give the PRC a secure second-strike capability, substantially enhancing its nuclear deterrent.

There is 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 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.²³

As a result of its modernization efforts, China's nuclear forces appear to be shifting from a minimal deterrent posture, 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, are capable of fielding. If there are corresponding changes in doctrine, modernization will enable China to engage in limited nuclear options in the event of a conflict.

This assessment changes, however, if the missiles going into the newly discovered silos are equipped with MIRVs (multiple independently targetable reentry vehicles). If the Chinese place five MIRVs atop each missile, then 300 new ICBMs would have some 1,500 warheads—equivalent to the U.S. and Russian numbers allowed under New START. Even if there are fewer than 300 ICBMs, the new SLBMs and new bombers would still mean that within a few years, China could field as large a nuclear force as the United States or Russia is capable of fielding.

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, which can reach as far as Guam and southern India.²⁴ 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 creation of the PLA Strategic Support Force (PLASSF), which brings the Chinese military's electronic, network (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 are known to have conducted 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.²⁵ 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: stealing the credit ratings and records of 147 million people from Equifax.²⁶

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 more than 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 not only has tested ASATs against low-Earth orbit systems, but also is 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 to fielding with units. 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.²⁷

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 in turn 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, two things seem obvious: China and the United States do not share a common conception of international space, and China is actively seeking to undermine 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 2017.⁵¹

Dangerous Behavior in the Maritime and Airspace Common Spaces. The

aggressiveness of the Chinese 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 at acceptable costs in the early stages of a conflict has become a matter of greater debate.²⁸ As its capabilities have expanded, China has increasingly challenged long-standing rivals Vietnam and the Philippines. It also has begun to push toward Indonesia's Natuna Islands and into waters claimed by Malaysia.

It is unclear whether China is yet in a position to enforce an air defense identification zone (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.²⁹ 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.

China has also begun to employ non-traditional methods of challenging foreign military operations in what Beijing regards 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.³⁰

Increased Military Space Activity. 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.

Because the American military is expeditionary (i.e., its wars are fought far from the homeland), its reliance on space-based systems is greater than that of many other militaries. 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 that is a major advantage. However, this heavy reliance on space systems is also a key American vulnerability.

China fields an array of space capabilities, including its own BeiDou/Compass system of navigation and timing satellites, and has claimed a capacity to refuel satellites.³¹ It has four satellite launch centers. 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.”³²

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.³³ The latter include anti-satellite lasers for either dazzling or blinding purposes.³⁴ 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.”³⁵

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.³⁶ 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. While the satellite itself may or may not have military roles, the deployment highlights that China will now be using the enormous volume of cis-lunar space (the region between the Earth and the 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 Chinese Chang'e-5 lunar sample retrieval mission in 2020 and the recent Chinese landing on Mars underscore China's effort to move beyond Earth orbit to cis-lunar and interplanetary space.

Cyber Activities and the Electromagnetic Domain. As far back as 2013, the Verizon Risk Center identified China as the “top external actor from which [computer] breaches

emanated, representing 30 percent of cases where country-of-origin could be determined.”³⁷ 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.³⁸ The Verizon report similarly concluded that China was the source of 95 percent of state-sponsored cyber espionage attacks. Since the 2015 summit meeting between Chinese President Xi Jinping and U.S. President Barack Obama, during which the two sides reached an understanding to reduce cyber economic espionage, Chinese cyber actions have shifted. Although the overall level of activity appears to be unabated, 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 China’s much more holistic 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, not through combined operations focused on multiple branches within a single service, and 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: Conflicts are now clashes between rival systems of systems.³⁹

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.⁴⁰

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; they 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.⁴¹ 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."

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—by force if necessary—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 presidential election. Beijing has suspended most direct government-to-government discussions with Taipei and is using a variety of aid and investment efforts to deprive Taiwan of its remaining diplomatic partners.

Beijing has also undertaken significantly escalated military activities directed at Taiwan. For example:

- In 2021, 20 Chinese aircraft, including fighters, bombers, and support aircraft, conducted the largest single incursion into Taiwanese airspace.⁴²
- 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.⁴³
- Through mid-April of 2021, China had already flown 260 unnotified sorties over Taiwan's ADIZ, compared to the record number of 380 it flew in 2020.⁴⁴

- The PLA has also undertaken sustained joint exercises to simulate extended air operations, employing both air and naval forces, including its aircraft carriers.⁴⁵

These activities continued unabated and in some ways even intensified in the wake of China's struggle with COVID-19.⁴⁶

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 it 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 PLA’s “new historic missions,” shaping its 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, thereby allowing the PRC to achieve a fait accompli. The growth of China’s military capabilities is specifically oriented toward countering America’s ability to assist in the defense of Taiwan.

Moreover, China’s 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.

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.

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. This is exacerbated by China’s status 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 diet contains a growing percentage of imported food. China relies on the seas to move its products to markets. Consequently, it 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 China Sea and the South China Sea, 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.

The growing tensions between China and Japan and among a number of claimants in the South China Sea are especially risky. 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.⁴⁷ Chinese fishing boats (often believed to be elements of the Chinese maritime militia) and Chinese Coast Guard (CCG) vessels have been encroaching steadily on the territorial waters within 12 nautical miles of the uninhabited islands. In 2020, CCG or other government vessels repeatedly entered the waters around the Senkakus.⁴⁸ In the summer of 2016, China deployed a naval unit (as opposed to the CCG) into the area.⁴⁹

Beijing’s 2013 ADIZ declaration was just part of a broader Chinese pattern of using intimidation and coercion to assert expansive extralegal claims of sovereignty and/or control incrementally. For example:

- 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.⁵⁰
- In May 2018, the Chinese intercepted an American WC-135, also over the East China Sea.⁵¹

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 except (occasionally) China.

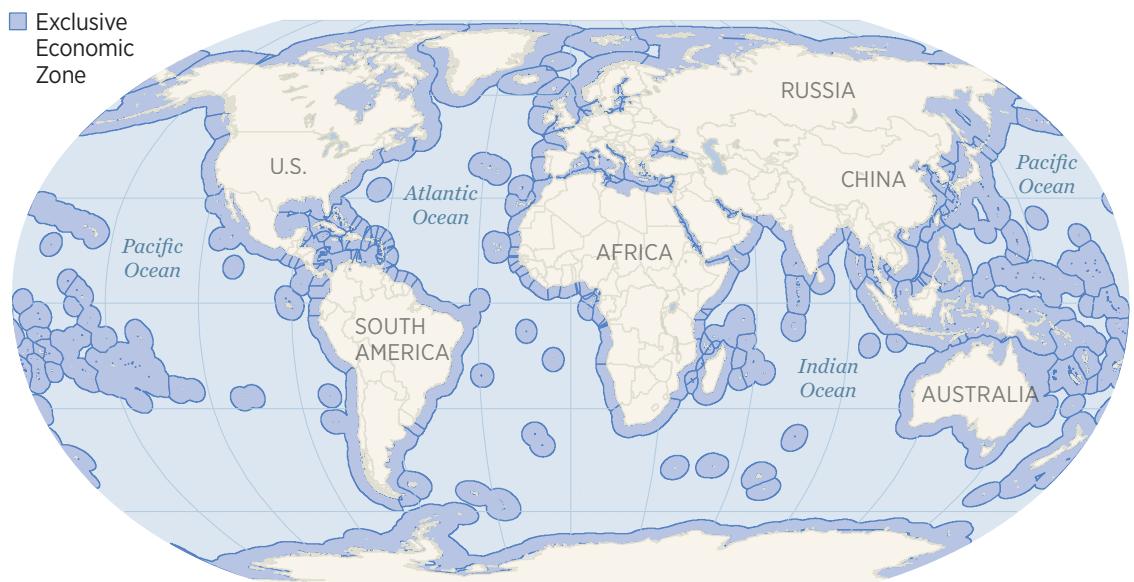
China–Vietnam tensions in the region, for example, were once again on display in 2020 when CCG vessels twice rammed and sank Vietnamese fishing boats near the disputed Paracel islands.⁵² Vietnam has also protested China’s decision to create additional administrative regions for the South China Sea, one centered on the Paracels and the other centered on the Spratlys.⁵³ This is part of Beijing’s “legal warfare” efforts, which employ legal and administrative measures to underscore China’s claimed control of the South China Sea region. For this reason, conflict often occurs around Chinese enforcement of unilaterally determined and announced fishing bans.⁵⁴

Because of the relationship between the Philippines and the United States, tensions between Beijing and Manila are the most likely to lead to American involvement in these disputes. 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, after which the Philippines successfully challenged Beijing in the Permanent Court of Arbitration regarding its rights under the U.N. Convention on the Law of the Sea (UNCLOS). There is no indication that the Chinese have reclaimed land around the shoal as they did in the Spratlys, but they continue to control access to the reef, and the presence of the Chinese Coast Guard remains a source of confrontation.⁵⁵

In March and April of 2021, a similar dispute seemed to be simmering around Whitsun Reef in the Spratlys. The presence there of more than two hundred Chinese fishing boats, among them known assets of China’s maritime militia,⁵⁶ sparked protests from Manila. After a

MAP 6

The Scope of Exclusive Economic Zones (EEZs)



As shown in the map above, EEZs and other waters under national jurisdiction account for 40 percent of the world's oceans. U.S. freedom of navigation worldwide would be compromised if national governments were granted expansive authority to restrict foreign militaries from operating in their EEZs. The South China Sea, virtually all of which is covered by various EEZ claims (see map at right), has become a particular flashpoint as China has sought to restrict freedom of navigation for U.S. military vessels there.



SOURCE: Heritage Foundation research.

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Exclusive Economic Zone (EEZ) Claims in the South China Sea



SOURCE: “China Has Militarised the South China Sea and Got Away with It,” *The Economist*, June 23, 2018, <https://www.economist.com/asia/2018/06/21/china-has-militarised-the-south-china-sea-and-got-away-with-it> (accessed July 23, 2021).

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stay of a few weeks—which Beijing claimed was necessary because of the poor weather—most of the ships departed. The unprecedented gathering of fishing boats and maritime militia could be an attempt to establish a basis within the Philippines exclusive economic zone (EEZ) for a subsequent return backed by the Chinese Coast Guard.

In all of these cases, the situation is exacerbated by rising Chinese nationalism.⁵⁷ 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 than in the past. 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.⁵⁸ 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. This is particularly true 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 Obama that China had no intention of militarizing the islands. That pledge has never been honored. In fact, 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.⁵⁹

There have been additional developments since the admiral's statement,⁶⁰ but the DOD's 2019 annual report on the Chinese military found no new militarization,⁶¹ which would seem to suggest that the process 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.⁶² There also are concerns that under the right circumstances, China will take action against vulnerable targets like Philippines-occupied Second Thomas Shoal or Reed Bank, where a Chinese fishing boat in 2019 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 again become a flashpoint in recent years. In April 2013, the most serious border incident between India and China in more than two decades occurred

Chinese Fault Lines



China-India Border. The Line of Actual Control represents one of the world’s longest disputed borders and has been the site of several standoffs between the Chinese and Indian militaries in recent years, including a border crisis in 2020 that resulted in the first casualties from hostilities at the border in more than 40 years.

East China Sea. China claims the disputed Senkaku/Diaoyu Islands, which are currently administered by Japan. In recent years, Chinese aircraft

and naval vessels have entered the airspace and territorial sea around the islands with growing frequency.

Taiwan. The Republic of China on Taiwan claims sovereignty. The People’s Republic of China disputes this and regularly conducts provocative military maneuvers near Taiwan.

South China Sea. The South China Sea hosts several territorial disputes between China and Taiwan and its

Southeast Asian neighbors. China’s unlawful claims in the sea and attempts to restrict freedom of navigation there have also produced tensions with the U.S., which has sent aircraft and naval vessels through the South China Sea to signal its objections to the nature of China’s claims. This has resulted in a number of confrontations between Chinese and U.S. vessels.

SOURCE: Heritage Foundation research.

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MAP 9

Disputed Borders Between India and China



Western Sector. Aksai Chin, a barren plateau that was part of the former princely state of Jammu and Kashmir, has been administered by the Chinese since they seized control of the territory in the 1962 Sino-Indian border conflict. One of the main causes of that war was India's discovery of a road China had built through the region, which India considered its territory.

Middle Sector. The Middle Sector, where the Indian states of Uttarakhand and Himachal Pradesh meet the Tibet Autonomous Region, is the least contentious of the three main disputed “sectors,” with the least amount of territory contested. It is also the only sector for which the Chinese and Indian governments have formally exchanged maps delineating their claims.

Eastern Sector. China claims nearly the entire Indian state of Arunachal Pradesh, which Beijing calls South Tibet. The McMahon Line, which has served as the de facto Line of Actual Control since 1962, was established in 1914 by the British and Tibetan representatives and is not recognized by China. The U.S. recognizes Arunachal Pradesh as sovereign Indian territory.

SOURCE: Heritage Foundation research.

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when Chinese troops settled for three weeks several miles inside northern Indian territory on the Depsang Plains in Ladakh. A visit to India by Chinese President Xi Jinping in September 2014 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 until 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, the latter requested by Bhutanese authorities to provide assistance. The crisis lasted 73 days; both sides pledged to pull back, but Chinese construction efforts in the area have continued.⁶³ 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.

In June 2020, the situation escalated even further. Clashes between Indian and Chinese troops using rocks, clubs, and fists led to at least 20 Indian dead and (as the Chinese authorities recently admitted) at least four Chinese killed. This was in the Galwan Valley area of Ladakh.⁶⁴ In September, there were reports of shots exchanged near the Pangong Lake region, signaling further potential escalation.⁶⁵

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 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.

Conclusion

China presents the United States with the region's most comprehensive security challenge. It poses various threat contingencies across all three areas of vital American national interests: homeland; regional war, including potential attacks on overseas U.S. bases as well as against allies and friends; and international common spaces. China's provocative behavior is well documented. It is challenging the U.S. and its allies such as Japan at sea, in the air, and in cyberspace; it has raised concerns on its border with India; and it is a standing threat to Taiwan. Despite a lack of official transparency, publicly available sources shed considerable light on China's rapidly growing military capabilities.

The Chinese commissioned their first homegrown aircraft carrier two years ago and are fielding large numbers of new platforms for their land, sea, air, and outer space forces as well as in the electromagnetic domain. The PLA has been staging larger and more comprehensive exercises, including major exercises in the East China Sea near Taiwan, that are improving the ability of the Chinese to operate their abundance of new systems. It has also continued to conduct probes of both the South Korean and Japanese ADIZs, drawing rebukes from both Seoul and Tokyo.

This *Index* 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		✓			
Capability		✓			

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Russia

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 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 336 intercontinental ballistic missiles, 2,840 main battle tanks, 5,220 armored infantry fighting vehicles, more than 6,100 armored personnel carriers, and more than 4,684 pieces of artillery.

- The navy has one aircraft carrier; 49 submarines (including 11 ballistic missile submarines); four cruisers; 11 destroyers; 15 frigates; and 125 patrol and coastal combatants.
- The air force has 1,160 combat-capable aircraft.
- The army has 280,000 soldiers.
- There is 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 they help the Kremlin "keep costs low and maintain a degree of deniability," and "[a]ny personnel losses could be shrouded from unauthorized disclosure."³

In February 2018, for example, 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.⁴ Approximately 30 U.S. Rangers and Delta Force special operators were also at the base.⁵ 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.⁶ Moscow claims, however, that since the launch of its Syria operation, only 112 Russian troops have suffered casualties.⁷

In January 2019, reports surfaced that 400 Russian mercenaries from the Wagner Group were in Venezuela to bolster the regime of Nicolás Maduro.⁸ 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.⁹

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.¹⁰ In December 2018, for example, Russia temporarily deployed two Tu-160 nuclear-capable bombers to Caracas.¹¹ 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.¹²

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.¹³ 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.”¹⁴ Putin is more likely to use this force domestically to stifle dissent than he is to deploy it abroad.¹⁵ However, in November 2020, the Russian National Guard (Rosgvardia) and the Belarusian Ministry of the Interior signed an official cooperation deal specifying that either side “may carry out law-enforcement-type operations on the other’s territory.”¹⁶ This deal likely directly resulted from the Belarusian protests that broke out in August 2020 following the fraudulent presidential election.

At first, the COVID-19 pandemic severely affected Russia’s economic growth.¹⁷ However,

the Russian economy rebounded during the latter part of the pandemic and is expected to record growth in 2021.¹⁸ Because of the economic boost following the coronavirus lockdowns, Russia will likely find it easier to fund its military operations.

In 2020, Russia spent \$61.7 billion on its military—5.23 percent less than it spent in 2019—but still remained one of the world’s top five nations in terms of defense spending.¹⁹

Much of Russia’s military expenditure is directed toward modernization of its armed forces. According to a July 2020 Congressional Research Service report, “Russia has undertaken extensive efforts to modernize and upgrade its armed forces” since its invasion of Georgia in 2008.²⁰ From 2010 to 2019 (the most recent year for which data are publicly available), close to 40 percent of Russia’s total military spending was on arms procurement.²¹ Taking into account total military expenditure, Russia spent more than 4 percent of GDP on defense in 2020.²²

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.”²³

Russia has prioritized modernization of its nuclear capabilities and “claims to be 81 percent of the way through a modernization program to replace all Soviet-era missiles with newer types by the early 2020s on a less-than one-for-one basis.”²⁴ Russia plans to deploy the RS-28 (Satan 2) ICBM by 2022 as a replacement for the RS-36, which is being phased out in the 2020s.²⁵ The missile, which can carry up to 15 warheads,²⁶ was to undergo test launches in 2019, but the tests were delayed. To complete the tests, “Russia will first need to upgrade the testing site,” which Russian Minister of Defense Sergei Shoigu admitted in December 2020 had yet to be built.²⁷

The armed forces also continue to undergo process modernization, which was begun by

Defense Minister Anatoly Serdyukov in 2008.²⁸ 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.²⁹

In April 2020, the Kremlin stated that it had begun state trials for its T-14 Armata main battle tank in Syria.³⁰ In March 2021, Russian Defense Minister Sergei Shoigu revealed that the Russian military would receive a pilot batch of the T-14 Armata tanks in 2022.³¹ Aside from the T-14 Armata, 10 new-build T-90M main battle tanks, contracted in 2017, were delivered to the 2nd Motor-Rifle Division in the Moscow region in 2020.³²

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 the deck and hull.³⁵ In December 2019, the carrier caught on fire during repair work.³⁶ Despite these setbacks, the *Kuznetsov* is scheduled to begin sea trials in 2022.³⁷ In May 2019, reports surfaced that Russia is seeking to begin construction of a new nuclear-powered aircraft carrier in 2023 for delivery in the late 2030s, but the procurement's financial and technological feasibility remains questionable.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 because of financial setbacks.⁴²

In November 2018, Russia sold three *Admiral Grigorovich*-class frigates to India. It 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. Of the planned 14 frigates, Russia had engines for only two,⁴⁴ but in January 2021, India procured gas turbine engines from Ukraine to give to Russia to install on the frigates.⁴⁵

Russia's naval modernization continues to prioritize submarines. In June 2020, the first Project 955A *Borei-A* ballistic-missile submarine, the *Knyaz Vladimir*, was delivered to the Russian Northern Fleet, an addition to the three original Project 955 *Borei*s.⁴⁶ Russia reportedly will construct at least 10 more *Borei-A*-class submarines.⁴⁷ According to Admiral Phil Davidson, head of U.S. Indo-Pacific Command, it was expected that "the Russian Pacific Fleet [would] add its first Kalibr cruise missile-capable ships and submarines to its inventory in 2021."⁴⁸ In August 2021, the missile corvette *Sovetsk*, part of Russia's Baltic Fleet, test-launched a Kalibr cruise missile from the White Sea.⁴⁹

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 6.⁵⁰ According to a Russian vice admiral, these submarines will be two times quieter than current subs.⁵¹

Russia also continues to upgrade its diesel electric *Kilo*-class subs.⁵² Reportedly, it inducted the first improved Project 636 *Kilo*-class submarine into its Pacific Fleet in November 2019 and is now focused on delivering six Project

636 improved *Kilo*-class subs to the Pacific Fleet.⁵³ 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."⁵⁴

Transport remains a nagging problem, and Russia's defense minister has stressed the paucity of transport vessels. According to a RAND report:

In 1992, just after the collapse of the Soviet Union, the Russian Federation military had more than 500 transport aircraft of all types, which were capable of lifting 29,630 metric tons. By 2017, there were just over 100 available transport aircraft in the inventory, capable of lifting 6,240 metric tons, or approximately one-fifth of the 1992 capacity.⁵⁵

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.⁵⁶

Although budget shortfalls have hampered modernization efforts overall, Russia continues to focus on development of such high-end systems as the S-500 surface-to-air missile system. As of March 2021, the Russian Ministry of Defense was considering the most fitting ways to introduce its new S-500 Prometheus surface-to-air missile system, which is able to detect targets at up to 1,200 miles, with its missile range maxing at approximately 250 miles, "as part of its wider air-defense modernization." According to one report, the S-500 system will enter full service by 2025.⁵⁷

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.⁵⁸

In December 2020, Russia tested a ballistic, anti-satellite missile built to target imagery and communications satellites in low Earth orbit.⁵⁹ According to Colonel Andrei Revenok, Chief of the Space Troops' Main Center for Missile Attack Warning within Russia's Aerospace Force, in February 2021, the latest *Voronezh* radars will replace all of the existing airspace control systems.⁶⁰

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.⁶¹

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.⁶² Sweden issued warnings to commercial aviation and sea traffic.⁶³ 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.”⁶⁴ The exercises took place near the Karlskrona Naval Base, the Swedish navy’s largest base.⁶⁵

Russia’s snap exercises are conducted with little or no warning and often involve thousands of troops and pieces of equipment.⁶⁶ In April 2021, for example, between 150,000 and 300,000 Russian troops massed at the Ukrainian border and in Crimea to conduct snap exercises that also involved approximately 35,000 combat vehicles, 900 aircraft, and 190 navy ships.⁶⁷ 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.”⁶⁸

Snap exercises have been used for military campaigns as well. According to General Curtis M. Scaparrotti, former EUROCOM Commander and NATO Supreme Allied Commander Europe, for example, “the annexation of Crimea took place in connection with a snap exercise by Russia.”⁶⁹ 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.”⁷⁰

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.⁷¹ Russia’s defense minister claimed that the exercises were the largest to have taken place in Russia since 1981; however, some analysis suggests that the actual number of participating combat troops was in the range of 75,000–100,000.⁷² 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.⁷³

Chinese and Mongolian forces also took part, with China sending 3,200 soldiers from the People’s Liberation Army along with numerous pieces of equipment.⁷⁴ 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.⁷⁵

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 2021 National Security Strategy describes NATO as a threat to the national security of the Russian Federation:

Military dangers and military threats to the Russian Federation are intensified by attempts to exert military pressure on Russia, its allies and partners, the buildup of the military infrastructure of the North Atlantic Treaty Organization near Russian borders, the intensification of reconnaissance activities, the development of the use of large military formations and

nuclear weapons against the Russian Federation.⁷⁶

The same document also clearly states that Russia will use every means at its disposal to achieve its strategic goals:

[P]articular attention is paid to...improving the system of military planning in the Russian Federation, developing and implementing interrelated political, military, military-technical, diplomatic, economic, information and other measures aimed at preventing the use of military force against Russia and protecting its sovereignty and territorial integrity.⁷⁷

Strategic Nuclear Threat. Russia possesses the largest arsenal of nuclear weapons (including short-range nuclear weapons) among the nuclear powers. 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 armament program.⁷⁸ An aging nuclear workforce could impede this modernization. “[A]lthough Russia’s strategic-defence enterprises appear to have preserved some of their expertise,” according to the IISS, “problems remain, for example, in transferring the necessary skill sets and experience to the younger generation of engineers.”⁷⁹ Nevertheless, Putin revealed in December 2020 “that modern weapons and equipment now make up 86 percent of Russia’s nuclear triad.”⁸⁰

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.⁸¹ 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.⁸²

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.⁸³

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.⁸⁴ Russia’s

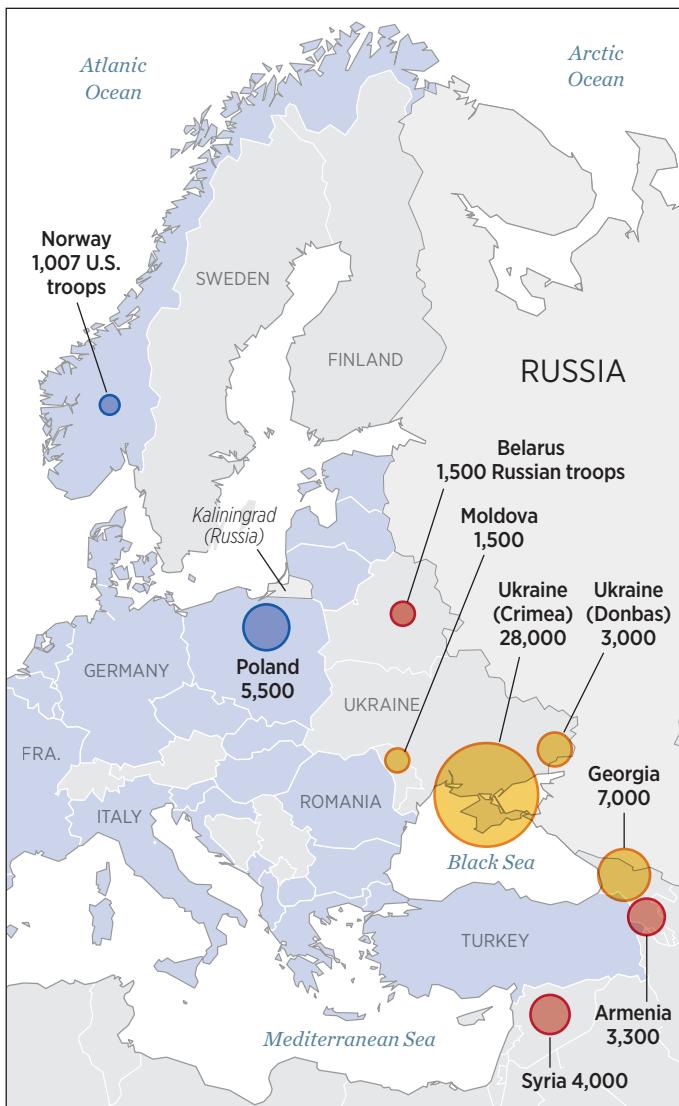
U.S. Troops Vastly Outnumbered by Russian Troops Outside Russia's Borders

U.S. troops in Norway and Poland number less than 7,000—far fewer than the 48,300 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 2021: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2021); U.S. Department of Defense, Defense Manpower Data Center; and Heritage Foundation research.

heritage.org



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.⁸⁵ The Russians justify their aggressive behavior by

pointing to deployments of U.S. missile defense systems in Europe. In the past, these systems were not scaled or postured to mitigate Russia’s advantage in ballistic missiles and nuclear weapons to any significant degree, but Pentagon officials have revealed that laser-armed Strykers, new Eastern European batteries, and sea-based interceptors are set to arrive by 2023.⁸⁶

Russia continues to violate the Intermediate-Range Nuclear Forces (INF) Treaty, which bans the testing, production, and possession of

intermediate-range missiles.⁸⁷ 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.⁸⁸ U.S. officials consider the banned cruise missiles to be fully operational.⁸⁹

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.⁹⁰ 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 2.⁹¹

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) and the Eurasian Economic Union (EEU), for example, embody Russia's 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. For example:

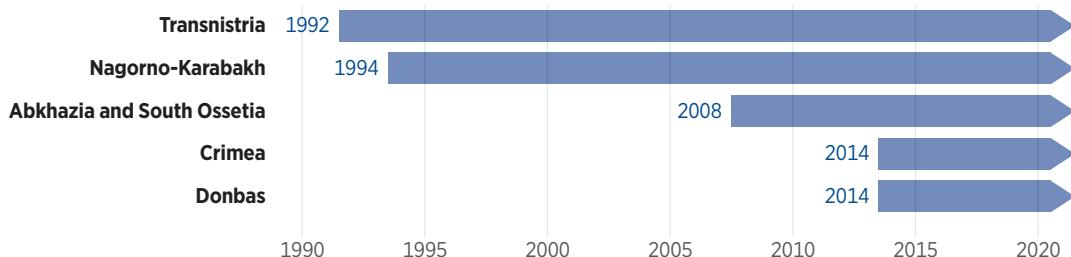
- In May 2016, a Russian spy was sentenced to prison for gathering intelligence for Russia's Foreign Intelligence Service (SVR) while working as a banker in New York. The spy specifically transmitted intelligence on "potential U.S. sanctions against Russian banks and the United States' efforts to develop alternative energy resources."⁹²
- 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.⁹³

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.⁹⁴ According to one report, Russian spies are becoming harder to track because they infiltrate companies, schools, and even the government.⁹⁵

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.⁹⁶ 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.⁹⁷

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."⁹⁸ 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.⁹⁹

Russian Interference Zones



Transnistria. Russia has stationed troops in Transnistria since 1992 when a cease-fire ended the Moldovan civil war.

Nagorno-Karabakh. In September 2020, major fighting broke out in the Nagorno-Karabakh frozen conflict. Since 1994, Armenia had been occupying Azerbaijan's Nagorno-Karabakh region and parts of seven other surrounding districts. The fighting ended in November 2020 when Armenia and Azerbaijan signed a Russian-brokered cease-fire.

deal. Although Azerbaijan regained much of its territory, approximately 2,000 Russian peacekeeping troops remain in parts of Nagorno-Karabakh for now.

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 then. In March–April 2021, Russian troops massed within Crimea in connection with an escalation of fighting in the Donbas region.

Donbas. Russia's annexation of Crimea led to an armed conflict between Russian troops, Russian-backed separatist forces, and Ukrainian soldiers in Ukraine's eastern Donbas region. In March–April 2021, the fighting escalated sharply, and Russia massed troops along the Ukrainian border in response to that escalation.

SOURCE: Heritage Foundation research.

heritage.org

Russian intelligence operatives are reportedly mapping U.S. telecommunications infrastructure around the United States, focusing especially on fiber-optic cables.¹⁰⁰

- 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.¹⁰¹
- 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.¹⁰²
- Undersea cables in the United States are also at risk of being tapped for valuable intelligence. Fourteen Russian sailors who died aboard a submarine that caught fire in July 2019 were suspected of attempting to tap information flowing from American undersea cables.¹⁰³

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.¹⁰⁴ In November 2017, the Russian-built “counter-drug” center at Las Colinas opened, its future purpose being to support “Russian security engagement with the entire region.”¹⁰⁵ 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 2017.¹⁰⁶ Russia also has an agreement with Nicaragua, signed in 2015, that allows access to Nicaraguan ports for its naval vessels.¹⁰⁷

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 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.”¹⁰⁸

After decades of Russian domination, the countries of 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 2021*, “It is almost certain that Russia’s policy of denying the sovereign choices of its neighbours will remain one of the most significant security threats in the Baltic Region in the future.”¹⁰⁹ 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.¹¹⁰

Latvian authorities describe the means used by Russia to claim that it is defending the rights of citizens or Russian compatriots in similar terms: 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.¹¹¹

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.”¹¹² 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.”¹¹³

In 2020, Russia used the COVID-19 pandemic to spread disinformation. In March, for example, 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. Nor did Russia create this disinformation on its own; it relied on various theories created by China and Iran.¹¹⁴

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.¹¹⁵ Since 2017, a disinformation campaign nicknamed “ghostwriter” has been ongoing. In some cases, Russian hackers published false news stories “on real news websites without permission.” In one case, a Lithuanian news site published a fake article in 2019 “claiming that German soldiers had desecrated a Jewish cemetery,” and in another, a fake message was published on the Polish War Studies Academy website, purportedly from the organization’s commander, calling for troops “to fight against ‘the American occupation.’”¹¹⁶

U.S. troops stationed in Poland for NATO’s eFP have been the target of similar Russian disinformation campaigns.¹¹⁷ A fabricated interview with U.S. Army Europe commander Lieutenant General Christopher Cavoli that

was published online was meant to undermine NATO’s reputation among the public.¹¹⁸ 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.”¹¹⁹ In particular, more recent Russian propaganda has focused on portraying eFP as an “occupying force.”¹²⁰

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.¹²¹

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.¹²² 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 2023.¹²³ 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.¹²⁴ 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.”¹²⁵

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.¹²⁶ The Monolit-B radar system, for instance, has a passive range of 450 kilometers, and its deployment “provides the Russian military with an excellent real-time picture of the positions of foreign surface

vessels operating in the Black Sea.”¹²⁷ 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.¹²⁸

These numbers may be larger now, given Russia’s military buildup in Ukraine in April 2021.¹²⁹ In March 2019, Russia announced the deployment of nuclear-capable Tupolev Tu-22M3 strategic bombers to Gvardeyskoye air base in occupied Crimea.¹³⁰

Control of Crimea has allowed Russia to use the Black Sea as a platform to launch and support naval operations in the Eastern Mediterranean.¹³¹ The Black Sea fleet has received six *Kilo* diesel submarines and three *Admiral Grigorovich*-class frigates equipped with Kalibr-NK long-range cruise missiles.¹³² Russia is also planning to add *Gorshkov*-class frigates to its Black Sea fleet.¹³³ Kalibrns have a range of at least 2,500 kilometers, placing cities from Rome to Vilnius within range of Black Sea-based cruise missiles.¹³⁴

Russia has deployed five S-400 air defense systems with a potential range of around 250 miles to Crimea.¹³⁵ Russia’s new S-350 air defense systems also have the potential to be deployed to Crimea.¹³⁶ 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.”¹³⁷ 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.”¹³⁸

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 the Donbas region of Ukraine.¹³⁹ Russian-backed separatists daily violate the September 2014 Minsk I and February 2015 Minsk II cease-fire agreements.¹⁴⁰ 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 April 2021, the war in Ukraine had cost an estimated 14,000 lives.¹⁴¹

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.¹⁴² In September 2019, Russia released the sailors in a prisoner swap with Ukraine.¹⁴³ 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.¹⁴⁴ 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 2014.¹⁴⁵

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.¹⁴⁶

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.”¹⁴⁷ 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.¹⁴⁸

Russia’s permanent stationing of Iskander missiles in Kaliningrad in 2018 occurred a year to the day after NATO’s eFP deployed to Lithuania.¹⁴⁹ Russia reportedly has deployed tactical nuclear weapons, the S-400 air defense system, and P-800 anti-ship cruise missiles to Kaliningrad.¹⁵⁰ 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.¹⁵¹ 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.¹⁵²

Russia also has outfitted a missile brigade in Luga, Russia, a mere 74 miles from the Estonian city of Narva, with Iskander missiles.¹⁵³

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.¹⁵⁴

Nor is Russia deploying missiles only in Europe. In February 2018, Russia approved the deployment of warplanes to an airport on Iturup, one of the largest Kuril Islands.¹⁵⁵ In September 2019, Russia announced its plans to deploy additional missile systems on Paramushir and Matua, two islands in the northern portion of the Kuril Island chain.¹⁵⁶ In December 2020, Russia announced the deployment of S-300V4 air defense missile systems on Iturup.¹⁵⁷ Russia has stationed 3,500 troops on the Kuril Islands. In December 2018, Japan lodged a formal complaint over the building of four new barracks.¹⁵⁸

Russia has deployed additional troops and capabilities near its western borders. In May 2021, Russia announced plans to increase its troop presence along its western border “in response to what it views as an increasing threat from the United States and the NATO alliance.”¹⁵⁹ In June 2020, one report revealed that the brigade in the Western Military District is relatively well-equipped with “modern weapons and specialist equipment, including T-90A tanks, BTR-82A armored personnel carriers, BMP-3 combat vehicles, as well as 9A34 Strela-10 and 2S6M Tunguska air defense systems.”¹⁶⁰ 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.¹⁶¹

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 a long history in the Arctic and, as an Arctic nation, has interests there. However, Russia's ongoing militarization of the region, coupled with its bellicose behavior toward its neighbors, makes the Arctic a security concern.

Because nationalism is on the rise in Russia, Vladimir Putin's Arctic strategy is popular among the population. For Putin, the Arctic is an area that allows Russia to flex its muscles without incurring any significant geopolitical risk.

Russia is also eager to promote its economic interests in the region. Half of the world's Arctic territory and half of the Arctic region's population are located in Russia. It is well known that the Arctic is home to large stockpiles of proven and yet unexploited oil and gas reserves. The majority of these reserves are thought to be located in Russia. In particular, Russia hopes that the Northern Sea Route (NSR) will become one of the world's most important shipping lanes.

Russia has invested heavily in the Arctic region, opening a series of Arctic bases and investing in cold-weather equipment, coastal defense systems, underground storage facilities, and specialized training. Additionally, "Russian hardware in the High North area includes bombers and MiG31BM jets, and new radar systems close to the coast of Alaska."¹⁶²

Russia has also staged a series of statement activities in the Arctic. In 2007, Artur Chilingarov, then a member of the Russian Duma, led a submarine expedition to the North Pole and planted a Russian flag on the seabed. Later, he declared: "The Arctic is Russian."¹⁶³ 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."¹⁶⁴

In May 2017, Russia announced that its build-up of the Northern Fleet's nuclear capacity is intended "to phase 'NATO out of [the] Arctic.'"¹⁶⁵ A recent statement exercise occurred in March 2021, when three Russian ballistic missile submarines punched through the Arctic ice near the North Pole.¹⁶⁶

In addition to an ongoing strong naval presence in the Arctic, Russia often undertakes aggressive Arctic flights. In one instance in March 2017, nine Russian bombers simulated an attack on the U.S.-funded, Norwegian-run radar installation at Vardø, Norway, above the Arctic Circle.¹⁶⁷ In May 2017, 12 Russian aircraft simulated an attack against NATO naval forces taking part in the Eastern Atlantic Area (EASTLANT) 17 exercise near Tromsø, Norway, and later that month, Russian aircraft targeted aircraft from 12 nations that were taking part in the Arctic Challenge 2017 exercise near Bodø.¹⁶⁸ 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.¹⁶⁹

Although the Arctic region has been an area of low conflict among the Arctic powers, NATO should consider the implications of Russia's recent aggressive military behavior. NATO is a collective security organization designed to defend the territorial integrity of its members. Five NATO members (Canada, Denmark, Iceland, Norway, and the United States) are Arctic countries, and each has territory above the Arctic Circle. Two closely allied nations (Finland and Sweden) also have Arctic territory.

The U.S. in recent years has begun to pay increased attention to the Arctic theater in Europe. One way has been by maintaining an enhanced presence in Norway. In April 2021, the two nations signed the Supplementary Defense Cooperation Agreement, which in part allows the U.S. to build additional

infrastructure at Rygge and Sola air stations in southern Norway as well as Evenes air station and Ramsund naval station above the Arctic Circle.¹⁷⁰ Construction at Evenes will support Norwegian and allied maritime patrol aircraft in monitoring Russian submarine activity.

Because Russia is an Arctic power, its military presence in the region is to be expected, but it should be viewed with some caution because of Russia's pattern of aggression. In the Arctic, sovereignty equals security. Respecting national sovereignty in the Arctic would ensure that the chances of armed conflict in the region remain low. Since NATO is an intergovernmental alliance of sovereign nation-states built on the consensus of all of its members, it has a role to play in Arctic security. In the words of NATO Secretary-General Jens Stoltenberg:

Increased Russian presence, more Russian bases in the High North, has also triggered the need for more NATO presence, and we have increased our presence there with more naval capabilities, presence in the air, and not least, the importance of protecting transatlantic under-sea cables transmitting a lot of data.¹⁷¹

In March 2017, a decree signed by Putin gave the Federal Security Service (FSB), which controls law enforcement along the Northern Sea Route, 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."¹⁷² 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 2018.¹⁷³

The Russian National Guard, which reports to President Putin,¹⁷⁴ 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 2017.¹⁷⁵ In April 2021, shareholders of Novatek, Russia's second-largest natural gas producer, "approved external financing of \$11 billion for the Arctic LNG 2 project, which is expected to start production of [LNG] in 2023."¹⁷⁶

In May 2018, Putin issued a presidential decree setting a target of 80 million tons shipped across the NSR by 2024.¹⁷⁷ In December 2020, Rosatom, Russia's state nuclear power company, announced that it had shipped a record 32 million tons on the NSR in 2020. This surpassed the original target of 29 million tons.¹⁷⁸ 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."¹⁷⁹

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.¹⁸⁰ In addition, old Soviet-era facilities have been reopened.

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.¹⁸¹ 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.¹⁸²

Air power in the Arctic is increasingly important to Russia, which has 14 operational airfields in the region along with 16 deep-water ports.¹⁸³ According to a March 18, 2021, *Forbes* report, "the Russian navy has tasked a regiment of upgraded MiG-31BM [interceptor aircraft] to skip and hop across Arctic airfields in order to range across the cold-but-rapidly-thawing North Pole."¹⁸⁴ In March 2019,

Major 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.”¹⁸⁵

Russia resumed regular fighter jet combat patrols in the Arctic in 2019.¹⁸⁶ The Ministry of Defense, for example, announced that in January 2019, two Tu-160 bombers flew for 15 hours in international airspace over the Arctic.¹⁸⁷ 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.¹⁸⁸

Russian Arctic flights are often aggressive. In May 2017, 12 Russian aircraft simulated an attack against NATO naval forces taking part in the EASTLANT 17 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.¹⁸⁹ As noted previously, 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.¹⁹⁰ 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.¹⁹¹

In 2017, Russia activated a new radar complex on Wrangel Island.¹⁹² 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.¹⁹³ Construction of the cable began in spring 2021.¹⁹⁴

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.¹⁹⁵ In March 2021, Russia’s *Admiral Gorshkov* frigate successfully “launched an Oniks cruise missile and hit a coastal target on Novaya Zemlya, about 300 kilometers from launch position.”¹⁹⁶

Russia’s ultimate goal is encapsulated in a June 2019 study published by the Royal Institute of International Affairs:

Since the mid-2010s, the Kremlin has deployed substantive force and capabilities along the coast of its northern border in the AZRF [Arctic Zone of the Russian Federation]. Parts of the armed forces are now Arctic-capable, and have developed concepts of operations tailored to that environment. With the creation of OSK Sever [Joint Strategic Command North] in 2013, the Russian armed forces have been slowly reshaping their Arctic command structure. The Arctic forces are primarily focused on air and naval operations, with the aim of creating an integrated combined-arms force for the region.¹⁹⁷

For a few years, Russia was developing three new nuclear icebreakers, and in May 2019, it launched its third and final *Arktika*.¹⁹⁸ The *Arktika*, currently the world’s largest and most powerful nuclear icebreaker,¹⁹⁹ sailed straight to the North Pole in October 2020.²⁰⁰

Russia’s most recently released naval doctrine, from July 2017, cites 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.”²⁰¹ 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.”²⁰²

Russia’s Northern Fleet is also building newly refitted submarines, including a newly converted *Belgorod* nuclear-powered submarine that was launched in April 2019.²⁰³ The *Belgorod* is expected to carry six Poseidon drones, also known as nuclear torpedoes, and

will carry out “a series of special missions.”²⁰⁴ The submarine will have a smaller minisub that will potentially be capable of tampering with or destroying undersea telecommunications cables.²⁰⁵ 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.”²⁰⁶ A similar submarine, the *Khabarovsk*, is under construction and scheduled to be launched in the fall of 2021.²⁰⁷

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. According to a U.S. Department of State official, as quoted in a Congressional Research Service report:

[The U.S. has] concerns about Russia’s military buildup in the Arctic. Its presence has grown dramatically in recent years with the establishments of new Arctic commands, new Arctic brigades, refurbished airfields and other infrastructure, deep water ports, new military bases along its Arctic coastline, an effort to establish air defense and coastal missile systems, early warning radars, and a variety of other things along the Arctic coastline. We’ve seen an enhanced ops [operations] tempo of the Russian military in the Arctic, including last October one of the largest Russian military exercises in the Arctic since the end of the Cold War. So there is some genuine and legitimate concern there on the part of the United States and our allies and partners about that behavior in the Arctic.²⁰⁸

Destabilization in the South Caucasus. The South Caucasus sits at a crucial geographical and cultural crossroads and has been 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.²⁰⁹ The Georgian Foreign Ministry criticized the treaties as a step toward “annexation of Georgia’s occupied territories,”²¹⁰ 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.²¹¹ 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.²¹² 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”).²¹³ In May 2020, the U.S. Embassy in Tbilisi reported that Russian-led security forces were continuing to erect unauthorized fences and reinforcing existing illegal “borderization” efforts near a number of Georgian villages.²¹⁴

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 dangerous 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 2044.²¹⁵ 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.²¹⁶ 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.²¹⁷ Armenian troops have even deployed alongside Russian troops in Syria to the dismay of U.S. policymakers.²¹⁸

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.²¹⁹ 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. In 2020, major fighting broke out along the front lines. After six weeks of fighting, Azerbaijan liberated its internationally recognized territory, "which had been under Armenian occupation since the early 1990s."²²⁰

The conflict ended on November 9, 2020, when Armenia and Azerbaijan signed a Russian-brokered cease-fire agreement.²²¹ As part of the nine-point cease-fire plan, nearly 2,000 Russian peacekeeping soldiers were deployed to certain parts of Nagorno-Karabakh largely populated by ethnic Armenians. In May 2021, tensions rose again in the region but for

a different reason—the demarcation of the Armenian-Azerbaijani border.²²²

The Nagorno-Karabakh 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.²²³ 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."²²⁴

The South Caucasus might seem distant to many American policymakers, but the spill-over 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 having 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.²²⁵ Russia's Hmeimim Air Base is closely located 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

Before and After the Second Karabakh War

The Nagorno-Karabakh region has been defined by nearly three decades of conflict. After a second war in the fall of 2020, Armenia and Azerbaijan finally reached a settlement. Azerbaijan regained much of its territory, and Russian peacekeeping forces now oversee the remaining parts.



SOURCE: Heritage Foundation research.

heritage.org

Tartus naval facility, Russia's only naval foothold in the Mediterranean, and grant Russian warships access to Syrian waters and ports.... The agreement will last for 49 years and could be prolonged further.”²²⁶ 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.²²⁷ In May 2021, the Voice of America reported that Russia is expanding its navy base at Tartus and “planning to construct a floating dock to boost the port’s ship repair facilities.”²²⁸

The agreement with Syria also includes upgrades to the Hmeymim air base at Latakia, including repairs to a second runway.²²⁹ Russia deployed the S-400 anti-aircraft missile system to Hmeymim in late 2015.²³⁰ 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.”²³¹ 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.²³² In August 2020, Syria agreed to give Russia additional land and coastal waters to expand its Hmeymim air base.²³³

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.”²³⁴ The IISS similarly reports that Russia has used Syria as “a test bed for the development of joint operations and new weapons and tactics.”²³⁵ 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.²³⁶

Overall, Russian arms sales abroad reportedly exceeded \$13 billion in 2019, surpassing sales in 2018 by more than \$2 billion.²³⁷

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-10.²³⁸ 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.”²³⁹

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.”²⁴⁰

In October 2018, Egyptian President Abdel Fattah al-Sisi signed a strategic cooperation treaty with Russia.²⁴¹ 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.²⁴² Russia is a major exporter of arms to Egypt, which agreed to purchase 20 Su-35 fighter jets in 2018 for \$2 billion.²⁴³ Production of the Su-35 jets began in May 2020.²⁴⁴

In Libya, Russia continues to support Field Marshal Khalifa Haftar with weapons and military advisers. According to the Department of Defense, Russia’s Wagner Group continues to be involved militarily in Libya.²⁴⁵ Despite its ties to Haftar, Russia has also focused on

growing business ties with the Libyan government in Tripoli.²⁴⁶

Russia has stepped up its military operations in the Mediterranean significantly, often harassing U.S. and allied vessels involved 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.”²⁴⁷ 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.²⁴⁸

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.²⁴⁹ In February 2020, General Wolters revealed that Russian submarines are becoming more active and harder for the United States to track.²⁵⁰

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.²⁵¹

Senior members of the Russian government have alleged that NATO enlargement in the Balkans is one of the biggest threats to Russia.²⁵² In June 2017, Montenegro became NATO’s 29th member state, and in March 2020, North Macedonia became NATO’s 30th member state, both joining Albania and Croatia 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.”²⁵³

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. Russia was the largest investor in Montenegro until October 2020, when it was surpassed by China.²⁵⁴

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.²⁵⁵ In 2018, after North Macedonia was invited to join NATO, Russia's ambassador to the EU stated that "there are errors that have consequences."²⁵⁶ 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.²⁵⁷

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.²⁵⁸

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."²⁵⁹

In February 2020, Serbia purchased the Pantsir S1 air-defense system from Russia despite objections and potential sanctions from the United States.²⁶⁰ Russia has used its cultural ties to increase its role in Serbia, 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.²⁶¹

Serbia and Russia have signed a strategic partnership agreement that is 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.²⁶²

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. An agreement between the two countries was signed in October 2019 "following veiled warnings from the European Union."²⁶³ 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.²⁶⁴

However, Serbia still participates in military exercises far more often 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."²⁶⁵ 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.²⁶⁶ 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."²⁶⁷

In many ways, Russia's relationship with Republika Srpska is akin to its relationship with Georgia's South Ossetia and Abkhazia occupied regions: more like a relationship with another sovereign state than a relationship with a semi-autonomous 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.²⁶⁸ In October 2018, just days before elections, Dodik again visited Russia where he watched the Russian Grand Prix in a VIP box with Putin.²⁶⁹ 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.²⁷⁰

On January 9, 2020, Bosnian Serbs again held "statehood day."²⁷¹ 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'."²⁷² 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."²⁷³ Veterans organizations in Russia and Republika Srpska have developed close ties.²⁷⁴

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."²⁷⁵

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."²⁷⁶

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—and with the significant exception of the Kerch Strait—this remains largely true with respect to the security of and free passage through shipping lanes. The maritime domain is heavily patrolled by the navies and coast guards of NATO and NATO partner countries, and except in remote areas in the Arctic Sea, search and rescue capabilities are readily available. Moreover, 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.”²⁷⁷ In April 2018, a fully armed Russian jet buzzed a French frigate operating in the eastern Mediterranean.²⁷⁸

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.”²⁷⁹ Thus, any disruption would cause a catastrophic reduction in the flow of capital.

The *Yantar*, a mother ship to two Russian minisubmersibles, 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.²⁸⁰ 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 2018.²⁸¹

Airspace. Russia has continued its provocative military flights near U.S. and European

airspace over the past year. In April 2021, Lieutenant General David Krumm from Joint Base Elmendorf–Richardson, Alaska, revealed that during the past year, there was a large increase in Russian activity and the U.S. intercepted more than 60 Russian aircraft.²⁸² That was the “most action the Alaska Air Defense Identification Zone—a region spanning 200 nautical miles that reaches past U.S. territory and into international airspace—ha[d] seen since the Soviet Union fell in 1991.”²⁸³ In October 2020, F-22 Raptor stealth fighter jets scrambled “to intercept Russian long-range bombers and fighters flying off Alaska’s coast” in “the 14th such incident off Alaska’s coast in 2020.”²⁸⁴

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.²⁸⁵ 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.²⁸⁶

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.²⁸⁷

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.²⁸⁸ 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.²⁸⁹ Nor is it only MPAs that fly near Japan; for instance, Russian Su-24 attack aircraft were intercepted in December 2018 and January 2019 incidents.²⁹⁰ 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.²⁹¹

The principal threat from Russian airspace incursions, however, remains near NATO territory in Eastern Europe, specifically in the Black Sea and Baltic regions. In the Black Sea region, in December 2020, Russia scrambled one of its Su-30 fighter jets to prevent U.S. and French reconnaissance planes from crossing the Russian border, even though they were flying over international waters.²⁹² In March 2021, NATO fighter jets scrambled 10 times in one day “to shadow Russian bombers and fighters during an unusual peak of flights over the North Atlantic, North Sea, Black Sea and Baltic Sea.”²⁹³ In the Baltics, in April 2021, “NATO scrambled fighter jets from bases in Estonia, Lithuania and Poland to track and intercept Russian fighters, bombers and surveillance aircraft over the Baltic Sea.”²⁹⁴

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.²⁹⁵ In September 2019, a Russian Air Force Sukhoi Su-34 fighter flew over Estonian airspace without filing a flight plan or maintaining radio contact with Estonian air navigation officials because the plane’s transponder had been switched off. This was the second violation of Estonia’s airspace by a Russian aircraft in 2019.²⁹⁶ In August 2019, two Russian Su-27 escort jets flew over the Baltic Sea without a flight plan and without turning on their transponders.²⁹⁷

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.’”²⁹⁸

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.²⁹⁹

Russia continued to conduct cyberattacks on government and private entities in 2020 and 2021. In December 2020, Russian hackers “broke into a range of key government networks, including in the Treasury and Commerce Departments, and had free access to

their email systems.”³⁰⁰ According to *The New York Times*, “[a]bout 18,000 private and government users downloaded a Russian tainted software update—a Trojan horse of sorts—that gave its hackers a foothold into victims’ systems, according to SolarWinds, the company whose software was compromised.”³⁰¹ Multiple U.S. government agencies, the Pentagon, nuclear labs, and several *Fortune* 500 companies had been using the SolarWinds software on their computers.³⁰²

In April 2021, the U.S. Treasury sanctioned Russia for the SolarWinds hack. It also sanctioned 32 Russian “entities and individuals” who had carried out “Russian government-directed attempts to influence the 2020 U.S. presidential election, and other acts of disinformation and interference.”³⁰³

In May 2021, a Russia-based hacking group known as DarkSide launched a cyberattack against Colonial Pipeline, “the operator of one of the nation’s largest fuel pipelines.”³⁰⁴ The 5,500-mile pipeline, “responsible for carrying fuel from refineries along the Gulf Coast to New Jersey,” was down for six days.³⁰⁵ Colonial Pipeline paid DarkSide \$90 million in bitcoin as a ransom payment,³⁰⁶ but the Department of Justice was able to recover approximately \$2.3 million of that amount a few weeks later.³⁰⁷ In June 2021, REvil, a Russian cybercriminal group, launched a ransomware attack on JBS, “the world’s largest meat processing company.”³⁰⁸ As a result of the cyberattack, JBS was forced to shut down all nine of its U.S. plants for a brief period.³⁰⁹

However, the United States is not 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.”³¹⁰ 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. Cyber activity continues to be a significant part of Russia’s efforts to manipulate and undermine democratic elections in Europe and elsewhere.

In addition to official intelligence and military cyber assets, Russia employs 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.”³¹¹

Russia’s cyber capabilities are advanced and of key importance 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 its 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 with respect to America's allies in the region is different. 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 ensure their continued relevance.

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 2021 Worldwide Threat Assessment states:

Moscow will continue to employ a variety of tactics this year meant to undermine US influence, develop new international norms and partnerships, divide Western countries and weaken Western alliances, and demonstrate Russia's ability to shape global events as a major player in a new multipolar international order. Russia will continue to develop its military, nuclear, space, cyber, and intelligence capabilities, while actively engaging abroad and leveraging its energy resources, to advance its agenda and undermine the United States.³¹²

For these reasons, the *Index of U.S. Military Strength* continues to assess the threat from Russia as "aggressive" and "formidable."

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 and proxy militias 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 and reaching 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.

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, of all of the world’s terrorist groups, Hezbollah had murdered the most Americans. 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. Today, it 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; and
- The June 25, 1996, Khobar Towers bombing, which killed 19 American servicemen stationed in Saudi Arabia.

In addition:

- Hezbollah operatives were later found to have been responsible for the 1984 murder of American University of Beirut President Malcolm Kerr and the June 14, 1985, murder of U.S. Navy diver Robert Stethem, who was a passenger on TWA Flight 847, which was hijacked and diverted to Beirut International Airport.
- In March 1984, Hezbollah kidnapped William Buckley, the CIA station chief in Beirut, who died in captivity in 1985 after being tortured for more than a year.²
- Hezbollah 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 kidnapped Colonel William Higgins, a Marine officer serving with the United Nations Truce Supervision

Organization in Lebanon, in February 1988 and killed him in 1989.

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.

Hezbollah 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. 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 to the survival of the Assad regime after the Syrian army was hamstrung by casualties, defections, and low morale.

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.³

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.⁴ 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."⁵

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 Lebanese immigrant 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.⁶

In January 2020, after a spate of attacks on U.S. military personnel and the U.S. embassy in Iraq provoked a U.S. unmanned aerial vehicle (UAV) strike that killed Iranian General Qassem Soleimani, leader of the Quds Force of Iran's Islamic Revolutionary Guard Corps (IRGC), U.S. intelligence officials warned about the potential Hezbollah threat to the U.S. homeland. The Department of Homeland Security warned in a January 4, 2020, bulletin that "Iran and its partners, such as Hizballah, have demonstrated the intent and capability to conduct operations in the United States."⁷

Four days later, the U.S. intelligence community warned that if Iran decided to carry out a retaliatory attack in the United States, it "could act directly or enlist the cooperation of proxies and partners, such as Lebanese Hezbollah."⁸ Then, on January 12, 2020, Hezbollah leader Hassan Nasrallah publicly threatened U.S. forces in the Middle East: "The U.S. administration and the assassins will pay a heavy price, and they will discover their miscalculation."⁹

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 Nicolás 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."¹⁰

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 is not likely to develop missiles capable of reaching the United States until 2025 at the earliest.¹¹ Iran has launched several satellites with space launch vehicles that use similar technology, which could also be adapted to develop an ICBM capability.¹²

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.¹³ 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. Iran is the only country in history that has developed missiles with a range of 2,000 kilometers without first having nuclear weapons.

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, 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 import 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.¹⁴ It also has developed its capacity to reverse engineer and build its own versions of ballistic missiles, rockets, 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.¹⁵

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.¹⁶ 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 2019.¹⁷ In 2020, defense spending declined again to an estimated \$14.1 billion.¹⁸

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."¹⁹ 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.²⁰ 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.²¹ 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.²²

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 could not be delivered until after the U.N. arms embargo expired in October 2020. 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."²³

Russia and Iran have not announced any arms deals since the expiration of the U.N. arms embargo. Moscow may be waiting to see whether the Iran nuclear agreement can be renegotiated, thereby enabling it to receive payments from Iran after U.S. financial sanctions are lifted.

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 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 Iran-backed Shiite militia fighters from Lebanon, Iraq, Afghanistan, and Pakistan.²⁴ Tehran escalated to deploy a force of almost 80,000 Shia militia fighters commanded by nearly 2,000 IRGC officers.²⁵

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.²⁶ 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.²⁷

Although Russia reportedly helped to arrange the withdrawal of Iranian heavy weapons to positions 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.²⁸ 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 2018.²⁹ 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.³⁰ 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.³¹ Israel launched a series of air strikes against Iranian forces and proxy militias in eastern Syria in January 2021, reportedly to prevent Iranian ballistic missiles, cruise missiles, and UAVs that have been deployed in western Iraq from being deployed inside Syria.³² Israel also has targeted Iranian forces and ballistic missiles inside Iraq.³³

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 Iranian 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.³⁴

In 2019, Tehran ratcheted up surrogate attacks in Iraq against U.S. troops 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 on January 2, 2020, with a drone strike that killed General Qassem Soleimani, 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.³⁵

After a February 15, 2021, rocket attack on an airport in Erbil, Iraq, killed a U.S. contractor, the U.S. retaliated with air strikes against seven targets inside Syria that were controlled by two Iran-backed Iraqi militias, Kataib Hezbollah and Kataib Sayyid al-Shuhada, that were found to have been responsible for the Erbil attack.³⁶ Attacks by Iran-backed militias have continued in Iraq, including UAV strikes that pose a growing threat to the 2,500 U.S. troops that train and support Iraqi security forces.³⁷

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 lion's share 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.³⁸ 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.³⁹ 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 UAVs 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 Saudi Arabian branch of Hezbollah 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.

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. Department of Defense, Defense Intelligence Agency, *Iran Military Power: Ensuring Regime Survival and Securing Military Dominance*, 2019, p. 43, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Iran_Military_Power_LR.pdf (accessed July 23, 2021).

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 who were seeking to escape Lebanon's civil war and took root among Lebanese Shi'ite immigrant communities throughout Europe. German intelligence officials have estimated that about 1,250 Hezbollah members and supporters were living in Germany in 2020.⁴⁰ Hezbollah also has developed an extensive web of fundraising and logistical support cells throughout Europe.⁴¹

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 peace-keeping force in Lebanon, which killed 58 French soldiers on the same day that 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, if Hezbollah decided to revive its aggressive operations in southern Lebanon, European participation in Lebanese peacekeeping operations, which became a lightning rod for Hezbollah terrorist attacks in the 1980s, could again become an issue. 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.⁴² On April 30, 2020, Germany designated Hezbollah as a terrorist organization after Israel provided intelligence on a Hezbollah stockpile of ammonium nitrate intended to make explosives that were stored in a German warehouse.

Mounting Missile Threat. Iran possesses the largest number of deployed missiles in the Middle East.⁴³ 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."⁴⁴ 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.⁴⁵

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 Arabia's 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.⁴⁶

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. Of the 16 short-range ballistic missiles launched from three bases inside Iran, 12 reached their targets: 11 struck al-Asad air base in western Iraq, and one struck a base near the northern Iraqi city of Irbil.⁴⁷ No U.S. personnel were killed, but more than 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. Based on Soviet-designed Scud missiles, the Shahabs 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."⁴⁸

Iran is not a member of the Missile Technology Control Regime. Instead, 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.⁴⁹

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.⁵⁰ 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.⁵¹

Iran's ballistic missiles threaten 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 such proxy groups 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."⁵² 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." However, 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. In April 2021, Hamas and Palestinian Islamic Jihad launched more than 4,000 rockets and missiles in an 11-day mini-war with Israel.⁵³

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.⁵⁴

Before the 2015 nuclear deal, Iran had accumulated enough low-enriched uranium to build eight nuclear bombs (assuming that 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."⁵⁵ 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."⁵⁶ 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.⁵⁷

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 would 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 were unable to offset the strength of U.S. nuclear sanctions that were fully reimposed by November 4, 2018, after a 180-day wind-down period.

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.⁵⁸ 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.⁵⁹

Although President Trump made it clear that he sought a new agreement on Iran's nuclear program, Tehran refused to return to the negotiating table. Instead, it 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.⁶⁰ Tehran gave the Europeans 60 days to deliver greater sanctions

relief, specifically with respect to oil sales and banking transactions, and warned that if the terms of its ultimatum were 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 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.⁶¹

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."⁶² By February 16, 2021, Iran had accumulated about 4,390 kilograms of low-enriched uranium and had reduced its estimated breakout time to as little as 2.7 months, with enough enriched uranium to arm three nuclear weapons within six months if it continued to enrich to higher levels.⁶³ 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.

On April 11, 2021, Iran's uranium enrichment efforts were disrupted by an explosion that cut power and damaged centrifuges at the underground Natanz enrichment facility, Tehran blamed the explosion and damage on Israeli sabotage.⁶⁴ Iran announced it would raise enrichment levels to 60 percent, much closer to the 90 percent enrichment level required for a nuclear weapon, in retaliation for the loss of centrifuge capacity.

The future of Iran's nuclear program is being negotiated at indirect talks between Iran and the United States hosted by the European Union in Vienna, Austria.

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.⁶⁵ 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.”⁶⁶

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 that are 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. At the same time, however, 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, including some whose ideology it does not necessarily share. Today, for example, Iran’s surrogates Hezbollah and Palestinian Islamic Jihad, along with more distantly aligned 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. Hezbollah has amassed at least 130,000 rockets and missiles—more than all of the European members of NATO combined.⁶⁷ Some of the most dangerous are long-range Iranian-made missiles capable of striking cities throughout Israel.⁶⁸ 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.⁶⁹ Iran and Hezbollah also have established another potential front against Israel in Syria.

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 during brief wars in 2008–2009, 2012, and 2014.⁷⁰ 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 has greatly mitigated this threat in recent years. In the 2014 Gaza 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.⁷¹ In May 2021, Hamas and Palestinian Islamic Jihad launched another 11-day war against Israel during which they launched about 4,300 rockets at Israel, killing 12 Israelis while suffering over 240 Palestinian deaths, including roughly 200 militants, according to Israel.⁷² 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, Iraq, 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."⁷³ After Bahrain stripped a senior Shiite cleric, Sheikh Isa Qasim, of his citizenship, General Qassem Soleimani, commander of the IRGC's Quds Force, threatened to make Bahrain's royal family "pay the price and disappear."⁷⁴

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 responded to the execution by attacking and setting fire to the Saudi embassy in Tehran.⁷⁵

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, Iraq, 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, 2019.⁷⁶ The Houthis have employed Iranian Sammad-2 and Sammad-3 UCAVs in strikes against Riyadh, Abu Dhabi International Airport in the UAE, and other targets.⁷⁷

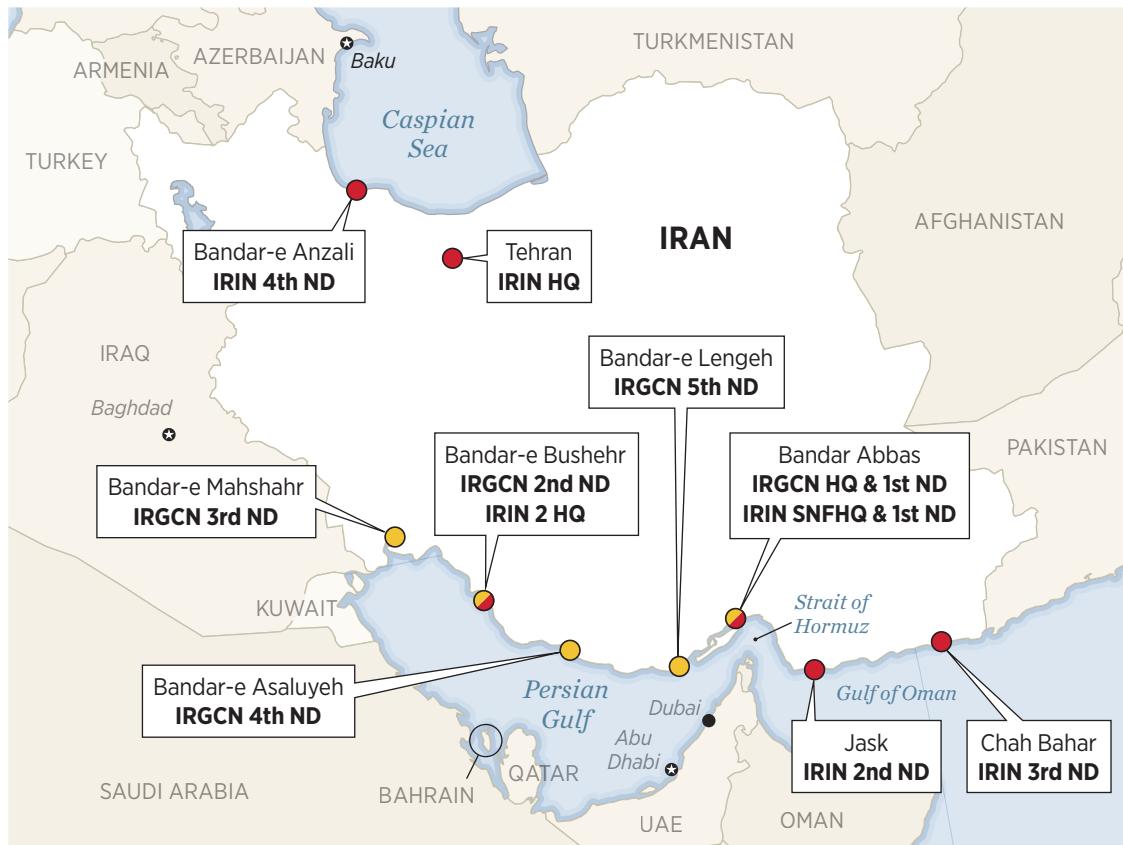
Threats to the Commons

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 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 the world's crude oil and held about 48 percent of

Iranian Naval Headquarters

● Islamic Republic of Iran Navy Headquarters ● Islamic Revolutionary Guard Corps Navy Headquarters



ND — Naval district

SOURCE: U.S. Department of Defense, Defense Intelligence Agency, *Iran Military Power: Ensuring Regime Survival and Securing Military Dominance*, 2019, p. 48, https://www.dia.mil/Portals/27/Documents/News/Military%20Power%20Publications/Iran_Military_Power_LR.pdf (accessed July 23, 2021).

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global proved crude oil reserves.⁷⁸ 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. 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.

The world's most important maritime choke point and the jugular vein through

which most Gulf oil exports flow to Asia and Europe is the Strait of Hormuz. In 2018, the “daily oil flow [through the Strait of Hormuz] averaged 21 million barrels per day (b/d), or the equivalent of about 21% of global petroleum liquids consumption.”⁷⁹ The chief potential threat to the free passage of ships through the strait is Iran, whose Supreme Leader, Ayatollah Ali Khamenei, proclaimed 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.”⁸⁰

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.”⁸¹

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.⁸² 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.⁸³ 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.⁸⁴ Iran continued its aggressive behavior, launching a sophisticated UCAV and cruise missile attack on Saudi oil facilities in September 2019.

In late 2019, Iranian-controlled Iraqi militias launched a series of rocket attacks on Iraqi bases containing U.S. troops, provoking U.S. retaliatory air strikes against those militias and the January 2020 UCAV strike that killed General Qassem Soleimani. 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 15.⁸⁵ The incident raised questions about the competence and training of Iran’s naval forces. The June 2, 2021, sinking of the *Kharg*, Iran’s largest warship, raised similar questions. The *Kharg*, a naval replenishment ship, caught fire and sank in the Gulf of Oman during a training exercise.

However, while Iran’s military forces have suffered numerous accidents because of lax maintenance and safety practices, there also was speculation that the *Kharg* might have been sabotaged in a covert Israeli attack. Israel reportedly has attacked at least 12 Iranian vessels transporting oil, arms, and other cargo to Syria to prop up the Assad regime and bolster Hezbollah.⁸⁶ It also has been suspected of triggering the April 6, 2021, explosion that damaged the *Saviz*, a converted cargo ship permanently moored in the Red Sea near the coast of Yemen to collect intelligence and support Iran’s Houthi allies.⁸⁷ For its part, Iran is the leading suspect in two attacks on Israeli-owned cargo ships: one on February 25, 2021, in the Gulf of Oman and another on March 25, 2021, in the Arabian Sea.⁸⁸ Although its contours remain murky, it is clear that the Iran-Israel shadow war has expanded to include maritime attacks.

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, 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 pressure Iraq economically 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. Since the 1990s, however, 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 represent 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 in addition to 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 UAE: 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. It also 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, and 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.⁸⁹ 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.⁹⁰ 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.⁹¹ 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 and 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.⁹² Iran also could use minisubmarines, helicopters, or small boats disguised as fishing vessels to deploy its mines. Iran's robust mine warfare capability and the U.S. and allied navies' limited capacity for countermine operations are major challenges to Gulf maritime security.⁹³

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.”⁹⁴ 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. It 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.⁹⁵ Then, on May 14, 2015, the *Alpine Eternity*, a Singapore-flagged oil tanker, 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.⁹⁶

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 Revolutionary Guard's confrontational tactics in the Gulf.⁹⁷ IRGC naval forces 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.⁹⁸ Even though 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, 2017.⁹⁹ 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.¹⁰⁰ One week later, President Trump warned that U.S. Navy forces were authorized to destroy any Iranian vessels that harassed them. Iran's naval harassment subsided, but resumed in April 2021, when the IRGC Navy staged two incidents, forcing U.S. naval vessels to take evasive action in one and fire warning shots in the second.¹⁰¹

Iran has been accused of spoofing satellite navigation systems to lure foreign ships into its territorial waters so that it can seize them. This may have occurred in 2016 when 10 U.S. sailors were captured near an Iranian island and in 2019 when the *Stena Impero* tanker was seized in the Strait of Hormuz.¹⁰² Iran also may have used a similar technique to divert a U.S. UAV from Afghan airspace to Iran, where it was captured and put on display in 2011.

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."¹⁰³ 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.¹⁰⁴ 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 imports of 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.¹⁰⁵ 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 boat 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, 2019.¹⁰⁶ 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 25.¹⁰⁷ 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.¹⁰⁸ On March 7, 2021, the Houthis launched long-range UAVs and ballistic missiles provided by Iran at Saudi Arabia's Ras Tanura oil shipment facility, the largest in the world, driving oil prices up to over \$70 per barrel for the first time since the COVID-19 pandemic depressed the global economy.¹⁰⁹

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.¹¹⁰

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."¹¹¹

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.¹¹²

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-27.¹¹³ The technology probably was transferred by North Korea, which built its BM-25 missiles using the R-27 as a model.¹¹⁴ 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

2013.¹¹⁵ 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.”¹¹⁶ 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).¹¹⁷ The satellite launch failed, as did another Simorgh-boosted satellite launch in January 2019.¹¹⁸

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 from a secret missile base to celebrate the 41st anniversary of the IRGC’s founding. 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.¹¹⁹ General Jay Raymond, commander of U.S. Space Command, dismissed the satellite as a “tumbling webcam in space,” but 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.¹²⁰ 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.

On February 2, 2021, Iran’s Defense Ministry announced the successful development of a new satellite launch vehicle, the Zuljanah. The first two stages of the three-stage rocket use solid fuel, and the rocket can be launched from a mobile launch pad—two characteristics more suitable for a weapons system than for a satellite launch system.¹²¹

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.”¹²²

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. The Ajax Security Team, a hacking group 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.¹²³ The group also has targeted dissidents within Iran, seeding versions of anti-censorship tools with malware and gathering information about users of those programs.¹²⁴ Iran has invested heavily in cyber activity, reportedly spending “over \$1 billion on its cyber capabilities in 2012 alone.”¹²⁵

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.¹²⁶

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.”¹²⁷ 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.¹²⁸ 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.¹²⁹

Israel has been a major target of Iranian cyberattacks. In 2014, Iranian hackers launched denial-of-service attacks against the infrastructure of the Israel Defense Forces. 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.”¹³⁰ 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.¹³¹ In September 2020, a hacker group linked to Iran targeted “many prominent Israeli organizations” according to the Israeli cybersecurity company Clearsky. The group, named MuddyWater, used malware disguised as ransomware that would encrypt files and demand payment but not allow the files to be accessed.¹³²

In the fall of 2015, U.S. officials warned of a surge of sophisticated computer espionage by Iran that would include a series of cyberattacks against State Department officials.¹³³ 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.¹³⁴ 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.¹³⁵

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.¹³⁶ 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).¹³⁷

On November 4, 2020, the U.S. Department of Justice announced that it had seized 27 domain names used by Iran’s IRGC in a global covert influence campaign.¹³⁸ The Office of the Director of National Intelligence released a report on March 16, 2021, assessing that during the 2020 U.S. presidential election:

Iran carried out a multi-pronged covert influence campaign intended to undercut former President Trump’s reelection prospects—though without directly promoting his rivals—undermine public confidence in the electoral process and US institutions, and sow division and exacerbate societal tensions in the US.¹³⁹

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. 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 field. The development of its ballistic missiles and potential nuclear capability also mean that it poses a significant long-term threat to the security of the U.S. homeland.

This *Index* therefore assesses the overall threat from Iran, considering the range of contingencies, as “aggressive.” Iran’s capability score holds at “gathering.”¹⁴⁰

Threats: Iran

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
Behavior		✓			

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
Capability		✓			

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140. This *Index* scores threat capability as it relates to the vital national interests of the United States 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 more than a decade.

North Korea

Bruce Klingner

North Korea is a perennial problem in Asia because of the regime's consistently provocative behavior and sustained investment in missile, nuclear, and cyber technologies that it sees as essential to maintaining power domestically and asserting its will internationally. Though not on the same scale as the threat posed by China or Russia, the threat that North Korea poses to the stability and security of the region and, given its developments in nuclear weapon delivery systems and cyberwarfare capabilities, to the United States and U.S. interests is significant.

Pyongyang now has a spectrum of missile systems that threaten the continental United States as well as U.S. forces and allies in Asia with nuclear weapons. On assuming power in 2011, Kim Jong-un accelerated nuclear and missile testing and oversaw an expansive diversification of North Korea's arsenal. New weapons overcame the shortcomings of their predecessors and now pose a far greater threat to allied forces in spite of advancements in missile defense systems.

Threats to the Homeland

In 2017, North Korea conducted three successful tests of two variants of its road-mobile intercontinental ballistic missile (ICBM), which "is capable of reaching anywhere in the U.S. mainland, according to United States Forces Korea's (USFK) first official assessment of the long-range missile."¹ In its October 2020 parade, North Korea revealed a new massive ICBM that may have the ability

to carry multiple warheads. In January 2021, Kim Jong-un declared that North Korea was in the final stages of perfecting the guidance technology for multi-warhead missiles.² Such missiles, combined with Pyongyang's recently confirmed ability to produce ICBM transporter-erector-launchers indigenously, risks overwhelming the limited missile defenses protecting the American homeland.

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 those of the Hiroshima and Nagasaki atomic bombs of World War II. In 2017, the U.S. Intelligence Community assessed that Pyongyang may have produced 30–60 warheads³ and can create enough fissile material for at least seven and as many as 12 warheads per year.⁴ By 2027, North Korea could have 200 nuclear weapons and several dozen ICBMs.⁵

Pyongyang has created a new generation of advanced mobile missiles that are more accurate, survivable, and capable of evading allied missile defenses. Pyongyang's evolving nuclear and missile forces increasingly give the regime the ability to conduct a surprise preemptive first-strike, retaliatory second-strike, and battlefield counterforce attacks.

In 2016 and 2017, North Korea 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, its highest-ever number of annual violations of U.N. resolutions. In March 2020, Pyongyang conducted another nine short-range missile launches, all of which were violations of U.N. resolutions.

In 2019, the regime unveiled five new short-range missile systems threatening South Korea, including a 400mm multiple rocket launcher (MRL); the KN-23 maneuverable missile, which is similar to the Russian Iskander; the KN-24 missile, which is similar to the U.S. Army's ATACMS; the KN-25 600mm MRL; and the Pukguksong-3 SLBM. The enhanced accuracy of these systems enables North Korea to accomplish counterforce operations with fewer missiles.

The KN-18 and KN-21 Scud variants have maneuverable reentry vehicles, and the KN-23's flight profile showed evasive characteristics instead of a typical ballistic parabola. The KN-23 was flown at depressed trajectories, potentially between the upper reach of Patriot missiles and below the minimum intercept altitude for Terminal High Altitude Area Defense (THAAD), with a final pull-up maneuver that provides a steep terminal descent,⁷ revealing that North Korea has studied U.S. and South Korean defensive systems in order to gain a military advantage with weapons that exploit gaps in coverage. The KN-23 could also be used in a first strike against leadership, hardened command and control, or high-value military targets.

North Korea has successfully tested the Pukguksong-1 (KN-11) and Pukguksong-3 (KN-26) SLBMs, which could target South Korea and Japan, potentially with a nuclear warhead. In its October 2020 and January 2021 parades, North Korea revealed the Pukguksong-4 and Pukguksong-5 SLBM missiles.

South Korea does not currently have defenses against SLBMs. Because the THAAD ballistic missile defense (BMD) system radar is limited to a 120-degree view that is directed toward North Korea, it cannot protect against SLBMs arriving from either the East or West Seas.⁸ The SM-2 missile currently deployed on

South Korean destroyers provides protection only against anti-ship missiles.

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."⁹ 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 had not agreed to do so and that the two sides still did not even have a common definition of "denuclearization" or what constitutes the Korean Peninsula. After October 2019, working-level diplomatic meetings collapsed, and North Korea rejected any further dialogue.

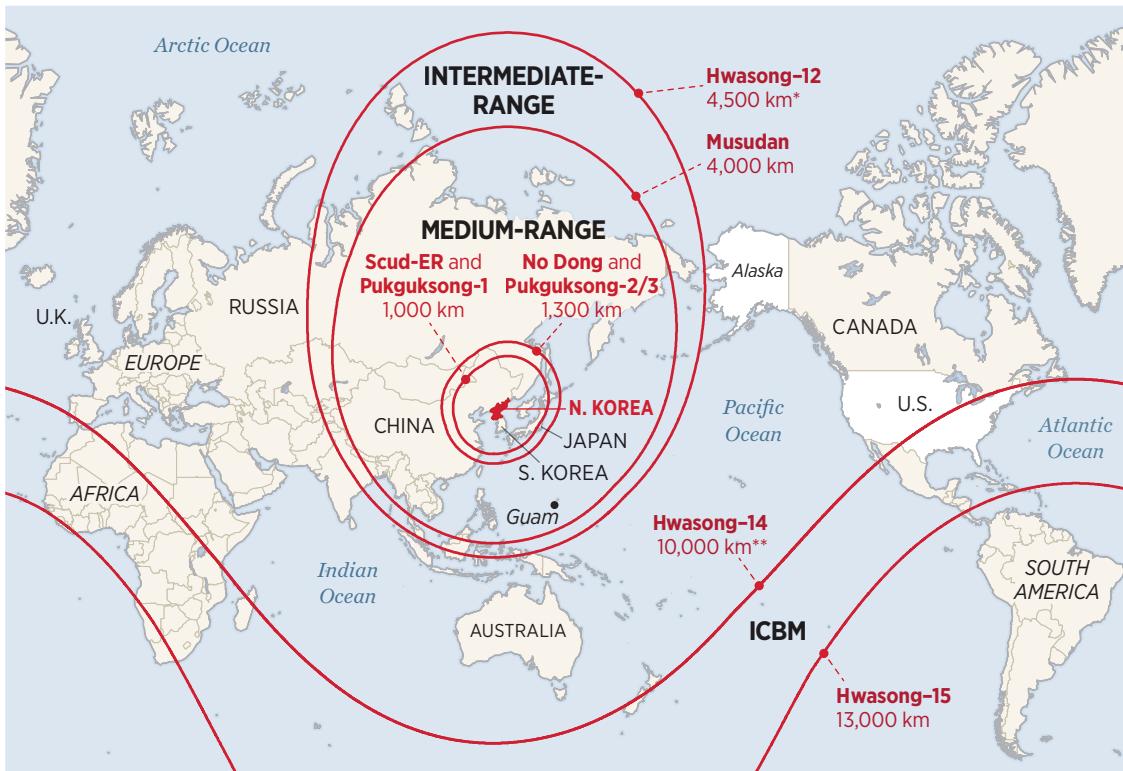
Despite three U.S.–North Korea summit meetings, there was no progress on denuclearization during the Trump Administration and no decrease in North Korea's weapons of mass destruction (WMD) arsenal or production capabilities. Pyongyang continued to increase its production of fissile material for nuclear weapons, and satellite imagery showed upgrades to missile, reentry vehicle, missile launcher, and nuclear weapon production facilities.¹⁰ The Intelligence Community assessed that North Korea "is unlikely to give up all of its WMD stockpiles, delivery systems, and production capabilities."¹¹

Threat of Regional War

In addition to its nuclear and missile forces, North Korea has approximately 1 million people in its military and reserves numbering several million more. Pyongyang has forward-deployed 70 percent of its ground forces, 60 percent of naval forces, and 40 percent of naval forces south of the Pyongyang–Wonsan line. South Korea assesses that North Korean forces "maintain a readiness posture capable of carrying out a surprise attack on the South at any time."¹²

The April 2018 inter-Korean summit led to bilateral pledges of nonaggression and mutual force reduction. Similar pledges were also

North Korean Missiles Can Target South Korea, Japan, U.S. Bases in Guam, and the United States



* First tested May 2017. ** First tested July 2017.

SOURCES: Heritage Foundation research and media reports.

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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 sought to reduce the danger that inadvertent tactical military clashes along the Demilitarized Zone (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 in 18-year-old conscripts, South Korea initiated a

comprehensive defense reform strategy to transform its military into a smaller but more capable force to deal with the North Korean threat. Overall, South Korean military manpower will be reduced approximately 25 percent, from 681,000 to a planned goal of 500,000. As of 2020, the South Korean military had a total strength of 550,000: 420,000 in the army, 70,000 in the navy, and 65,000 in the air force.¹³ Seoul planned to compensate for decreased troop levels by procuring advanced fighter and surveillance aircraft, naval platforms, and ground combat vehicles.¹⁴

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.

Since 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. North Korea has deployed hundreds of 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 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 including nuclear weapons.¹⁵ North Korea has conducted several missile exercises and has subsequently announced that they were practice drills for preemptive nuclear attacks on South Korea and Japan.¹⁶

Threats to the Commons

Pyongyang has developed an advanced cyberwarfare prowess that is surpassed by that of few other nations. From initial rudimentary distributed denial-of-service (DDoS) attacks against South Korea, the regime has improved its cyber programs to create a robust and global array of disruptive military, financial, and espionage capabilities.

North Korea leader Kim Jong-un declared that cyber warfare is a “magic weapon”¹⁷ and an “all-purpose sword that guarantees the North Korean People’s Armed Forces ruthless striking capability, along with nuclear weapons and missiles.”¹⁸ In the run-up to a crisis or as an alternative to kinetic strikes, the regime could conduct cyberattacks on government and civilian computer networks controlling communications, finances, and infrastructure such as power plants and electrical grids.

As its cyber proficiencies have evolved, Pyongyang has implemented ever more sophisticated techniques and prioritized financial targets to evade international sanctions and increase its ability to finance its nuclear and missile programs. Pyongyang has conducted cyber guerrilla warfare to steal classified military secrets in addition to absconding with billions of dollars in money and cyber currency, holding computer systems hostage, and inflicting extensive damage on computer networks.

To the extent that the cyber domain is a “global commons” used by all people and countries, North Korea’s investment in and exploitation of cyberwarfare capabilities presents a very real threat in this domain.

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 has also 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 the capability to reach the continental United States with a missile.

This *Index* assesses the overall threat from North Korea, considering the range of contingencies, as “testing” for level of provocative 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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Non-State Actors

James Phillips and Jeff Smith

Terrorist groups come in many forms but have one thing in common: the use of violence to achieve their political objectives, whether those objectives are 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.¹

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 America'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 Arab foreign fighters 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 revolutionary vanguard that would radicalize and recruit Sunni Muslims across the world and lead a global Islamist revolution.²

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, Iraq, Pakistan, Syria, Yemen, and Somalia. However, al-Qaeda's central leadership remains a potential threat to the U.S. homeland. Key elements of al-Qaeda's leadership have survived or been replaced. Bin Laden's successor as emir, Ayman al-Zawahiri, was forced deeper into seclusion and reportedly is sick or already dead from natural causes.³ Some al-Qaeda lieutenants are believed still to be in the Afghanistan–Pakistan region; others have taken refuge in Iran.⁴ Zawahiri's likely successor, Mohammed Salahuddin Zeidan, reportedly also is based in Iran, where he operates under the nom de guerre Saif al-Adel ("Sword of Justice").⁵

Like scores of other al-Qaeda members in Iran, Zeidan experienced imprisonment, some form of house arrest, and periods of relative freedom to operate inside Iran, depending

on the state of relations between Iran and al-Qaeda. Although both share common enemies in the United States, Israel, and Sunni Arab regimes, they represent clashing Shia and Sunni Islamist ideologies and pursue conflicting long-term goals in Iraq, Lebanon, Syria, and Yemen.

Iran's Islamic Revolutionary Guard Corps (IRGC) played an important role in establishing links with al-Qaeda in the early 1990s, when Bin Laden was based in Sudan. According to the report of the 9/11 Commission, the IRGC trained al-Qaeda members in camps in Lebanon and in Iran, where they learned to build much bigger bombs. The commission assessed that al-Qaeda may have assisted Iran-backed Saudi Hezbollah terrorists who executed the June 1996 bombing that killed 19 U.S. Air Force personnel at the Khobar Towers residential complex in Saudi Arabia and recommended that further investigation was needed to examine Iran's ties to al-Qaeda.⁶

This long-neglected issue resurfaced in 2020 after *The New York Times* reported that al-Qaeda's second-highest leader was killed in the heart of Iran's capital city on August 7, 2020, by Israeli agents at the behest of the United States.⁷ The al-Qaeda leader, Abdullah Ahmed Abdullah, who went by the nom de guerre Abu Muhammad al-Masri, had been living in Iran at least since 2003 when he had fled from Afghanistan. Abdullah was a longtime fixture on the FBI's "most wanted" list for his role in planning the August 7, 1998, bombings of the U.S. embassies in Kenya and Tanzania, which killed 224 people including 12 Americans. He was gunned down on a street in Tehran by two assassins on a motorcycle on the anniversary of that attack, which was al-Qaeda's most lethal operation before 9/11.⁸

On January 12, 2021, then-Secretary of State Mike Pompeo confirmed the *New York Times* report about Abdullah's death and warned that Iran had become the "new Afghanistan."⁹ He also announced sanctions on two al-Qaeda leaders that continue to operate inside Iran.

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 enjoyed some success in exploiting local conflicts. 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.¹⁰

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.¹¹ 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*.¹²

After 9/11 and following crackdowns in other countries, Yemen became increasingly important as a base of operations for al-Qaeda. In September 2008, al-Qaeda 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. By 2010, CIA analysts assessed that AQAP posed a more urgent threat to U.S. security than the al-Qaeda general command based in Afghanistan/Pakistan.¹³

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 2009.¹⁴ Awlaki was also tied to plots to poison food and water supplies, as well as to launch ricin and cyanide attacks,¹⁵ 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.¹⁶

Since Awlaki's death, the number of AQAP-sanctioned external operations in the West has diminished.¹⁷ 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.¹⁸

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 2012.¹⁹ 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 indications that AQAP was planning a massive attack.²⁰ In January 2015, two AQAP-trained terrorists murdered staff members and nearby police at *Charlie Hebdo* magazine in Paris.²¹ In 2017, aviation was targeted once again by a plan to conceal bombs in laptop batteries.²²

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 the shooter, Mohammed Saeed Al-Shamrani, had been

radicalized by 2015 and was influenced by Awlaki's propaganda.²³

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 2012.²⁴

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 that were targeting the Houthis.²⁵

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.²⁶

In 2018, U.N. experts estimated that AQAP commanded between 6,000 and 7,000 fighters in 2018.²⁷ AQAP has declined since its 2015–2016 peak, losing key leaders to drone strikes and other attacks and suffering manpower losses in factional clashes and defections.²⁸ Nevertheless, it remains a resilient 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, initially named 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.²⁹ 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.³⁰ Most ANF cadres are concentrated in rebel strongholds in northwestern Syria, but the group also has small cells operating elsewhere in the country.

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.³¹ 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.³²

In recent years, the al-Qaeda network in Syria has undergone several name changes, allying itself with various Islamist rebel groups. This has made it more difficult to assess the degree of direct threat that it poses outside of Syria.

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.³³ 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.³⁴

In January 2017, ANF merged with other Islamist extremist movements to create 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 2017.³⁵ HTS suffered many casualties as Syria's Assad regime, backed by Iran and Russia, tightened the noose around its strongholds in northwest Syria. "Since 2017," according to the U.S. Department of State's 2019 *Country Reports on Terrorism*, "ANF has continued to operate through HTS

in pursuit of its objectives." The report further estimated that ANF's strength had fallen to "between 5,000 to 10,000 fighters."³⁶

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 2018.³⁷ Among its ranks were those who defected from HTS, and its suspected emir is an Ayman al-Zawahiri acolyte.³⁸

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 who are loyal to him.³⁹ 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.⁴⁰

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.⁴¹ 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 who once were 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 probably 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 Niger."⁴² 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.⁴³ 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 late in 2012, implementing a brutal version of sharia law, until a French military intervention helped to push them back.

AQIM continues to support and work 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.⁴⁴

AQIM is not known to have targeted the U.S. homeland explicitly 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; diminishing and discrediting Shia Islam, which it considers apostasy; and becoming 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, supported by U.S. and coalition air strikes and special operations forces, liberated Mosul in July 2017. In Syria, U.S.-backed Syrian Democratic Forces militia liberated Raqqa in October 2017, and ISIS's last town (Baghouz) fell in March 2019.

ISIS fighters have dispersed, 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, four American military and civilian personnel were killed in a suicide bombing at a market in Manbij in northern Syria.⁴⁵

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.⁴⁶ 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.⁴⁷

The number of ISIS attacks in Iraq and Syria fell from 776 during the first four months of 2019 to 330 during the same period in 2020.⁴⁸ 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 its strength in remote desert and mountain regions.⁴⁹

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 his successor, 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 seize territory, overthrow governments, and impose its harsh brand of Islamic law.

Although the regional ISIS groups may not pose as great a threat to the U.S. homeland as the original group in Iraq and Syria posed, they represent significant threats to U.S. allies and U.S. forces deployed overseas. 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.⁵⁰ In addition, ISIS has made threats against embassies, including those of the U.S., in its areas of influence.⁵¹

ISIS poses an ongoing threat to life in the West. On May 3, 2015, for example, 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.⁵²

More commonly, however, the ISIS ideology has inspired individuals and small groups to plan attacks in the U.S. According to the GW Extremism Tracker, “228 individuals have been charged in the U.S. on offenses related to the Islamic State...since March 2014, when the first arrests occurred.”⁵³

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.⁵⁴ 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.⁵⁵ The group also claimed responsibility for the October 31, 2017, vehicular attack by Sayfullo Saipov in New York that killed eight.⁵⁶ Saipov, too, had pledged allegiance to ISIS's emir but did not appear to be operationally guided by ISIS.⁵⁷ Such terrorist attacks, incited but not directed by ISIS, are likely to continue for the foreseeable future.

Although its appeal appears to have diminished since the fall of its caliphate in Iraq and Syria, ISIS continues to attract support from

self-radicalized Americans. For example, in April 2021, two men were arrested for attempting to provide material support to ISIS. One received a prison term for providing material support, and one received a prison term for the December 2017 bombing of a New York City subway.⁵⁸

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.⁵⁹

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.⁶⁰ These individuals, who are likely to have received military training, could well pose an ongoing threat upon their return to the U.S. by involving themselves in attack planning or by helping to recruit future generations of jihadists.

ISIS had greater success attracting recruits from Europe, with approximately 6,000 departing from European countries.⁶¹ 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.⁶² 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.⁶³

Similarly, a group of ISIS foreign fighters teamed with local Islamist terrorists in France 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 in November 2015.⁶⁴ 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 2016.⁶⁵

ISIS ideology has also inspired a wave of vehicle and knife 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 2016.⁶⁶ 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.⁶⁷ 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.⁶⁸

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 had produced ricin as part of a suspected attack.⁶⁹ This was the first time that ricin had been 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 more than 1,700 injuries.⁷⁰ 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 2016.⁷¹ 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 2019.⁷²

Terrorist Groups Operating in Afghanistan and Pakistan (Af-Pak)

According to General John W. Nicholson, former Commander of U.S. Forces-Afghanistan, “Of the 98 U.S.-designated terrorist organizations globally, 20 are located in the Afghanistan–Pakistan region. This constitutes the highest concentration of terrorist groups anywhere in the world...”⁷³

A wide variety of Islamist terrorist groups operate from Pakistani territory, many with

the support or sanction of the Pakistani state. Pakistan's military and intelligence leaders maintain a short-term tactical approach of fighting some terrorist groups that are deemed a threat to the state while supporting others that are aligned with Pakistan's goal of extending its influence and curbing India's.

Pakistan's Inter-Services Intelligence (ISI) views terrorist proxies as an extension of Pakistan's foreign policy, and many of these groups advance Pakistan's interests by launching attacks in Afghanistan, Kashmir, or other parts of India.

Some Islamist terrorist groups operating in Pakistan target non-Muslims and Muslim minorities deemed un-Islamic. A smaller number of anti-state terrorist outfits, like the "Pakistani Taliban" or TTP, have targeted Pakistani security forces, though their capabilities have been degraded in recent years by Pakistani military operations.⁷⁴

In 2015, after a series of terrorist attacks against Pakistan's state and security services, the government introduced a National Action Plan (NAP) to reinvigorate the country's fight against terrorism. Pakistani military operations against TTP 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 mostly been declining steadily since 2009.⁷⁵

However, there are few signs that Pakistan's crackdown on terrorism extends to groups that target India such as Lashkar-e-Taiba (LeT), which was responsible for the 2008 Mumbai attacks, and 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 2019.⁷⁶ Pakistani military and intelligence officials also maintain close links to the Taliban and the Haqqani Network.

The Haqqani Network, which operates out of Pakistan's tribal areas, has enjoyed close links to Pakistan's ISI since the 1970s. After

the U.S. invasion of Afghanistan in 2001, the Haqqani Network launched some of the deadliest and most devastating attacks on U.S. forces in Afghanistan. These attacks include a December 2009 bombing of a CIA outpost in Khost, the deadliest attack on the CIA in the agency's history, and two brazen assaults in 2011, including an attack on a U.S. military base in Wardak that injured 77 soldiers and an attack on the U.S. embassy that resulted in a 20-hour gun battle. Former Chairman of the Joint Chiefs of Staff Admiral Mike Mullen has described the Haqqani Network as a "veritable arm" of Pakistan's ISI.⁷⁷ The Haqqani Network maintains close links to al-Qaeda, and its operational leader, Sirajuddin Haqqani, was named Interior Minister in the Taliban's new government in Afghanistan in August 2021.⁷⁸

The threat posed by al-Qaeda in Afghanistan and Pakistan diminished somewhat after the U.S. invasion of Afghanistan in 2001 and the killing of Osama bin Laden at his hideout in Abbottabad, Pakistan, in May 2011. It was further degraded by an intensive drone campaign in Pakistan's tribal areas in the 2010s. Nevertheless, al-Qaeda still maintains a presence in the region and could experience a resurgence with the Taliban takeover of Afghanistan, given the group's close links to both the Haqqani Network and the Taliban. A 2020 report by the U.S. Treasury Department concluded that "as of 2020, al-Qaeda is gaining strength in Afghanistan while continuing to operate with the Taliban under the Taliban's protection. Senior Haqqani Network figures have discussed forming a new joint unit of armed fighters in cooperation with and funded by al-Qaeda."⁷⁹

A local affiliate of ISIS, the so-called Islamic State-Khorasan (IS-K), emerged in Afghanistan and Pakistan in 2014–2015, drawing from disaffected members of the Afghan Taliban and TTP. 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, the head of CENTCOM, said that he believed "ISIS Khorasan does have ideations focused on external operations toward our homeland."⁸⁰

Experts believe that there is little coordination between the IS branch operating in Afghanistan and the central command structure located in the Middle East. Instead, the branch draws recruits from disaffected members of the Pakistani Taliban and other radicalized Afghans and has frequently found itself at odds with the Afghan Taliban, which views IS-K as a direct competitor for financial resources, recruits, and ideological influence. U.S. officials acknowledge that even though they were not coordinating directly, U.S. air strikes and Taliban ground attacks substantially degraded IS-K capabilities in the late 2010s.⁸¹

The lack of publicly available information and the willingness of local fighters in the region to change allegiances make it difficult to know the exact number of IS-K fighters in Afghanistan at any given time. In September 2019, U.S. officials estimated that there were between 2,000 and 5,000 ISIS fighters in Afghanistan.⁸² A series of major defeats in 2019 led to IS-K’s “collapse” in eastern Afghanistan, according to U.S. officials.⁸³ Since then, it appears to have changed strategies—for example, by pursuing a rapprochement with the ISI and Haqqani Network—even as it continues to battle the Afghan Taliban.⁸⁴

Finally, the U.S. withdrawal from Afghanistan in August 2021 and the Afghan Taliban’s rapid takeover of the country have raised concerns that Afghanistan will once again become a safe haven for international terrorist groups, including al-Qaeda. Of particular concern is the fact that on August 19, a senior member of the Haqqani Network was put in charge of security in Kabul.⁸⁵ One week later, a suicide bomber launched an attack on the Kabul airport that killed 13 U.S. military personnel and over 150 Afghans.⁸⁶ The Biden Administration blamed IS-K, which took responsibility for the attack, and launched two drone strikes on IS-K targets in the week following the airport attack.⁸⁷

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 has transitioned 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, both ISIS and al-Qaeda 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.

The terrorist threat to the U.S. homeland from Afghanistan and Pakistan remains real and uncertain in a rapidly shifting landscape that is home to a wide variety of extremist and terrorist groups. On one hand, the capabilities of al-Qaeda, the terrorist group that is most directly focused on attacking the U.S. homeland, have been degraded since the U.S. invasion of Afghanistan in 2001. On the other hand, the U.S. withdrawal from Afghanistan and the Taliban’s rapid takeover of the country, as well as its ongoing links to the Haqqani Network, al-Qaeda, and other terrorist groups, are serious causes for concern.

In its interim peace agreement with the U.S., the Taliban ostensibly committed to preventing Afghan soil from being used to launch attacks against the U.S. homeland. However, experts remain skeptical of these commitments.

The Pakistani state, meanwhile, continues to harbor and support a vibrant ecosystem of terrorist groups within its borders, creating a volatile situation even as it seeks to dissuade loyal militant organizations from attacking the U.S. for fear of blowback.

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: Non-State Actors

	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 with:

- 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 in 2021 pressured Ukraine with a large buildup of forces

along its border, raising speculation about a possible incursion. It also has sustained its increased 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. Its economy was affected in the early stages of the COVID-19 pandemic but rebounded in the later stages and has grown in 2021. The *2022 Index* again assesses Russia's behavior as "aggressive" and its growing capabilities as "formidable" (the highest category on the scale).

China is the most comprehensive threat the U.S. faces. It remains "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. It launched its first domestically produced aircraft carrier this year and continues construction of its second. 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 has been especially aggressive in sailing and flying through the seas and airspace around Taiwan.

Iran represents by far the most significant security challenge to the United States, its allies, and its interests in the greater Middle

Behavior of Threats

	HOSTILE	AGGRESSIVE	TESTING	ASSERTIVE	BENIGN
China		✓			
Russia		✓			
Iran		✓			
North Korea			✓		
Non-State Actors		✓			
OVERALL		✓			

Capability of Threats

	FORMIDABLE	GATHERING	CAPABLE	ASPIRATIONAL	MARGINAL
China	✓				
Russia	✓				
Iran		✓			
North Korea		✓			
Non-State Actors			✓		
OVERALL		✓			

Threats to U.S. Vital Interests

	SEVERE	HIGH	ELEVATED	GUARDED	LOW
China		✓			
Russia		✓			
Iran		✓			
North Korea		✓			
Non-State Actors		✓			
OVERALL		✓			

East. This is underscored by its open hostility to the United States and Israel, sponsorship of terrorist groups like Hezbollah, history of threatening the commons, and increased activity associated with its nuclear program. Iran relies heavily on irregular (including political) warfare against others in the region and fields more ballistic missiles than are fielded by 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 2022 Index extends the 2021 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. Though Pyongyang has refrained from nuclear tests during 2021, it has engaged in a range of provocative behavior that includes missile tests.

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. North Korea also uses cyber warfare as a means of guerilla warfare against its adversaries and international financial institutions. 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.

A broad array of terrorist groups remain the most hostile of any of the threats to America examined in the *Index* even though they fall short of the state-level capabilities possessed

by countries such as Iran. 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, threatening 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 2022 *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."

Our combined score for threats to U.S. vital interests can be summarized as:

Threats to U.S. Vital Interests: Summary



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.

During 2020, SARS-CoV-2, the virus that causes the COVID-19 disease, affected the military services in ways that were similar to how it affected the population generally.

- Training was curtailed in order to minimize the transmission of the virus within the force by keeping servicemembers as separated as possible;

- Exercises with allies and other security partners were canceled or reduced in scope; and
- Military resources, especially in the medical community, were redirected to support civilian efforts to deal with the spreading pandemic through the construction and staffing of field hospitals and the distribution and administering of vaccines.

This situation took a toll on some aspects of conventional readiness across the force, but it also provided an opportunity—albeit unwanted—for the military to practice existing protocols for dealing with infectious disease and develop new methods for training and education, conducting exercises under restricted conditions, and maintaining operational efforts abroad in spite of the pandemic. Similar pandemic-related problems confronted all elements of the defense industrial base and the full range of supply, maintenance, and transportation activities across the military and civilian, government, and private sectors that are essential to maintaining a viable military enterprise.

Viewed through the lenses of readiness, the potential requirement to surge operations in war, or the need to adjust practices to counter an enemy attack, responding to the COVID-19 challenge served as an important learning opportunity. Whether the military services, the Department of Defense (DOD), the Administration and Congress, and civilian firms supporting defense programs internalize such

lessons remains to be seen. For 2021, it is reasonable to assume that the U.S. military gained as much as, if not more than, it lost with regard to wartime readiness.

How to Think About Sizing Military Power

Military power consists of many things and is the result of how all of its constituent pieces are brought together to create an effective war-fighting 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 for one group either 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: 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 advising 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 exactly 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 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 as a natural occurrence commensurate with its strengthening status. There can be dramatically different perspectives with respect to how China might use its military power and what would constitute an effective U.S. response. 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 conventional war and, if one thinks it unlikely, what level of risk is one 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 is one example frequently cited by analysts. 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.”¹

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.”² 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,³ 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.

Though the Biden Administration has not yet produced a national defense strategy to replace the one issued by the Trump Administration in 2018, its Interim National Security Strategic Guidance (INSSG) echoes the general goal for the U.S. military to “deter and prevent adversaries from directly threatening the United States and our allies, inhibiting access to the global commons, or dominating key regions,”⁴ themes that have remained remarkably consistent from one Administration to the next for several decades. Taken at face value and considering the challenges posed simultaneously by a multitude of competitors in several regions, the INSSG seems to imply that the military should have the capability and capacity to meet this objective.

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 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 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.⁵ The increasing presence of unmanned systems that can deliver precision-guided munitions against targets adds complexity and danger to the modern battlefield.

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. military 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).
- Some 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, the number of infantry squads needed to secure an urban area where line of sight is constrained and precision weapons have limited utility is the same as the number needed in World War II.

Regardless of the improved capability of smaller forces, there is a downside to fewer numbers. With smaller forces, each 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 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.⁶ 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 become more important 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 to 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 2001.⁷ Consistent assessment of their capability, readiness, and operational role is challenging 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.⁸

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 the 2020 *Index*, four Army National Guard BCTs were counted as “available” for use because of the significant amounts of additional resources that had been dedicated specifically to these formations to raise their readiness levels.⁹

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. A larger defense budget, for example, 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 composition of the force and the understanding of military risk have become more salient issues with the shift toward competition with China and Russia. Both the 2017 National Security Strategy¹⁰ and the 2021 Interim National Security Guidance¹¹ recognize that meeting the challenges posed by these two large,

well-equipped, and well-resourced countries requires a U.S. force that is modern, ready, and effective in all domains of warfare.

The decision to fund national defense at a level that is 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.

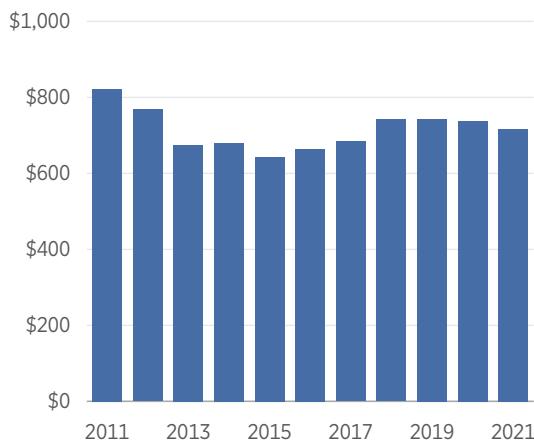
The fiscal year (FY) 2021 base discretionary budget for the Department of Defense was \$703.7 billion.¹² This represents the resources allocated to pay for the forces (manpower, equipment, and training); enabling capabilities (things like transportation, satellites, defense intelligence, and research and development); and institutional support (bases and stations, facilities, recruiting, and the like). The base budget has not paid for the cost of major ongoing overseas operations, which are captured in supplemental funding known as OCO (overseas contingency operations).

FY 2021 was the last year that was heavily shaped by two budgetary instruments: OCO and the Budget Control Act (BCA) of 2011.¹³ The OCO account was created in the immediate aftermath of the September 11, 2001, terrorist attacks to provide the resources needed to prosecute the war on terrorism.¹⁴ Since then, the account has ebbed and flowed depending on political and fiscal concerns in Congress and operational realities on the battlefields. The account is set to be merged into the base budget by the Biden Administration starting in FY 2022.¹⁵

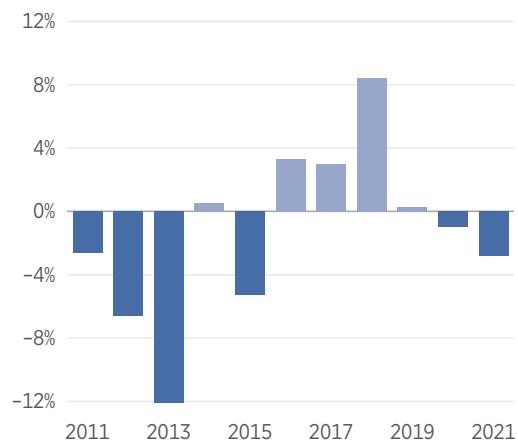
Passage of the BCA established legal limits on the funds dedicated to the budget, including defense. That prompted Congress to use OCO as an escape valve for artificially low defense budgets.¹⁶ In this regard, for the past decade, the level of funding for defense has been determined by the politics surrounding the BCA. Despite repeated emphasis on the importance of investing more to fix obvious readiness, capacity, and modernization problems, the debate has been determined by larger

Changes in Defense Spending Since 2011

IN BILLIONS OF CONSTANT DOLLARS



YEAR-TO-YEAR PERCENTAGE CHANGE



SOURCE: U.S. Department of Defense, Office of the Under Secretary of Defense (Comptroller), *National Defense Budget Estimates for FY 2021*, April 2020, https://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2021/FY21_Green_Book.pdf (accessed July 23, 2021).

heritage.org

political dynamics that pit 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.

This dynamic shaped the defense spending debate until FY 2021, the last year within the BCA framework. As Congress and the DOD move into a new budgetary reality, there will be an opportunity to explain the challenges that lie ahead both for the U.S. military and for America's national interests.

Senior DOD leaders have expressed the need for more funding to meet the challenge of a more capable and aggressive China and Russia since well before the release of the 2018 NDS. 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. Secretary Mattis said that “he expect[ed] 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 General 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.”¹⁷

The bipartisan commission that assessed the National Defense Strategy also assessed the need for budgetary growth of between 3 percent and 5 percent above inflation,¹⁸ and this recommendation was sustained by former Secretary of Defense Mark Esper.¹⁹

Unfortunately, over the past five fiscal years, the DOD has seen a swing when it comes to real

growth in its budget authority (i.e., budgets that account for the effect of inflation). From 2017 to 2019, there was significant real growth of 3 percent followed by 8.4 percent and 0.3 percent. However, that was followed by two years of real decline of 1 percent in 2020 and then 2.8 percent in 2021. Further, the latest projection of defense budgets anticipates negative growth of 0.1 percent in the coming years.²⁰ That is a far cry from the steady above-inflation increase that was seen as necessary by bipartisan leaders.

Adding to future challenges, the federal government's response to the coronavirus pandemic could influence how the defense budget is discussed and appropriated in future fiscal years. The Congressional Budget Office highlighted a \$3 trillion deficit for FY 2020 and a second \$3 trillion deficit for FY 2021 in its most recent outlook on the budget and the economy.²¹ This extremely high level of budgetary deficit will undoubtedly shape how the country assesses the federal government's budgetary priorities, especially when added to the already massive national debt that approached \$27 trillion by the end of 2020,²² and demand adjustments in the federal government's allocations of taxpayers' dollars.

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, although they have occurred every 15 years on average.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 COCOMS²⁴—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 servicemembers 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 COCOM 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.²⁵ 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”²⁶ 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, given its focus on counterinsurgency, stability, and advise-and-assist operations since 2004 and the 2018 NDS directive to prepare for conflict in an era of great-power competition, the military community has

focused on its suitability and readiness for major conventional warfare.²⁷ 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 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, a troubling and fairly consistent trend within U.S. military acquisition characterizes the path from requirement to fielded capability. Along the way to acquiring the capability, several linked things happen that result in far less of a presumed “critical capability” than was supposedly 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.

TABLE 1

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		9	n/a
Reserve Fighter Wings	7	8	12	n/a	n/a	n/a	20	7	n/a
Airlift/Tankers	n/a	n/a	n/a	n/a	1023	1023	1,000	954	n/a

U.S. Military Power: Five-Grade Scale

VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
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- 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 to 21 in order to make resources available for experimentation and modernization.²⁸
- 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 372 ships, with some working estimates as high as 500 manned ships.

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 national 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 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 be committed to only 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, albeit 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 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,²⁹ 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 over the past decade have caused military service officials, senior DOD officials, and even Members of Congress to warn of the dangers of re-creating the "hollow force" of the 1970s when units existed on paper but were staffed at reduced levels, minimally trained, and woefully ill-equipped.³⁰ 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 2020 led to fiscal pressure on defense accounts in future years, but gains in readiness were preserved during FY 2020. Ensuring adequate readiness in FY 2021 has been difficult given the challenges created by COVID-19 during the preceding year.

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 achieve a better understanding of operations and orchestrate them more effectively have the potential to change military force posture calculations in the future. At the present time, however, 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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5. The United States has not had to contend in combat with any credible air force since the Vietnam War, but U.S. Air Force planners are increasingly concerned about an enemy's ground-based, anti-air missile capability. Naval planners are much more concerned about ship-based, air-based, and shore-based anti-ship cruise missiles than they are about the number of conventional surface combatants armed with large-caliber guns that an enemy navy has. Likewise, ground force planners have to consider the numbers and types of guided anti-armor weapons that an enemy possesses and whether an opposing force has guided artillery, mortar, or rocket capabilities. Guided/precision weapons are typically less expensive (by orders of magnitude) than the platforms they target, which means that countries can produce far more guided munitions than primary weapons platforms. Adding this to the rise of unmanned platforms capable of carrying anti-platform weapons makes the threat environment even more complicated. Some examples: Harpoon ASCM (\$2 million)/DDG-51 *Arleigh Burke*-Class destroyer (\$2 billion); AT4 anti-armor weapon (\$1,500)/M1A1 Abrams main battle tank (\$9 million); 120mm guided mortar round (\$10,000) or 155mm guided artillery round (\$100,000)/M198 155mm howitzer (\$500,000); S-300 anti-air missile (\$1 million)/F/A-18 Hornet (\$70 million) or F-35A Lightning II (\$78 million).
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24. U.S. Space Command (USSPACECOM) is also considered a geographic command, but within the context of this discussion, SPACECOM's interactions with other countries and the extent to which it must deal with units and peoples operating on its terrain is much different from those of terrestrial commands.
25. 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.
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28. General David H. Berger, Commandant of the Marine Corps, “Force Design 2030,” March 2020, pp. 7–8, <https://www.hqmc.marines.mil/Portals/142/Docs/CMC38%20Force%20Design%202030%20Report%20Phase%20I%20and%20II.pdf?ver=2020-03-26-121328-460> (accessed July 9, 2021).
29. The Department of Defense, through the Joint Staff and Geographic Combatant Commanders, manages a relatively small set of real-world operational plans (OPLANS) that are focused on specific situations in which 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 agent for the conduct of land warfare. Although it is capable of all types of operations across the range of military operations and support to civil authorities, its chief value to the nation is its ability to defeat and destroy enemy land forces in battle.

The Army is engaged throughout the world in protecting and advancing U.S. interests. Operationally, as of May 20, 2021, the Army had 167,370 soldiers forward located in 142 countries.¹ On May 5, 2021, the Acting Secretary of the Army and the Army Chief of Staff testified that:

Over 69,000 Soldiers are in the Indo-Pacific, including over 25,000 forward deployed on the Korean peninsula. Over 30,000 Soldiers are in Europe supporting NATO and the European Deterrence Initiative, including the forward command post of our newly reactivated V Corps. We remain dedicated to our counterterrorism and train, advise, assist missions, providing over 21,000 Soldiers in support of the U.S. Central Command theater.²

The Army, like the other military services, finds itself at a strategic inflection point. That it needs to evolve and transform is unquestioned. Advances in firepower like ballistic missiles and kamikaze drones fielded by adversaries like China have outpaced the U.S. Army's capabilities. Information-age warfare requires new levels of speed and precision in

Army sensor-to-shooter chains. Autonomy is changing the character of warfare, and the Army has bold ideas about how to take advantage of this technology.

However, whether the necessary resources will be available to enable such change is open to question. Since fiscal year (FY) 2019, the Army's budget has decreased, and the Administration's FY 2022 budget request for the Army takes a sharp downward drop from \$177 billion in FY 2021 to \$173 billion requested for FY 2022. If this requested amount is approved, the Army may not be able to achieve its vision of modernizing and regaining its technological advantage while preserving readiness and sufficient end strength. The FY 2022 proposed Army budget sharply reduces training programs and exercises and drastically curtails many equipment programs.³

Enduring Relevance of Land Power. Arguments that America no longer needs a strong modern Army because, for example, China is largely a maritime threat ignore history and ignore what it means to be engaged in global competition with a near peer. America has a horrible record of predicting where it will fight its next war. As former Secretary of Defense Robert Gates famously said:

When it comes to predicting the nature and location of our next military engagements, since Vietnam, our record has been perfect. We have never once gotten it right, from the Mayaguez to Grenada, Panama, Somalia, the Balkans, Haiti,

Kuwait, Iraq, and more—we had no idea a year before any of these missions that we would be so engaged.⁴

Many also seem to overlook the fact that great-power competition with China and Russia is a global contest, which means that we face the enduring need to counter aggression wherever it may occur, not just within the territory or waters of China or Russia. All of this reinforces the reality that America has a long-term need for modernized, sufficiently sized land power.

A Difficult Year. The Army has largely surmounted the challenges posed by the COVID-19 pandemic. The virus affected Army recruiting efforts in 2020, but in the end, the Army achieved its desired overall end strength, albeit by relying more on reenlistments.⁵ The magnitude of Army support for the fight against the pandemic stands in sharp contrast to the views of those who opine that our national security infrastructure is not designed to counter threats like novel coronaviruses.⁶

The Army's contributions to this fight were both multiple and noteworthy. Operation Warp Speed, the prior Administration's herculean effort to jump-start the production of COVID-19 vaccines, was a Department of Defense (DOD)—Department of Health and Human Services operation that included multiple senior Army officers and was co-led by Army General Gus Perna.⁷ During the height of the pandemic, the Army Corps of Engineers built dozens of treatment centers, and Army soldiers were deployed throughout the country to help administer vaccines. More than 47,000 National Guard personnel were deployed to help states combat the pandemic.⁸

Although the Army was forced to scale back its Defender-Europe 20 exercise, which was planned to be the Army's largest exercise in Europe in 25 years, DEFENDER 21 was executed in 2021 from March to June and was more extensive than the prior year's planned event.⁹

A Strong Force Showing Its Age. The U.S. Army is currently the world's most powerful army, but it is also too small to meet even the

modest requirements of the 2018 National Defense Strategy (NDS), much less the standard of being able to handle two major regional contingencies simultaneously, which most experts believe is necessary. It also is not sufficiently modern.

Even though the conflict in Iraq has largely ended and the military is withdrawing from Afghanistan, the 15 years from 2001 to 2016, when the Army was focused single-mindedly on counterinsurgency and winning those conflicts, completely distracted the service from focusing on modernizing the key combat capabilities that it will need for near-peer competition. As a consequence, the Army's last major modernization occurred in the 1980s. As Army Chief of Staff General James McConville stated in March 2021, “[W]e must modernize the Army. Every 40 years the Army needs to transform. It did in 1940, it did in 1980 and we're in 2020 right now.”¹⁰

The Army's ability to recover was further constrained by a period of fiscal austerity that began with the Budget Control Act (BCA) of 2011.¹¹ The inability to fund everything that was needed led to difficult across-the-board tradeoffs in equipment, manpower, and operations accounts. Budget pressure drove DOD in January 2014 to shrink the Army's Active component end strength from more than 500,000 to 420,000—the smallest Army in modern U.S. history.¹² Multiple equipment programs were cancelled.

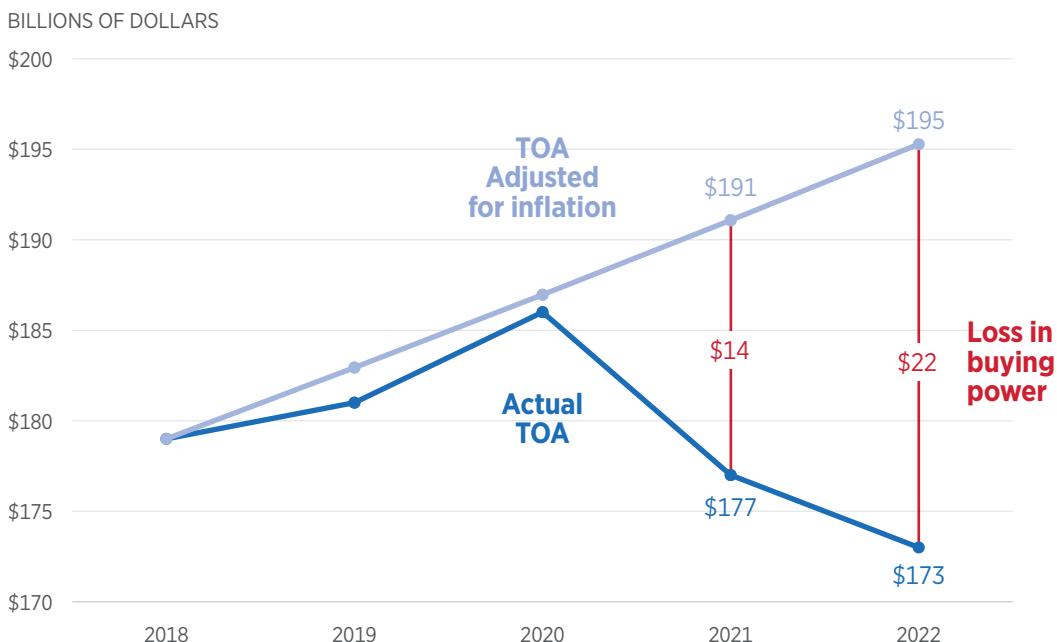
The change in Administrations in 2017 forestalled those cuts in end strength. However, the addition of billions of dollars by Congress and the Trump Administration, although it served to arrest the decline of the Army and significantly improved unit readiness, was not sufficient to modernize or significantly increase the size of the force.¹³

A Change in Strategic Direction? It is unclear what direction the Biden Administration's National Security or National Defense strategies will take. The Administration's Interim National Security Guidance provides little insight into its thinking with respect to national defense and does not even mention

CHART 4

Army Budget Hit by Inflation and Cuts

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 2018 to 2022, those losses have totaled \$39 billion.



SOURCE: Major General Paul A. Chamberlain, Director, Army Budget, "Army Fiscal Year 2022 Budget Overview," May 28, 2021, p. 4, https://www.asafm.army.mil/Portals/72/Documents/BudgetMaterial/2022/pbr/FY22_PB_brief_28MAY21.pdf (accessed July 23, 2021).

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the Army or any other service.¹⁴ The Trump Administration's NDS made "long-term strategic competitions" with China and Russia the "principal priorities" but also stated that DOD would "sustain its efforts" to counter the challenges posed by Iran, North Korea, and terrorism—threats where land power has great or even predominant utility.¹⁵

The 2018 NDS included the relatively modest goal of "defeating aggression by a major power; deterring opportunistic aggression elsewhere; and disrupting imminent terrorist and WMD threats."¹⁶ Some, however, question

whether even that goal is achievable. According to Representative Adam Smith (D-WA), the influential chairman of the House Armed Services Committee, for example, "We should get off of this idea that we have to win a war in Asia, with China, what we have to do from a national security perspective, from a military perspective, is we have to be strong enough to deter the worst of China's behavior."¹⁷ Exactly what the "worst" of China's behavior would be and what it would take to deter it remained undefined, but a change in U.S. strategy is clearly possible.

Consequences of the Loss in Buying Power.

Despite relatively broad agreement that the DOD budget needed real growth of 3 percent through 5 percent to avoid a strategy-budget mismatch,¹⁸ the defense budget topline did not meet that target in FY 2019 and still has not done so.

Of all the services, the Army has fared the worst in terms of resources. Its funding levels plateaued with the FY 2018 budget and since then have declined. The Army received \$179 billion in FY 2018, \$181 billion in FY 2019, \$186 billion in FY 2020, and \$177 billion in FY 2021 and requested \$173 billion for FY 2022. Because of the inexorable annual bite of inflation and the decline in budget authority, the Army budget for FY 2022 represents a net loss of about 9 percent in buying power, or \$16 billion, since FY 2018.¹⁹

Summarizing the Army budget at a recent hearing, Acting Secretary of the Army John Whitley stated, “I think there is a lot of risk in the budget, congressman.... The Army’s budget has actually been flat for the last two to three years.”²⁰ General McConville’s assessment is somewhat more colorful: In the past two years, the Army has “picked the fruit” from the tree trying to find ways to make tough budget choices. Now, as the service approaches FY 2022, “[t]here’s no more fruit in that tree.”²¹

Capacity

Capacity refers to the sufficiency of forces and equipment needed to execute the National Defense Strategy. One of the ways the Army quantifies its warfighting capacity is numbers of Brigade Combat Teams (BCTs).

Brigade Combat Teams. BCTs are the Army’s primary combined arms, close combat force. They often operate as part of a division or joint task force, both of 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 limited independent operations as circumstances demand.²²

BCTs range between 4,400 and 4,700 soldiers in size.²³ There are three types of BCTs: Infantry, Armored, and Stryker. Each of these formations at its core has three maneuver battalions enabled by multiple other units such as artillery, engineers, reconnaissance, logistics, and signal units.²⁴

The best way to understand the status of hard Army combat power is to know the readiness, quantity, and modernization level of BCTs. This section deals with the number of BCTs in the force.

In January 2012, “DOD announced [that] the Army would reduce the size of the Active Army starting in 2012 from a post-9/11 peak in 2010 of about 570,000 soldiers to 490,000 soldiers by the end of 2017.” Later guidance revised that figure downward “to a range of 440–450,000 soldiers.”²⁵ In 2013, the Army announced that because of those end strength reductions and the priorities of the prior Administration, the number of Regular Army BCTs would be reduced from 45 to 33.²⁶ Subsequent reductions reduced the number of Regular Army BCTs from 33 to 31, where they remain today.

When President Trump 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 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.²⁷

Combat Aviation Brigades. The Regular 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 been reduced. In May 2015, the Army deactivated one of its 12 CABs, leaving only 11 in the Regular Army.²⁸

Generating Force. CABs and Stryker, Infantry, and Armored BCTs make up the Army’s main combat forces, but they obviously

TABLE 2

Major Army Combat Formations

Brigade Combat Teams	Regular Army	Army National Guard	Total
Infantry Brigade Combat Teams	13	20	33
Stryker Brigade Combat Teams	7	2	9
Armored Brigade Combat Teams	11	5	16
Total	31	27	58

Aviation Brigades	Regular Army	Army National Guard	Total
Combat Aviation Brigades	11	-	11
Expeditionary Combat Aviation Brigades	-	8	8
Theater Aviation Brigades	-	2	2
Total	11	10	21

SOURCES:

- U.S. Department of the Army, *Department of the Army Fiscal Year (FY) 2022 Budget Estimates, Volume 1, Operation and Maintenance, Army, Justification of Estimates*, May 2021, pp. 65 and 128, https://www.asafm.army.mil/Portals/72/Documents/BudgetMaterial/2022/Base%20Budget/Operation%20and%20Maintenance/OMA_VOL_1_FY_2022_PB.pdf (accessed July 23, 2021).
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do not make up the entirety of the Army. A so-called Generating Force of 87,015 Regular Army troops provides such types of support as preparing and training troops for deployments, carrying out key logistics tasks, staffing headquarters, and overseeing military schools and Army educational institutions.²⁹ The troops in this Generating Force are the seed corn of the Army, which therefore endeavors to insulate them from drawdown and restructuring proposals in order to “retain a slightly more senior force in the Active Army to allow growth if needed.”³⁰

Functional or Multifunctional Support Brigades. In addition to the institutional Army, a great number of functional or

multipurpose support brigades, amounting to approximately 46 percent of the force,³¹ 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. Special operations forces such as the 75th Ranger Regiment, six Special Forces Groups, and the 160th Special Operations Aviation Regiment are also included in this category.

New Concepts and Supporting Force Structure. The Army is trying to adapt its force structure to meet the anticipated new demands of near-peer competition. The foundations for these changes are contained in

the Army's multi-domain operations (MDO) concept, which outlines how the Army views the future.³²

In April 2020, the Army announced that it planned to modify its force structure for MDO under the designation AimPoint Force Structure Initiative. Its objective is to produce an "MDO-capable force" by 2028 and an "MDO-ready force" by 2035.³³ As part of this initiative, the Army reactivated V Corps Headquarters on October 16, 2020, to provide operational planning, mission command, and oversight of rotational forces in Europe.³⁴ The Army has also announced plans to create five Multi-Domain Task Forces (MDTFs). One MDTF is currently stationed at Joint Base Lewis–McChord in Washington State. Another will be located in Germany. Of the remaining three MDTFs, one will be in the Indo-Pacific, one will be in the Arctic, and the fifth will likely be maintained in the U.S. to be available for global response. These task forces contain rockets, missiles, military intelligence, and other capabilities that will allow Army forces to operate seamlessly with joint partners and conduct multi-domain operations.³⁵

To relieve the stress on the use of BCTs for advisory missions, the Army has activated six Security Force Assistance Brigades (SFABs). These units, composed of about 800 soldiers each, are designed specifically to train, advise, and mentor other partner-nation military units. 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 was a poor fit. The SFABs will be regionally aligned to combatant commands. Of the six SFABs, one is in the National Guard, and the other five are in the Regular Army.³⁶

Force Too Small to Execute the NDS. Army leaders have consistently stated that the Army is too small to execute the National Defense Strategy at less than significant risk. As of September 30, 2021, the Army had an authorized total end strength of 1,012,200 soldiers:

- 485,900 in the Regular Army,
- 189,800 in the Army Reserve, and
- 336,500 in the Army National Guard (ARNG).³⁷

In May 2021, Army Chief of Staff McConville testified that "[w]hen we take a look at end-strength, I would like to grow the Army. We've done analysis like the previous chief [General Mark Milley] talked about. 540 to 550 [thousand] is about the right size of the Army."³⁸ In an earlier discussion with reporters, McConville stated, "I would have a bigger...sized Army if I thought we could afford it, I think we need it, I really do.... I think the regular Army should be somewhere around 540–550 [thousand].... So, we're sitting right now at 485,000."³⁹

The Army's plan to increase the size of the Regular Army force has recently been put on hold because of budget cuts. The Army had planned to raise the Regular Army incrementally to above 500,000 by adding approximately 2,000 soldiers per year.⁴⁰ At that rate, it would have reached 500,000 by around 2028. Now even that modest plan is off the table. As a result of bleak defense budget forecasts, McConville has reported that the Army will have to hold its end strength constant to save money.⁴¹

Overall end strength dictates how many BCTs the Army can form, and by holding end strength constant, it is very unlikely that the service will be able to add any new maneuver formations to the mix. This will drive a higher operational tempo (OPTEMPO) for Army units and increase risk both for the force and for the ability of the Army to carry out its mission.

Many outside experts agree that the U.S. Army is too small. In 2017, Congress established the National Defense Strategy Commission to provide an "independent, non-partisan review of the 2018 National Defense Strategy." Two of the commissioners, Dr. Kathleen Hicks and Michael McCord, are now senior DOD officials. Among its findings, the commission unanimously reported that the NDS

TABLE 3

Army Formations: Time Deployed vs. Time at Home Station

Even with a reduced presence in Iraq and Afghanistan, certain Army formations continue to deploy globally at a high tempo. The table below shows the ratio of time deployed to time at home station for three select Army formations. Typically, if the ratio drops below 1-to-2, a formation is spending more time deployed than is recommended, and this pace will cause long-term challenges.

Unit Type	Ratio of Time Deployed to Time at Home Station
Patriot Battalions	1 to 1.23
IBCTs (Regular Army)	1 to 1.86
Division Headquarters (Regular Army)	1 to 2.25

NOTE: Data are current as of May 20, 2021.

SOURCE: Email from Headquarters, Department of the Army, G-3/5/7 Office to the author, May 25, 2021.

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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 “[t]his 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.”⁴²

In addition to the increased strategic risk of not being able to execute the NDS within the desired time frame, the combination of an insufficient number of BCTs and a lower-than-required Army end strength has resulted in a higher-than-desired level of OPTEMPO. As of May 2021, despite a reduction in unit deployments to Iraq and Afghanistan, Army units continued to experience sustained demand. Some of the units with the highest OPTEMPOs (measured in boots on the ground/dwell ratios) are shown in Table 3.⁴³

Army Force Posture. 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 mostly 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.⁴⁴ 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. Even though the 2018 NDS placed a high premium on how the joint force is postured, achieving that goal will be very difficult with the vast bulk of the Army now in the United States.

Among Army units that deploy periodically are Armored Brigade Combat Teams (ABCTs) that rotate to and from Europe and Korea. Rather than relying on forward-stationed BCTs, the Army rotates ABCTs to Europe and Korea on a “heel-to-toe” basis so that there is never a gap. There is disagreement as to which represents the better option: rotated forces or forward-stationed forces. 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.⁴⁵ In reality, both types of force postures 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.

To mitigate risk and add to the number of ready BCTs, the Army has initiated a program, ARNG 4.0, to resource select Army National Guard BCTs with additional training days, moving from the standard number of 39 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. Because of budget cuts, however, the FY 2022 budget reduces National Guard CTC rotations back down to two.⁴⁶

Despite the increase in the number of training days, the training goal for National Guard BCTs is to achieve a company level rather than a brigade level of proficiency, which means that additional training time would be required before the unit could be deployed.

Capability

Capability in this context refers to the quality, performance, suitability, and age of the Army's various types of combat equipment. In general, the Army is 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 BCA; 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. General McConville believes that modernization cannot be deferred any longer:

[E]veryone believes, and I believe strongly—that we must transform and modernize the Army now. So we've got to do that. We're three years into it, [and] I think we've got some really good programs going. We probably need about two or three more years of good solid budgets. And I think that's something we have to do.⁴⁷

Emphasizing the point, McConville also said recently that "we must transform the Army, now. Every 40 years, I would argue or suggest the Army transforms. It did it in 1940, it did it when I came in, in the Army in 1980. Now, we're in 2020, and we must transform the Army."⁴⁸

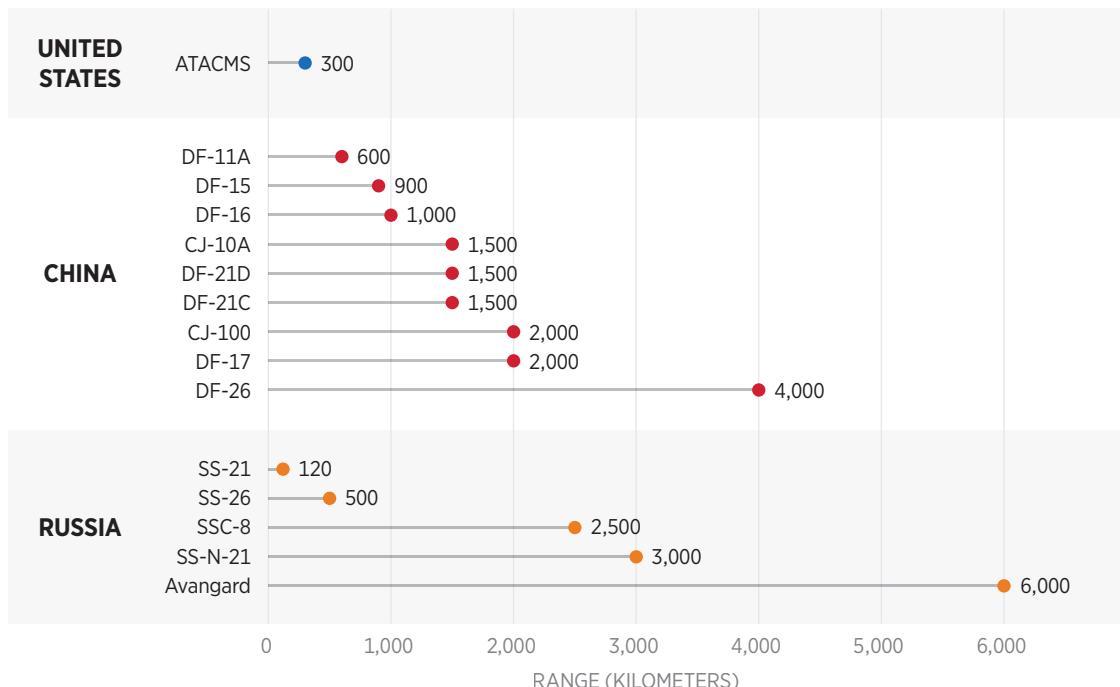
Equipment Losing Its Competitive Advantage. As an example of how Army equipment is falling behind that of our competitors, the Army Tactical Missile System (ATACMS), first introduced in 1991, is the Army's only ground-launched precision missile. Due to the restrictions of the Intermediate Range Nuclear Forces Treaty and other factors, it had a maximum range of 300 kilometers. Meanwhile, both China and Russia have much more substantial inventories of conventional, precision, ground-launched missiles and rockets. China has nine major ground-launched missile systems and more than 425 launchers. These capable systems can range from 600 km (DF-11A and DF-15) to 4,000 km (DF-26).⁴⁹ Russia, on the other hand, has the widest inventory of missiles in the world: at least four conventional ground-launched missile systems that can range from 120 km (SS-21) to 2,500 km (SSC-8).⁵⁰ The U.S. hopes to field a new precision strike missile by 2023, but for now, that system remains a plan, not a capability.

Another example is the main battle tank. When the M-1 Abrams was introduced in 1980, it was indisputably the world's best tank. Now, in 2021, Russia is reportedly beginning to

CHART 5

U.S. Lags Behind China, Russia in Land-Based Missiles

GROUND-LAUNCHED CONVENTIONAL-CAPABLE PRECISION MISSILE SYSTEMS



SOURCES:

- Center for Strategic and International Studies, China Power Project, “How Are China’s Land-based Conventional Missile Forces Evolving?” updated May 12, 2021, <https://chinapower.csis.org/conventional-missiles/> (accessed July 23, 2021).
- Center for Strategic and International Studies, Missile Defense Project, “Missiles of Russia,” *Missile Threat*, last modified February 11, 2021, <https://missilethreat.csis.org/country/russia/> (accessed July 23, 2021).
- U.S. Army, Acquisition Support Center, “Army Tactical Missile System (ATACMS),” <https://asc.army.mil/web/portfolio-item/atacms/> (accessed July 23, 2021).

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export versions of its 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 155 mm gun, and 360-degree ultraviolet high-definition cameras. The M-1 is a great tank, but the decisive advantage that the U.S. once enjoyed in tank warfare is disappearing.⁵¹

Similarly the U.S. Army’s Patriot Missile System is an excellent system, but countries

such as Saudi Arabia, Turkey, and India have either purchased or recently expressed interest in buying the Russian competitor system, the S-400.⁵² The question has to be asked: Why?

Within the Army’s inventory of equipment are thousands of combat systems, including small arms, trucks, aircraft, soldier-carried weapons, radios, tracked vehicles, artillery systems, missiles, and drones. The following updates with respect to some of the major systems as they pertain to Armored, Stryker, and

Infantry BCTs and Combat Aviation Brigades are by no means exhaustive.

Armored Brigade Combat Team (ABCT).

The Armored BCT's role is to "close with the enemy by means of fire and movement to destroy or capture enemy forces, or to repel enemy attacks by fire, close combat, and counterattack to control land areas, including populations and resources."⁵³ The Abrams Main Battle Tank (most recent version in production: M1A2 SEPv3, first unit equipped in FY 2020)⁵⁴ and Bradley Fighting Vehicle (most recent version: M2A4, first unit equipped in FY 2020) are the primary combat platforms in Armored BCTs. There are two modernization levels of these two armored combat vehicles within the Army. (See Chart 6).

The M-1 tank and Bradley first entered service in 1980 and 1981, respectively. There are 87 M-1 Abrams tanks and 152 Bradley Fighting Vehicle variants in an ABCT.⁵⁵ Despite upgrades, the M-1 tank and the Bradley are now at least 40 years old, and their replacements will likely not arrive until the platforms are at least 50 years old.

Optionally Manned Fighting Vehicle (OMFV).

The Army's replacement program for the Bradley, the Optionally Manned Fighting Vehicle, was on an aggressive timeline, but the Army cancelled the request for proposals in January 2020 and re-released a new RFP for what it calls a "concept design" in December 2020. As many as five proposals were scheduled to be awarded in June 2021 to companies to refine their designs,⁵⁶ and "[t]he Army now plans for the first unit to be equipped [with the OMFV] in the fourth quarter of FY2028."⁵⁷

New Tank? 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 2023.⁵⁸

Armored Multi-Purpose Vehicle (AMPV).

Also part of an ABCT, the venerable M113 multi-purpose personnel carrier fills multiple roles like mortar carrier and

ambulance. It entered service in 1960 and was scheduled to be replaced by the new Armored Multi-Purpose Vehicle (AMPV), which after delays has begun product qualification testing. As of May 20, 2021, BAE had delivered 31 AMPVs to the Army.⁵⁹ First fieldings for this system are now expected during the second quarter of FY 2023.⁶⁰ Apparently because of budget cuts, no procurement of the AMPV is proposed in the Army's FY 2022 budget request. It is unclear what the Army plans for this platform or whether its stated objective of 2,897 AMPVs will ever be reached.⁶¹

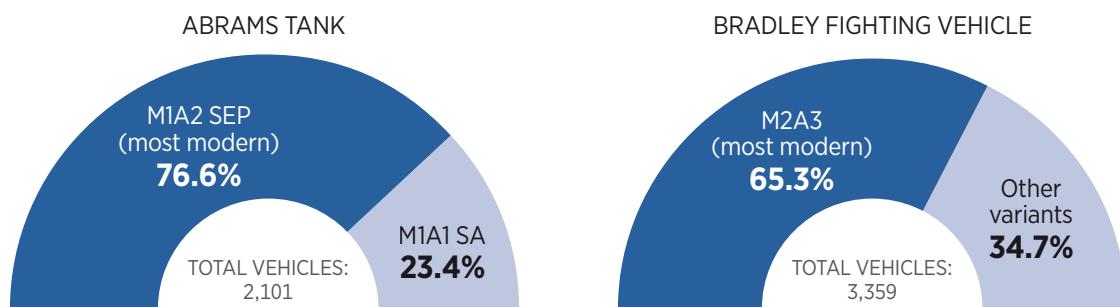
Stryker Brigade Combat Team (SBCT).

The Stryker BCT "is an expeditionary combined arms force organized around mounted infantry" and is able to "operate effectively in most terrain and weather conditions" because of their rapid strategic deployment and mobility.⁶² Stryker BCTs are equipped with approximately 321 eight-wheeled Stryker vehicles.⁶³ Relatively speaking, 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 30 mm cannon to provide an improved anti-armor capability.⁶⁴ Based on the success of that effort, the Army decided to outfit at least three of its SBCTs equipped with the Double V-hull, which affords better underbody protection against such threats as improvised explosive devices (IEDs), with the 30 mm autocannon.⁶⁵ The Army is also integrating Javelin anti-tank missiles on the Stryker platform.⁶⁶

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."⁶⁷ Infantry BCTs have fewer vehicles and rely on lighter platforms such as trucks, High Mobility Multipurpose Wheeled Vehicles (HMMWVs), and Joint Light Tactical Vehicles (JLTVs) for mobility.

Army Armored Combat Vehicle Modernization



SOURCE: Email from Headquarters, Department of the Army, G-3/5/7 Office to the author, May 25, 2021.

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Joint Light Tactical Vehicle (JLTV). The Joint Light Tactical Vehicle (JLTV) combines 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. As of May 20, 2021, the Army had fielded 4,543 JLTVs.⁶⁸

Requested FY 2022 funding of \$574.5 million would support procurement of 1,203 JLTVs and 1,541 trailers. This reflects a continued reduction in funding for this program (\$884 million was enacted for FY 2021) and illustrates the extreme budget pressures the Army is facing. Considering the 8,621 JLTVs the Army has already procured⁶⁹ and procurement at a rate of 1,203 vehicles per year starting in FY 2022, the Army will not reach its acquisition objective for the JLTV until 2055, forcing continued reliance on aging HMMWVs, which began fielding in 1983.⁷⁰

Mobile Protected Firepower (MPF). The Army is developing an armored gun system called Mobile Protected Firepower (MPF) to provide IBCTs with the firepower to engage

enemy armored vehicles and fortifications. In 2020, the Army received 24 prototypes (12 each from General Dynamics Land Systems and BAE) for testing and evaluation, which will continue through June 2021. The first units are expected to receive MPF in FY 2025.⁷¹

Ground Mobility Vehicle (GMV). Airborne BCTs are the first IBCTs to receive a new platform to increase their speed and mobility. The Ground Mobility Vehicle (GMV) provides enhanced tactical mobility for an IBCT nine-soldier infantry squad with their associated equipment. GM Defense was selected for the production contract in June 2020. The Army has approved a procurement objective of 11 IBCT sets at 59 vehicles per IBCT (649 vehicles in total), to be completed by FY 2028. Ultimately, the Army will buy as many as 2,065 of these vehicles.⁷² As of May 20, 2021, 168 GMVs had been fielded to Army units.⁷³

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, but the FY 2022 budget request dramatically curtails the number of aircraft to be procured. This cutback in helicopter modernization, if enacted, would extend the

amount of time necessary to put aircraft crews in the latest version of these critical platforms. This is a continued reflection of downward budget pressure and incurs additional risk for the Army.

UH/HH-60. The acquisition objective for the H-60 medium-lift helicopter is 1,375 H-60Ms and 760 recapitalized 60-A/L/Vs for a total of 2,135 aircraft. The FY 2022 procurement request for the UH-60M is \$630.2 million, which would support the procurement of 24 aircraft (18 less than the 42 requested in FY 2021).⁷⁴ The most modernized variant, the UH/HH-60M, accounts for approximately 50 percent of the Army's H-60 medium helicopter fleet.⁷⁵

CH-47. The CH-47F Chinook, a rebuilt variant of the Army's CH-47D heavy-lift helicopter, has an acquisition objective of 550 aircraft and, with no replacement on the horizon, is expected to remain the Army's heavy-lift helicopter for the next several decades. The FY 2022 budget request of \$145.2 million would support the procurement of six aircraft, all of which would be the MH-47G special operations model.⁷⁶ The most recent model, the CH-47F, accounts for 89 percent of the 518 CH-47 helicopters currently in service.⁷⁷

AH-64. The AH-64E heavy attack helicopter has an acquisition objective of 791 aircraft, which is being met by the building of new aircraft and remanufacturing of older AH-64 models. The FY 2022 procurement request of \$504.1 million would support the purchase of 30 AH-64E aircraft,⁷⁸ 22 less than the 52 produced in FY 2021. This would likely terminate the AH-64E new-build line. Of the 740 AH-64 helicopters in service, 53 percent are the most recent variant, the AH-64E.⁷⁹

Overall, the Army's equipment inventory, while increasingly dated, is maintained well. Despite high usage in Afghanistan and Iraq, most Army vehicles are relatively "young" because the Army deliberately undertook and Congress funded a "reset" plan that includes "[r]epairing and reconditioning systems to bring them back to a satisfactory operating condition." Under its current modernization plans, for example, "the Army envisions [the

M-1 Abrams Tank, the M-2/M-3 Bradley Fighting Vehicle (BFV), and the M-1126 Stryker Combat Vehicle] in service with Active and National Guard forces beyond FY 2028."⁸⁰

In addition to seeing 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 could be forced to engage an enemy 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 counter-insurgency followed by concentration on the current readiness of the force, the Army is now playing catch-up in equipment modernization. Chairman of the Joint Chiefs of Staff General Mark Milley, for example, has said that China is "on a path...to be on par with the U.S. at some point in the future..."⁸¹ While his statement is intentionally ambiguous, General Milley was clearly conveying his concern about the pace of China's modernization and the very real danger that the U.S. military could lose its current advantages.

New Organizations and Emphasis on Modernization. The Army established a new four-star headquarters, Army Futures Command, to manage modernization and eight cross-functional teams (CFTs) to improve the management of its top modernization priorities.⁸² Army leadership—in particular the Under Secretary of the Army and the Vice Chief of Staff of the Army—devote an extraordinary amount of time to equipment modernization issues, but only time will tell whether the new structures,

commands, and emphasis 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 modernization priorities: “Long Range Precision Fires, Next Generation Combat Vehicle, Future Vertical Lift, the Army Network, Air and Missile Defense, and Soldier Lethality.”⁸³

Although the Army has put in place new organizations, plans, and strategies to manage modernization, the future is uncertain, and Army programs are in a fragile state, with only a few in an active procurement status. The Army has shown great willingness to make tough choices and reallocate funding toward its modernization programs, but usually at the expense of end strength or reduction in the total quantity of new items purchased. “There has been real progress in [modernization] over the last three or four years, but that progress is fragile,” Lieutenant General James Pasquarette, a senior Army budget official, has warned. “We continue to fund [the top] priority programs at the cost of the other programs in the equipping portfolio.”⁸⁴

As DOD budget challenges for nuclear deterrence programs, rising personnel costs, health care, and the need to invest in programs to respond to China’s increasingly aggressive activities present themselves, the Army desperately needs time and funding to modernize its inventory of equipment. Recent modernization programs seem to be on track except for the OMFV program, which needed a reboot. Limited numbers of Stryker vehicle-mounted Maneuver Short Range Air Defense (M-SHORAD) systems have been delivered to Europe.⁸⁵ Army officials are currently optimistic about future fielding dates for equipment like the Extended Range Cannon Artillery, a hypersonic weapon firing battery, and the Precision Strike Missile, all of which are scheduled for delivery in FY 2023, but their success will depend on sustained funding.⁸⁶

Readiness

BCT Readiness Reduced. Over the past four years, the Army has made 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 FY 2021, however, BCT readiness declined, and if enacted, the FY 2022 budget’s dramatic cuts in funding for Army training could lead to even bigger declines in the future.

As of May 20, 2021, the Army reported that “58 percent of Active Component Brigade Combat Teams are at the highest levels of tactical readiness,” eight percentage points below their goal and 16 percentage points below last year’s reported level. This means that 18 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.⁸⁷ Last year’s *Index* reported that 21 Regular Army BCTs were at the highest levels of readiness.

There has also been an apparent drop in readiness among National Guard BCTs from FY 2020 to FY 2021. Last year’s *Index* estimated that four to five National Guard BCTs were at the highest levels of readiness. Now the Army reports that no National Guard BCTs are at the highest levels of readiness.⁸⁸

Of the Army’s 11 Combat Aviation Brigades, eight (73 percent) are at the highest levels of readiness. This is relatively healthy.⁸⁹

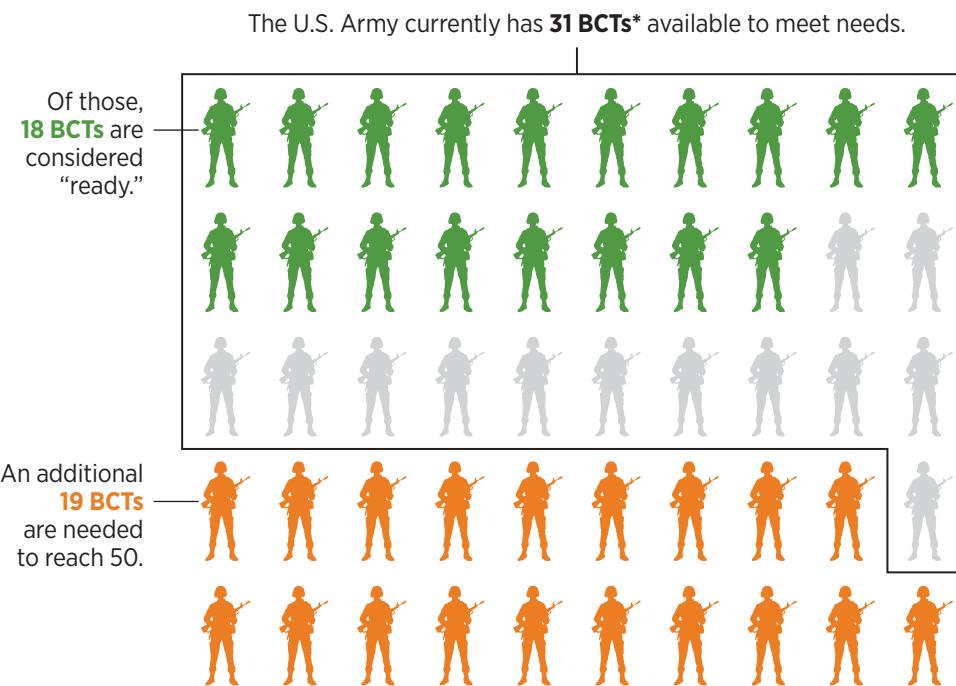
Training Resources Slashed. In the FY 2022 budget request, funding for training activities has been reduced significantly. When measuring training resourcing, the Army uses full-spectrum training miles (FSTMs) for Brigade Combat Teams, representing the number of miles that formations are resourced to drive their primary vehicles on an annual basis. For Combat Aviation Brigades, the Army uses hours per crew per month ((H/C/M), reflecting the number of hours that aviation crews can fly their helicopters per month.

According to the Army’s budget justification exhibits, “[t]he FY 2022 budget funds 1,109 Operating Tempo Full Spectrum Training Miles and 10.2 flying hours per crew, per month” to meet “required training readiness levels.”⁹⁰ The FY 2022 proposed FSTM is significantly

FIGURE 1

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). Although the Army currently has 58 BCTs, only the 31 Regular Army BCTs have the necessary readiness to meet near-term and mid-term operation plan requirements.



* Includes four Army National Guard BCTs.

SOURCE: Email from Headquarters, Department of the Army, G-3/5/7 Office to the author, May 25, 2021.

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lower (30 percent) than resourced levels of 1,598 miles and lower (5 percent) than the 10.8 flying hours enacted in the FY 2021 budget.

Training Level Goals Reduced. The Army is trying to cope with these reduced training resources by shifting training to lower echelons, which is less expensive. Its new strategy “focuses resources on squad, platoon and company level training to achieve highly trained companies.”⁹¹ The FY 2022 budget justification books omit the Unit Proficiency Level Goal, which for years has been BCT; it is

likely now battalion or company. In addition, the Army’s major exercise, the DEFENDER series, is being cut back dramatically by \$339 million in FY 2022, shifting to an exercise in Europe in even years and an exercise in the Pacific in odd years.⁹²

CTC Rotations Chopped. The Army uses Combat Training Centers (CTCs) to train its forces to desired levels of proficiency. Specifically, this important program “provide[s] realistic joint and combined arms training... approximating actual combat” and increases

“unit readiness for deployment and warfighting.”⁹³ The FY 2022 budget request reduces CTC rotations by 34 percent: For FY 2022, the Army requested resources for 17 CTC rotations (15 Regular Army and two National Guard); in FY 2021, the Army was resourced for 26 rotations (21 Regular Army and five National Guard).⁹⁴

New Readiness Model. The Army is transitioning from one readiness model to another. Its Sustainable Readiness Model, implementation of which began in 2017, was intended to give units more predictability. Its new Regionally Aligned Readiness and Modernization Model (ReARMM) is designed to “better

balance operational tempo (OPTEMPO) with dedicated periods for conducting missions, training, and modernization.”⁹⁵ ReARMM reportedly will feature six-month cycles to field new equipment and allocate units to specific theaters. The Army intends to shift to this new model on October 1, 2021.⁹⁶

In general, the Army continues to be challenged by structural readiness problems as evidenced by too small a force attempting to satisfy too many global presence requirements and Operations Plan (OPLAN) warfighting requirements. If demand is not reduced, funding cuts in the FY 2022 budget can be expected to result in a continued decline in readiness.

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 approximately 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.⁹⁷ Taking into account the need for a strategic reserve, the Army force should also include an additional 20 percent of the 42 BCTs, resulting in an overall requirement of 50 BCTs.

Previous editions of the *Index* had counted four Army National Guard BCTs in the overall

count of available BCTs. Because the Army reports that no Army National Guard BCTs are at the highest state of readiness, they are no longer counted in this edition of the *Index*. The Army has 31 Regular Army BCTs compared to a two-MRC construct requirement of 50. The Army’s overall capacity score therefore remains unchanged from 2020.

- **Two-MRC Benchmark:** 50 Brigade Combat Teams.
- **Actual FY2021 Level:** 31 Regular Army Brigade Combat Teams.

The Army’s current BCT capacity equals 62 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.”

Despite modest progress with the JLT 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. FY 2022 requested funding levels would lead to reductions in numerous equipping programs: helicopter modernization, AMPV, JLT, HEMMT, and others. The result would be an Army that is aging faster than it is modernizing.

Readiness Score: Very Strong

The Army reports that 58 percent (18) of its 31 Regular Army BCTs are at the highest state of readiness.⁹⁸ No National Guard BCTs are at

those levels of readiness. The Army's internal requirement for Regular Army BCT readiness is 66 percent, or 20.5 BCTs.⁹⁹ Using the assessment methods of this *Index*, this results in a percentage of service requirement of 87 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 2021 *Index*, which also rated the Army as "marginal" overall.

U.S. Military Power: Army

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

ARMY SCORES



Procurement Through FY 2021
and Spending 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 build prototypes of the OMFV, but it 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 to late 2020. This 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 because of technology and cost hurdles. The original Stryker is being replaced with a double-v hull (DVH) configuration 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 379 for details on fleet ages, dates, and procurement spending.

ARMY SCORES



Procurement Through FY 2021
and Spending 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 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.	2	3

PROCUREMENT
474 2,391

SPENDING (\$ millions)
\$2,666 \$11,126

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 (for example, as ambulances). Its expected life span 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 the USMC. In June 2019, the Army approved the JLTV for full-rate production. Production is underway. Current budget shortfalls have forced the Army to reduce procurement quantities.	3	3

PROCUREMENT
13,438 35,661

SPENDING (\$ millions)
\$6,492 \$19,219

NOTE: See page 379 for details on fleet ages, dates, timelines, and procurement spending.

ARMY SCORES

1 2 3 4 5

Weakest ← → Strongest

Procurement Through FY 2021
and Spending Pending

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 found in Combat Aviation Brigades and is the Army's attack helicopter. It can destroy armor, personnel, and material targets. Its expected life cycle is approximately 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 will be able to carry modern munitions, including the JAGM missile.	3	5
AH-64E Inventory: 351 Fleet age: 4 Date: 2012 The AH-64E variant is a remanufactured version with substantial upgrades in power plant, avionics, communications, and weapons capabilities. Its expected life cycle is approximately 20 years.	5	5	AH-64E New Build Timeline: 2010-2027 The AH-64E New Build program produces new-build, not rebuilt, 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.	3	5

PROCUREMENT*

431	189
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SPENDING* (\$ millions)

\$10,639	\$3,986
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PROCUREMENT*

79	2
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SPENDING* (\$ millions)

\$2,404	
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* Additional procurement expected.

NOTE: See page 379 for details on fleet ages, dates, timelines, and procurement spending.

ARMY SCORES



Weakest ← Strongest

Procurement Through FY 2021
and Spending Pending

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
UH-60A Black Hawk Inventory: 157 Fleet age: 36.5 Date: 1978 The UH-60A is a utility helicopter that provides air assault and aeromedical evacuation and supports special operations. Its expected life span is approximately 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 its rotor blades, engine, and computers.	3	5
UH-60L Black Hawk Inventory: 958 Fleet age: 14.5 Date: 1989 The UH-60L is the follow-on to the UH-60A helicopter. 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 at least until 2030.	3	3	UH-60V Black Hawk Timeline: 2021-TBD The Army plans to upgrade the older model UH-60L to the UH-60V configuration, which incorporates a digital cockpit like the one on the UH-60M. This is an Army cost-saving measure because it is cheaper to make a UH-60V from a UH-60L than it is to buy a new UH-60M.	1	4
UH-60M Black Hawk Inventory: 1,070 Fleet age: 7.5 Date: 2005 The UH-60M is the follow-on to the UH-60A helicopter. 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 at least until 2030.	5	4			

NOTE: See page 379 for details on fleet ages, dates, timelines, and procurement spending.

ARMY SCORES



Procurement and Spending Through FY 2021
and 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. Its 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 its 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 The 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

* Additional procurement expected.

NOTES: See Methodology for descriptions of scores. Fleet age is the average between the first and last years 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 Navy's enacted budget for fiscal year (FY) 2021 was \$162.9 billion. The goal was to balance readiness, lethality, and capacity so that the Navy could be "agile and ready to fight today while also committing to the training, maintenance, and modernization to ensure [that it] can fight and win tomorrow."¹ The proposed FY 2022 Navy budget is \$163.9 billion for an overall increase of 1 percent.²

The budget themes for the Department of the Navy (which includes both the U.S. Navy and the U.S. Marine Corps) under the Biden Administration are "Defend the Nation" (to include "rapid innovation"); "Take Care of Our People" (to include "building resilience and readiness"); and "Succeed through Teamwork."³ Unfortunately, the Navy is under immense strain to maintain readiness for combat while also conducting the daily operations necessary in peacetime to compete with the activities of China and Russia.

In the year since publication of the *2021 Index of U.S. Military Strength*, there have been several significant developments that are important to the Navy.

- COVID-19 vaccines have been approved, enabling officers and sailors to be vaccinated at higher rates relative to the national average.
- In late April 2021, the Navy conducted its first multi-platform manned-unmanned fleet experiment, Integrated Battle Problem 21 (UxS IBP21).

- Highlighting the importance of maritime choke points to national security, on March 23, 2021, container ship *Ever Given* ran aground in the Suez Canal and stopped the flow of maritime traffic through the canal for 11 days, delaying transit of the *Eisenhower* Carrier Strike Group.⁴
- Because of a catastrophic fire in mid-July 2020, USS *Bonhomme Richard* (LHA-6) was decommissioned just halfway through its planned service life.

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. To address today's maritime competition more effectively, the sea services have released a new naval strategy, *Advantage at Sea*. If the new strategy is executed, the Navy will be conducting more assertive forward presence operations to challenge Chinese and Russian maritime coercion.⁵

As the U.S. military's primary maritime arm, the Navy will provide the enduring forward global presence required of this strategy while retaining war-winning forces. The Navy therefore continues 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 2021 Interim National Security Strategic Guidance;⁶
- The December 2020 Advantage at Sea naval strategy;⁷
- The 2018 National Defense Strategy (NDS);⁸ and
- The Global Force Management Allocation Plan (GFMAP).⁹

U.S. official strategic guidance increasingly requires the Navy to act beyond the demands of conventional warfighting. China and Russia use their fleets to establish a physical presence in regions that are important to their economic and security interests in order to influence the policies of other countries. To counter their influence, the U.S. Navy similarly sails ships in these waters to reassure allies of U.S. commitments and to signal to competitors that they do not have a free hand to impose their will. This means that the Navy must balance two key missions: ensuring that it has a fleet ready for war while also using that fleet for peacetime “presence” operations. Both missions require crews and ships that are materially ready for action and a fleet that is large enough to maintain presence and marshal enough combat power to win in battle.

This *Index* focuses on the following elements as the primary criteria by which to measure U.S. naval strength:

- Sufficient **capacity** to defeat enemies in major combat operations and provide a credible peacetime forward presence to maintain freedom of shipping lanes and deter aggression;
- Sufficient technical **capability** to ensure that the Navy is able to defeat potential adversaries; and
- Sufficient **readiness** to ensure that the fleet can “fight tonight” given proper material maintenance, personnel training, and physical well-being.

Capacity

Force Structure. The Navy is unique relative to the other services in that its capacity requirements must meet two separate objectives:

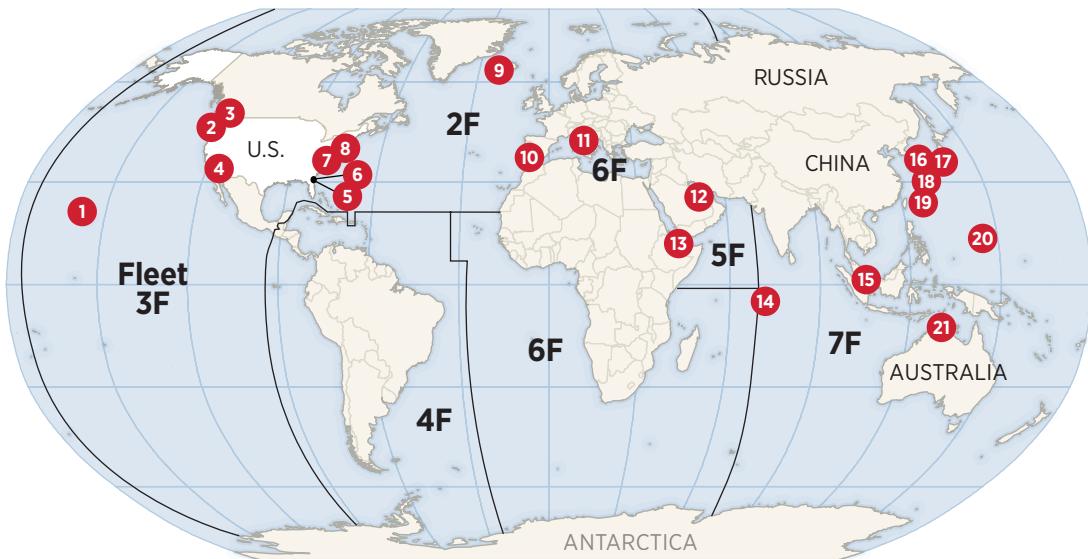
1. During peacetime, the Navy must maintain a global presence in distant regions both to deter potential aggressors and to assure allies and security partners.
2. The Navy must be able to win wars. To this end, the Navy measures capacity by the size of its battle force, which is composed of ships it considers directly connected to combat missions.¹⁰

This *Index* continues the benchmark set in the *2019 Index*: 400 ships to ensure the capability to fight two major regional contingencies (MRCs) simultaneously or nearly simultaneously, plus a 20 percent strategic reserve, and historical levels of 100 ships forward deployed in peacetime.¹¹ This 400-ship fleet is centered on providing:

- 13 Carrier Strike Groups (CSGs);
- 13 carrier air wings with a minimum of 624 strike fighter aircraft;¹² and
- 15 Expeditionary Strike Groups (ESGs).¹³

Unmanned platforms are not included because they have not matured as a practical asset. They hold great potential and will likely be a significant capability, but until they are developed and fielded in larger numbers, their impact on the Navy’s warfighting potential remains speculative. The same holds true across the fleet when it comes to new classes of ships. The Navy is investing in research, modeling, war gaming, and intellectual exercises to improve its understanding of the potential utility of new ship and fleet designs. Consequently, this *Index* measures what is known and can be known in naval affairs, assessing the current Navy’s size, modernity, and readiness to perform its most important missions today.

Key U.S. Naval Installations



- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1 Joint Base Pearl Harbor-Hickam, HI
U.S. Pacific Fleet headquarters</p> <p>2 Naval Base Kitsap, WA</p> <p>3 Naval Station Everett, WA</p> <p>4 Naval Base San Diego and Naval Base Coronado, CA
U.S. Third Fleet headquarters</p> <p>5 Naval Station Mayport, FL
U.S. Fourth Fleet headquarters</p> <p>6 Naval Submarine Base King's Bay, GA</p> <p>7 Naval Base Norfolk and Joint Expeditionary Base Little Creek, VA
U.S. Fleet Forces Command and U.S. Second Fleet headquarters</p> <p>8 Naval Submarine Base New London, CT</p> <p>9 Keflavik, Iceland—Expeditionary Maritime Operations Center</p> <p>10 Naval Station Rota, Spain</p> <p>11 Naval Support Activity Gaeta, Italy
U.S. Sixth Fleet headquarters</p> | <p>12 Naval Support Activity, Bahrain
U.S. Fifth Fleet headquarters</p> <p>13 Lemonnier, Djibouti—Camp Lemonnier</p> <p>14 Diego Garcia—Navy Support Facility Diego Garcia</p> <p>15 Singapore—Commander Logistics Group Western Pacific</p> <p>16 Buson, South Korea—Fleet Activities Chinhae Navy Base</p> <p>17 U.S. Fleet Activity Yokosuka, Japan
U.S. Seventh Fleet headquarters</p> <p>18 U.S. Fleet Activity Sasebo, Japan</p> <p>19 Okinawa, Japan—Naval Base White Beach</p> <p>20 Naval Base Guam—Navy Expeditionary Force Command Pacific headquarters</p> <p>21 Darwin, Australia—Marine Rotational Force Darwin</p> |
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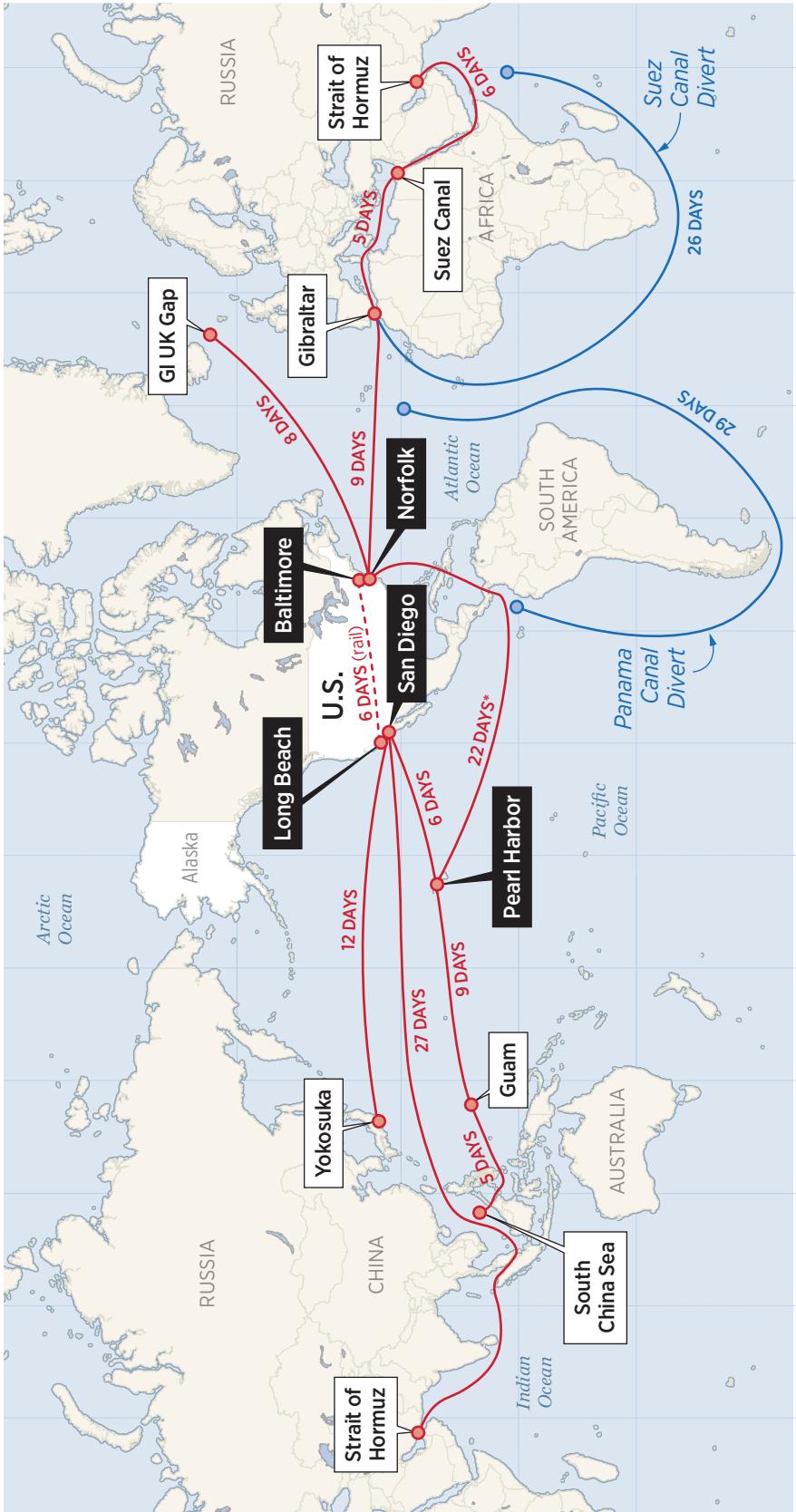
NOTE: Fleet boundaries are approximate.

SOURCE: Heritage Foundation research.

 heritage.org

Steaming Times to Areas of Vital U.S. National Interest

Steam times are approximate based on an average speed of 15 knots.



* Assumes no delay in passage through the Panama Canal.

SOURCE: Heritage Foundation research.

Relative to the above metric, the Navy's current fleet of 297 warships is inadequate and places greater strain on the ability of ships and crews to meet existing operational requirements. To alleviate the operational stress on an undersized fleet, the Navy has attempted since 2016 to build a larger fleet. However, for myriad reasons, it has been unable to achieve sustained growth. In the past, the Navy has had some success in meeting operational requirements with fewer ships by posturing ships forward as it has done in Rota, Spain, and Guam.

Posture/Presence. Although the Navy remains committed to sustaining forward presence, it has struggled to meet the requests of regional Combatant Commanders. The result has been longer and more frequent deployments to meet a historical steady-state forward presence of 100 warships.¹⁴ At the height of the Cold War in 1985, the percentage of the 571-ship fleet deployed was less than 15 percent, and throughout the 1990s, deployments seldom exceeded the six-month norm: Only 4 percent to 7 percent of the fleet exceeded six-month deployments on an annual basis.¹⁵ Using the Navy's aircraft carrier fleet—the most taxed platform—as a sample set, for 20 years, approximately 25 percent of the aircraft carrier fleet has been deployed. Following the 2017 deadly collisions involving USS *McCain* and USS *Fitzgerald*, this dropped temporarily to less than 20 percent, but it surged again to almost 30 percent in 2020.¹⁶

The numbers as of July 12, 2021, are fairly typical for a total battle force of 297 deployable ships with 83 warships at sea: 58 deployed and underway and 25 underway on local operations for an operational tempo (OPTEMPO) of 28 percent, nearly double the OPTEMPO that characterized the Cold War.¹⁷ 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.¹⁸ 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) can provide by offsetting the time needed to transit ships to and familiarize their crews with distant theaters.¹⁹ 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.²⁰ To date, the Navy's use of homeporting and forward stationing has not mitigated the reduction in overall fleet size on forward presence.

Shipbuilding Capacity. To meet stated fleet-size goals, the Navy must build and maintain ships. Significant shortfalls in shipyards, both government and commercial, make both of these tasks hard to accomplish, and underfunded defense budgets make accomplishing them even more difficult. Given the limited ability to build ships, the Navy will struggle to meet the congressionally mandated 355-ship goal,²¹ much less the 400 ships called for in this *Index*.

A bright spot in FY 2020 was the Navy's procurement of 12 ships, which marked a high point in shipbuilding over the past 20 years.²² However, subsequent procurement has not kept pace. The Navy purchased 10 new warships in FY 2021 and will purchase another eight in FY 2022,²³ but it will not meet congressional mandates for a fleet of 12 aircraft carriers.²⁴ Instead, the aircraft carrier fleet could shrink to nine (possibly augmented by a light carrier yet to be defined).²⁵

Meanwhile, diminished demand for ships has led shipbuilders to divest workforce and

delay capital investments. From 2005 to 2020, the Navy's procurement of new warships increased the size of the fleet from 291 to 296 warships; at the same time, China's navy grew from 216 to 360 warships.²⁶ If the Navy is to build a larger fleet, more shipbuilders will have to be hired and trained—a lengthy process that precedes any expansion of the fleet. Sadly, labor statistics from 2017 to 2020 show trends in the opposite direction with total shipbuilding labor involved in production, like welders and pipefitters, shrinking 3 percent for a loss of 1,950 workers and wages falling relative to inflation.²⁷ The consequence is a reduction in the shipbuilding sector's capacity to meet emergent demands from the Navy.

Of particular concern is the increased production of nuclear-powered warships, most notably nuclear-powered submarines that would be vital in any conflict with China. Limited nuclear shipbuilding capacity²⁸ may constrain the Navy's plans to increase the build rate from two attack submarines to three while concurrently building one ballistic missile submarine.²⁹ To support a larger nuclear-powered fleet, the relevant public shipyards have increased their workforce by 16 percent since 2013.³⁰ However, as demand increases for nuclear-powered warships to pace the threat from China and Russia into the foreseeable future, it remains to be seen whether the public shipyards will be able to sustain the recruitment of skilled labor in the numbers needed.

As it stands today, the most senior naval officer, the Chief of Naval Operations (CNO), has admitted that current funding will not build or maintain the larger fleet that both the Navy and this *Index* say is needed and Congress has mandated. At best, the Navy has assessed that it will only be able to maintain a fleet of "about 300 to 305 ships."³¹

Manpower. In 2018, the Navy assessed that its manpower would need to grow by approximately 35,000 to achieve an end strength of 360,395 sailors to support a 355-ship Navy;³² for comparison, the last time the Navy had a similar number of ships was in 1997, when it had 359 ships and 398,847 officers and

sailors.³³ As of June 10, 2021, the Navy consisted of 342,911 officers and sailors, 17,484 short of the number needed by 2034.³⁴ To improve personnel readiness and meet the demands of a growing fleet, the Navy added 5,100 sailors in FY 2020.³⁵ The FY 2021 budget continued these increases in active-duty manning end strength by an additional 7,300 sailors.³⁶ The Navy recently exceeded retention and recruitment goals for FY 2020 and appears to be on track to meet its FY 2021 recruitment goals. It remains to be seen, however, whether high retention and recruitment rates can be sustained to meet long-range manning needs.

Despite the acknowledged need to increase the Navy's cadre of officers and enlisted sailors, the President's FY 2022 budget goes in the opposite direction for the first time in years. This proposed budget reduces the Navy's end strength by 1,600 officers and sailors in the Active component and 200 in the reserves while increasing the civilian workforce by 1,141 full-time employees.³⁷ Moreover, under the theme of "Take Care of Our People," it shrinks higher education funding by \$117 million and other "key educational programs" such as the Reserve Officer Training Corps (ROTC) by another \$4 million.³⁸ Such reductions are surprising in view of the Government Accountability Office's recent findings that persistent crew manning shortfalls on ships are as high as 15 percent and compound crew fatigue, which was a contributing factor in several fatal collisions in 2017.³⁹

Finally, the effort to attract people to join the Navy is made more difficult by wages that are not keeping up with civilian wages. It is therefore not helpful that a 2.7 percent pay raise is planned in FY 2022 at a time when inflation continues to increase: On August 11, 2021, the U.S. Bureau of Labor Statistics reported that "[t]he all items index rose 5.4 percent for the 12 months ending July, the same increase as the period ending July."⁴⁰

Capability

A complete measure of naval capabilities requires an assessment of U.S. platforms against enemy weapons in plausible scenarios. The

TABLE 4

Navy Fleet Design

	Starting Point	Recommendation			Navy Plan (Dec. 2020)		Range per Future Naval Force Study
		Jan. 2021	2023	2028	2035	2023	
Unmanned (LUSV, MUSV, XLUUV)	0	9	48	136	2	110	143 to 242
Aircraft Carriers (CVN, CVNE, CVS)	11	11	12	15	11	11	8 to 17
Large Surface Combatant	91	103	111	94	92	86	73 to 88
Small Surface Combatant	30	32	38	56	37	58	60 to 67
Logistics and Support Vessels	63	71	98	135	70	96	96 to 117
Submarines (SSBN, SSGN, SSN)	68	78	77	82	72	74	84 to 90
Amphibious Warships	33	34	42	57	28	52	61 to 67
Total Without Unmanned	296	329	378	439	310	377	382 to 446
Total	296	338	426	575	312	487	525 to 688

SOURCES: U.S. Navy, Office of the Chief of Naval Operations, Deputy Chief of Naval Operations (Warfighting Requirements and Capabilities—OPNAV N9), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels*, December 9, 2020, https://media.defense.gov/2020/Dec/10/2002549918/-1/-1/1/SHIPBUILDING%20PLAN%20DEC%2020_NAVY OSD OMB_FINAL.PDF (accessed August 19, 2021), and Heritage Foundation research.

 heritage.org

Navy routinely conducts war games, exercises, and simulations to assess this, but insight into its 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 fleet consists of older platforms; of the Navy’s 20 classes of ships, only eight are in production. However, across the Department of the Navy’s \$211.7 billion FY 2022 budget,⁴¹ investment in future capability will see the largest real dollar increase (\$2.5 billion) and relative increase (12.4 percent) over the previous year.⁴² The following are highlights by platform.

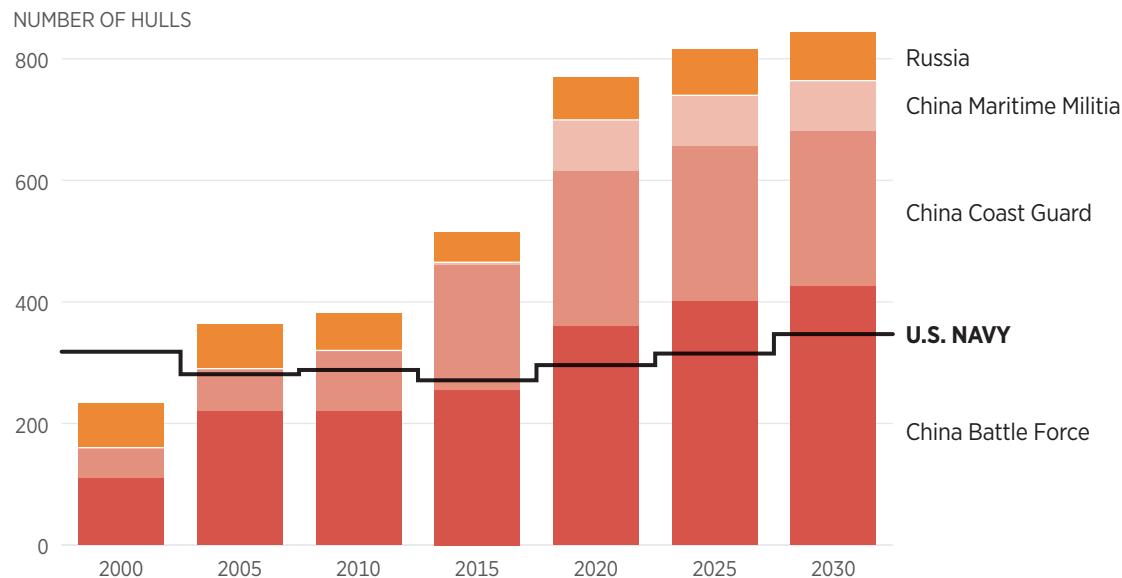
Ballistic Missile Submarines (SSBN). The *Columbia*-class will relieve the aging *Ohio*-class SSBN fleet. Because of the implications of this for the nation’s strategic nuclear

deterrence, the *Columbia*-class SSBN remains the Navy’s top acquisition priority. To ensure the continuity of this leg of the U.S. nuclear triad, the first *Columbia*-class SSBN must be delivered on time for its first deterrent patrol in 2031.⁴³ To achieve this goal, the Navy signed a \$9.47 billion contract in November 2020 with General Dynamics Electric Boat for the first in-class boat and advanced procurement for long-lead-time components of the second hull.⁴⁴

Nuclear Attack Submarines (SSN). SSNs are multi-mission platforms whose stealth enables clandestine 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 newest class of SSN, the Block V *Virginia* with the Virginia Payload Module (VPM) enhancement, is important to the Navy’s overall strike

CHART 7

U.S. vs. China and Russia Navies: Fleet Expansion Trends



NOTE: U.S. figures are actual through 2020. Figures for 2025 and 2030 are from the Navy's December 2020 30-year shipbuilding plan. See U.S. Navy, Office of the Chief of Naval Operations, Deputy Chief of Naval Operations (Warfighting Requirements and Capabilities—OPNAV N9), *Report to Congress on the Annual Long-Range Plan for Construction of Naval Vessels*, December 9, 2020, https://media.defense.gov/2020/Dec/10/2002549918/-1/-1/SHIPBUILDING%20PLAN%20DEC%2020_NAVY OSD OMB_FINAL.PDF (accessed September 3, 2021).

SOURCES:

- Figure 1, "Growth of China's Maritime Forces Since 2000," in U.S. Department of the Navy, U.S. Marine Corps, and U.S. Coast Guard, *Advantage at Sea: Prevailing with Integrated All-Domain Naval Power*, December 2020, p. 4, <https://media.defense.gov/2020/Dec/16/2002553074/-1/-1/0/TRISERVICESTRATEGY.PDF> (accessed September 2, 2021).
- Table 2, "Numbers of Chinese and U.S. Navy Battle Force Ships, 2000–2030," in Ronald O'Rourke, "China Naval Modernization: Implications for U.S. Navy Capabilities—Background and Issues for Congress," Congressional Research Service Report for Members and Committees of Congress No. RL33153, updated January 27, 2021, p. 32, <https://crsreports.congress.gov/product/pdf/RL/RL33153/248> (accessed September 2, 2021).
- U.S. Navy, Office of Naval Intelligence, *The Russian Navy: A Historic Transition*, December 2015, <https://nuke.fas.org/guide/russia/historic.pdf> (accessed September 2, 2021).
- Michael A. McDevitt, Rear Admiral, U.S. Navy (Ret.), prepared statement in hearing, *Department of Defense's Role in Competing with China*, Committee of Armed Services, U.S. House of Representatives, 116th Cong. 2nd Sess., January 15, 2020, pp. 76–88, <https://www.govinfo.gov/content/pkg/CHRG-116hhrg40508/pdf/CHRG-116hhrg40508.pdf> (accessed September 2, 2021).

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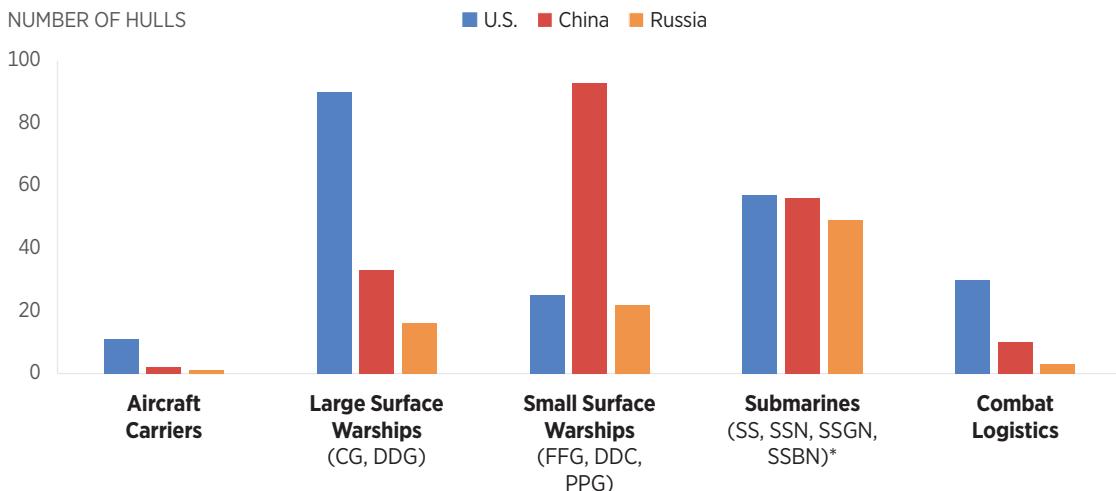
capacity, enabling the employment of an additional 28 Tomahawk cruise missiles over earlier SSN variants.⁴⁵

The FY 2021 National Defense Authorization Act included additional funds for advanced procurement that preserves a future

option to buy as many as 10 *Virginia*-class submarines through FY 2023. As indicated previously, increasing *Virginia*-class production has raised concerns regarding strain on the industrial base. Complicating matters is the recently revealed premature replacement

CHART 8

U.S. vs. China and Russia Navies: Hull Classes



* USN ballistic missile submarines are not included because their mission is strategic deterrence, which makes it unlikely that they will be employed in a combat zone.

SOURCES:

- Michael A. McDevitt, Rear Admiral, U.S. Navy (Ret.), prepared statement in hearing, *Department of Defense's Role in Competing with China*, Committee of Armed Services, U.S. House of Representatives, 116th Cong. 2nd Sess., January 15, 2020, pp. 76–88, <https://www.govinfo.gov/content/pkg/CHRG-116hrg40508/pdf/CHRG-116hrg40508.pdf> (accessed September 2, 2021).
- Graphic, “Major Naval Units,” in U.S. Department of Defense, Office of the Secretary of Defense, *Annual Report to Congress: Military and Security Developments Involving the People’s Republic of China 2020*, p. 49, <https://media.defense.gov/2020/Sep/01/2002488689/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF> (accessed September 3, 2021).
- International Institute for Strategic Studies, *The Military Balance 2021: The Annual Assessment of Global Military Capabilities and Defence Economics* (London: Routledge, 2021), pp. 196–199, 235–237, and 261–263, <https://www.iiss.org/publications/the-military-balance> (accessed September 3, 2021).

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of parts that were intended to last for the life of the boat. That such life-of-ship parts had to be replaced further taxes the ability of suppliers to meet the demand for new SSNs.⁴⁶

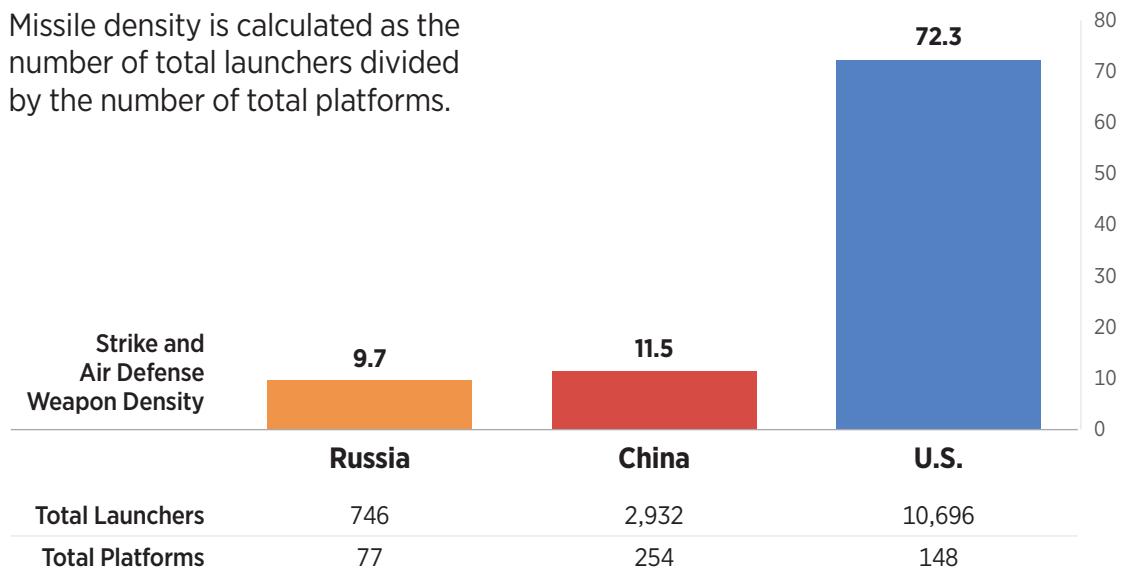
Aircraft Carriers (CVN). The Navy has 11 nuclear-powered aircraft carriers: 10 *Nimitz*-class and one *Ford*-class. The Navy has been making progress in overcoming nagging issues with several advanced systems, notably the advanced weapons elevators, but has not announced any delay in USS *Ford*'s first operational deployment in FY 2022.⁴⁷ The second ship in the class, USS *John F. Kennedy* (CVN

79), christened on December 7, 2019, is more than 76 percent complete. Given recent shifts in shipyard workloads due to later than anticipated *Kennedy* construction and planned *Nimitz* overhaul, the Navy recently renegotiated the *Kennedy* to single-phase contracting, which is intended to ensure that the ship is ready to support F-35C fighters before its anticipated delivery to the fleet on June 30, 2024.⁴⁸

Large Surface Combatants. The Navy's large surface combatants consist of the *Ticonderoga*-class cruiser, the *Zumwalt*-class destroyer, and the *Arleigh Burke*-class destroyer. If

U.S. vs. China and Russia Navies: Missile Density

Missile density is calculated as the number of total launchers divided by the number of total platforms.



NOTES: Numbers of launchers do not include reloads. Launchers include torpedo tubes, vertical launch tubes (submarine and surface ships), and mounted canister launchers.

SOURCES: U.S. Navy, Office of Information, “Fact Files,” <https://www.navy.mil/Resources/Fact-Files/> (accessed September 3, 2021), and Naval Sea Systems Command, Naval Vessel Register, “Ship Battle Forces,” <https://www.nvr.navy.mil/NVRSHIPS/SHIPBATTLEFORCE.HTML> (accessed September 3, 2021).

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the Navy executes the President’s FY 2022 budget, it will decommission “15 Battle Force Ships” including seven cruisers.⁴⁹ The effect is a measurable reduction of the fleet’s aggregate firepower of 854 vertical launch tubes for launching strike and defensive weapons—a 9 percent reduction of overall surface fleet firepower. Attempts to extend the life of the aging *Ticonderoga*-class cruisers have yielded mixed results as deferred upgrades and past incomplete maintenance are now driving up operating costs.⁵⁰

In FY 2022, the Navy intends to procure one *Arleigh Burke*-class DDG 51 destroyer; there is no intention of resuming construction of *Zumwalt* destroyers beyond the three previously purchased and being built out. The first *Zumwalt* destroyer (DDG-1000) was delivered

on April 24, 2020; the second, USS *Michael Monsoor* (DDG-1001), was commissioned on January 26, 2019; and the third, USS *Lyndon B. Johnson* (DDG-1002), should complete construction in November 2021.⁵¹ The *Zumwalt* was to achieve initial operational capability (IOC) by September, but it is more likely that IOC will be achieved in December 2021.⁵²

To reach 355 ships by 2034, the Navy plans several class-wide service life extensions, notably the extension of DDG-51-class service life from 35 to 40 years and modernization of older hulls. The FY 2020 budget included \$4 billion for modernization of 19 destroyers from FY 2021 through FY 2024.⁵³ The previously noted decommissioning of seven cruisers in FY 2022 makes this more critical.

Small Surface Combatants. The Navy's small surface combatants consist principally of the *Avenger*-class mine countermeasures (MCM) ship; the Littoral Combat Ship (LCS); and the *Constellation*-class frigate (FFG), which has just begun production in 2021. In January 2021, the Navy halted production of the mono-hull *Freedom*-variant of LCS until issues involving the design of its propulsion system are resolved. In the meantime, the top speed of affected ships (currently 40-plus knots) is reportedly limited to 34 knots.⁵⁴ Today's fleet of 23 LCS (10 *Freedom*-variant and 13 *Independence*-variant) is expected to grow to 34 hulls, to be joined by 18 frigates by FY 2034.⁵⁵

On August 20, 2020, the Navy decommissioned three of its aging *Avenger*-class MCM ships, leaving eight in service overseas in Sasebo, Japan, and Manama, Bahrain. These represent the only dedicated ships countering the mine threat.⁵⁶ The FY 2020 budget accelerated retirement of all *Avenger*-class MCMs by FY 2023.⁵⁷ In what could be a reversal of that decision, the current long-range shipbuilding plan will retain the last four ships of the class in Sasebo, Japan, through 2024.⁵⁸

As these ships reach the end of their service life, the Navy is relying on the development of mine countermeasure mission packages (MPs) for the LCS to provide this capability, which will not reach IOC until FY 2022 at the earliest. In an unanticipated move, the Navy announced plans, supported in the FY 2022 budget, to begin arming LCS ships with the naval strike missile, giving these ships a long-range anti-ship capability that they had lacked despite notable operations by the class in the South China Sea.⁵⁹

Instead of requesting additional LCS, the Navy has focused on a new frigate. 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.⁶⁰ The FY 2021 budget supported purchase of the second ship with annual procurement beginning in FY 2023.⁶¹ The Navy intends to expand production of these

frigates to four a year by FY 2025 with the addition of a second "follow yard" by FY 2023. Austal USA has broken new ground on a steel production facility in an effort to become this second yard.⁶²

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 to support an amphibious force of two Marine Expeditionary Brigades (MEB).⁶³ The Commandant envisions a larger yet affordable fleet of smaller, low-signature amphibious ships—the so-called Light Amphibious Warship (LAW)—that enable littoral maneuver and associated logistics support in a contested theater.⁶⁴ Today, the amphibious fleet remains centered on fewer large ships, but the Navy's Future Naval Force Study (FNFS)⁶⁵ and December 2020 30-year shipbuilding plan acknowledged the growing importance of the LAW, which will have to be produced rapidly and in sufficient numbers in order to actualize the naval forces' distributed concepts of operations (e.g., Marine Littoral Regiments and Maritime Distributed Operations).

As of July 14, 2021, the Navy had nine amphibious assault ships in the fleet (seven *Wasp*-class LHD and two *America*-class LHA); 11 amphibious transport docks (LPD); and 11 dock landing ships (LSD).⁶⁶ USS *Tripoli* (LHA-7) was delivered on February 28, 2020, and fabrication has begun on LHA-8, supporting delivery in FY 2024.⁶⁷

The FY 2021 budget included \$250 million in additional funds to accelerate construction of LHA-9.⁶⁸ The July 2020 catastrophic fire on *Bonhomme Richard* (LHD-6) makes it important that LHA-9 be delivered early so that the Navy can sustain its amphibious capacity. The decision to decommission the damaged ship further exposed limitations in shipyard capacity, as repairs would have had a negative effect on other planned shipbuilding and maintenance.⁶⁹

The Navy's 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. LPD-30 began construction in April 2020 and when delivered will be the first of 13 *San Antonio*-class Flight II ships to replace the legacy LSD ships. The 12th first flight *San Antonio*-class ship (LPD 28) will be delivered in September 2021,⁷⁰ and the FY 2021 budget included \$500 million "to maximize the benefit of the amphibious ship procurement authorities provided elsewhere in this Act through the procurement of long lead material for LPD-32 and LPD-33."⁷¹

Unmanned Systems. The Navy does not include unmanned ships in counting its battle force size, but the current long-range shipbuilding plan envisions purchasing 12 Large Unmanned Surface Vessels (LUSV); one Medium Unmanned Surface Vessel (MUSV); and eight Extra Large Undersea Unmanned Vessels (XLUVU) by FY 2026.⁷² This plan builds on the previous FY 2021–FY 2025 budget, which included \$12 billion for all naval unmanned air and sea platforms, an increase of 129 percent over FY 2020.⁷³ The June 2021 iteration of the Navy's long-range shipbuilding plan does not address the procurement of unmanned ships.⁷⁴

In April 2020, the Navy took delivery of its second MUSV *Sea Hunter* prototype. It will be joined in FY 2022 by two LUSV under Surface Development Squadron One (SURFDEVRON ONE), charged with developing associated operating requirements.⁷⁵ On May 18, 2021, one of these experimental LUSV vessels, the *Nomad*, was seen transiting the Panama Canal on its way to SURFDESRON ONE.⁷⁶

In a show of concern about the maturity of technologies associated with unmanned systems, both the Senate and House Armed Services Committees stipulated in the FY 2021 NDAA that the Navy qualify the reliability of engines and power generators before procuring unmanned surface vessels.⁷⁷ Those concerns remain outstanding.

Until the March 2021 release of the Department of the Navy's Unmanned Campaign Framework, there had been no overarching

vision to guide the naval services' unmanned investments and operational strategies.⁷⁸ For example, in 2019, the Marine Corps' Long Range Unmanned Surface Vessel conducted autonomous navigation from Norfolk, Virginia, to Cherry Point, North Carolina. The Corps plans to procure three more of these long-range unmanned vessels for further testing.⁷⁹

As the Marine Corps' unmanned program has progressed, the Navy has also made independent progress, notably its April 2021 U.S. Pacific Fleet-led Unmanned Integrated Battle Problem 21 (IBP21) exercise. This fleet experiment brought together the Navy's *Zumwalt* destroyer and unmanned MUSVs with a range of sensitive air and undersea unmanned platforms to mature the technologies and techniques required for effective naval manned–unmanned operations.⁸⁰

Navy and Marine Corps unmanned programs also appear to be converging in the development of an expeditionary control station for the *Fire Scout* (MQ-8C) unmanned helicopter.⁸¹ If deployed, this control station would allow for flexible employment of the Fire Scout both from austere sites ashore and from a range of ships for anti-submarine as well as surface warfare missions. However, as the Navy and Marine Corps accelerate their investments in unmanned systems, future fleet experimentation will have to incorporate both services' platforms to ensure interoperability.

Logistics, Auxiliary, and Expeditionary Ships. Expeditionary support vessels are highly flexible platforms consisting of two types: Today there are two Expeditionary Transfer Dock (ESD) and three Expeditionary Sea Base (ESB) vessels, which are used for prepositioning and sustaining forward operations, and 12 shallow-draft Expeditionary Fast Transport (EPF) vessels for high-speed lift in uncontested environments. Delivery of ESB 6 is planned for FY-2022, and delivery of ESB 7 is planned for FY 2023.⁸² *Newport* (EPF-12) was delivered to the Navy on September 2, 2021, and construction of *Apalachicola* (EPF-13) is progressing.⁸³ In March 2021, the Navy revised its contract with Austal USA for \$235 million to

modify EPF-14 and future EPF-15 to be high-speed hospital ships with the capability of embarking a V-22 tilt-rotor aircraft.⁸⁴

The Navy's Combat Logistics Force (CLF), consisting of dry-cargo and ammunition ships (T-AKE), fast combat support ships (T-AOE), and oilers (AO), provides critical support, to include at-sea replenishment, that enables the Navy to sustain the fleet at sea for prolonged periods. The Navy's future oiler *John Lewis* (T-AO 205) was launched on January 12, 2021, with delivery expected in June 2021 and an additional five to follow.⁸⁵ To sustain the fleet's number of oilers, the Navy will have to receive T-AO 205 and T-AO 206, both currently under construction, by FY 2023.⁸⁶

Strike Platforms and Key Munitions.

The FY 2021 and proposed FY 2022 budgets continued the Navy's focus on long-range, offensive strikes launched from ships, submarines, and aircraft. Notable investments include 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).

The FY 2021 budget sustained the rapid prototyping of upgraded SM-2 Block IIIC and SM-6 Block IB; procurement of Block V Tactical Tomahawk (TACTOM) cruise missiles and Navigation/Communication upgrade kits to improve performance in layered defense environments; and procurement of 48 LRASM.⁸⁷

To counter the threat posed by the Chinese PL-15 long-range air-to-air missile, which has an operational range of 186 miles, the Navy is working with the Air Force to develop the AIM-120 Advanced Medium-Range missile, the operational range of which has not been made public.⁸⁸ In March 2021, the Air Force reported a record long-range kill of a drone target by this developmental missile from one of its F-15C fighters.⁸⁹ If this report is accurate, it indicates that development is proceeding apace.

Shore-Based Anti-Ship Capabilities. Following the August 2019 U.S. withdrawal from the Intermediate-Range Nuclear Forces (INF) Treaty, new intermediate-range (500–1,000

miles) conventional ground-launched strike options became politically viable. This is especially important in Asia where such capable missiles deployed to the first island chain would have great relevance in any conflict with China.⁹⁰

The FY 2020 budget included \$76 million to develop ground-launched cruise missiles.⁹¹ The FY 2021 budget included \$59.6 million in additional funds to procure 36 ground-based anti-ship missiles.⁹² A photo of the launch of a U.S. Marine Corps truck-mounted naval strike missile—ostensibly, part of the Navy–Marine Expeditionary Ship Interdiction System (NMESIS)—was released in April 2021.⁹³

Electronic Warfare (EW). The purpose of electronic warfare is to control the electromagnetic spectrum (EMS) by exploiting, deceiving, or denying its use by an enemy while ensuring its use by friendly forces. It is therefore a critical element of successful modern warfare. The final dedicated EW aircraft, the EA-18G Growler, was delivered in July 2019, meeting the Navy's requirement to provide this capability to nine carrier air wings (CVW), five expeditionary squadrons, and one reserve squadron.⁹⁴ Anticipating the EA-18G's retirement in the 2030s, the Navy has been exploring follow-on manned and unmanned systems.

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 supported the procurement of four aircraft with an additional 10 to be procured over the next two years.⁹⁵ The proposed FY 2022 budget conforms to this plan by including procurement of five new E-2D aircraft, thus sustaining effective air early warning and increasingly important air control of unmanned platforms.

High Energy Laser (HEL). HEL systems provide the potential to engage targets or shoot down missiles without being limited to how much ammunition can be carried onboard ship. A significant 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, 2020.⁹⁶ This was followed by the Navy’s decision to begin installation of a HEL system—the HELIOS (60kw) laser—on destroyers in 2021 beginning with USS *Preble*.⁹⁷

HELIOS is a scalable laser system integrated into the ship’s weapons control and radar systems that can dazzle and confuse threats, disable small boats, or shoot down smaller air threats. However, until field testing against meaningful threat platforms is conducted across a range of weather conditions, the effectiveness of such systems remains unproven.

Command and Control. Networked communications are essential to successful military operations, and the information passed over these networks includes sensitive data from targeting to logistics. Cyber security, communications, and the information systems that generate and relay this information are therefore critical elements of the DOD information enterprise.

To enhance continuity, 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.⁹⁸ On February 23, 2021, the Navy consolidated network and IT-related technical authorities in a newly formed office, Taskforce Overmatch.⁹⁹ At a May 10, 2021, event, the CNO described Taskforce Overmatch as a unified data construct at the operational and tactical level and part of the DOD Joint All Domain Command and Control architecture.¹⁰⁰ 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).

Readiness

In the 1980s, the Navy had nearly 600 ships in the fleet and kept roughly 100 (17 percent) deployed at any one time. As of July 12, 2021, the fleet numbered 297 ships, of which 83 (28 percent) were at sea or deployed. With fewer ships carrying an unchanging operational

workload, training schedules become shorter while deployments become longer. The commanding officer’s discretionary time for training and crew familiarization is a precious commodity that is made ever scarcer by the increasing operational demands on fewer ships.

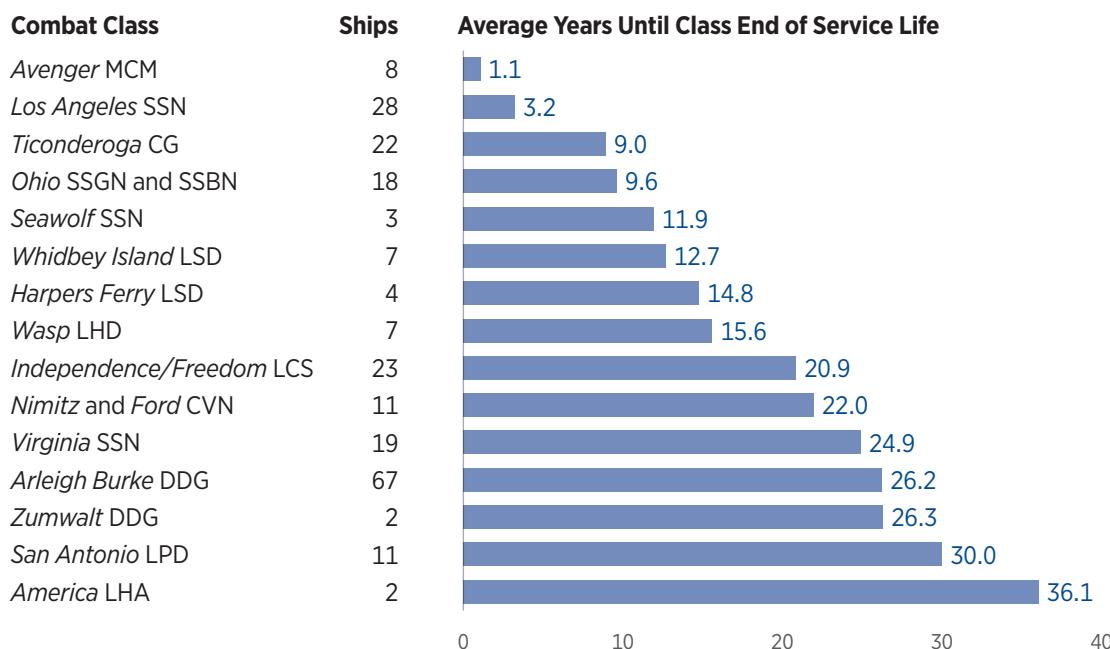
FY 2019 marked the first time in more than a decade that the DOD and the Navy did not have to operate under a continuing resolution for at least part of the fiscal year. Having a full fiscal year to plan and execute maintenance and operations helped the Navy to continue on its path to restoring fleet readiness. However, as CNO Admiral John Richardson explained to the Senate Armed Services Committee in April 2018, it will take until late 2021 or 2022 to restore fleet readiness to an “acceptable” level provided adequate funding is maintained, and without “stable and adequate funding,” it will take longer.¹⁰¹

Unfortunately, the Navy began FY 2020 under a continuing resolution that delayed planned maintenance for USS *Bainbridge* (DDG 96) and USS *Gonzalez* (DDG 66).¹⁰² This indicates that progress on fleet material readiness remains tenuous despite the fact that current and previous CNOs have made readiness their number one priority. Admiral Michael Gilday reiterated this most recently at a May 2021 Navy Memorial SITREP speaker event.¹⁰³

Impact of COVID-19. The eruption of the COVID-19 pandemic in 2020 caused many problems for the U.S. Navy. USS *Theodore Roosevelt* (CVN 71), for example, was forced to quarantine for 55 days in Guam; the major biannual international Rim of the Pacific Exercise (RIMPAC) was scaled down; 1,629 reservists were called to active duty to backfill high-risk shipyard workers conducting critical maintenance; and the Navy was restricted to using “safe haven” COVID-free ports, limiting where warships could call. In May 2021, the CNO assessed that the Navy managed the pandemic with minimal operational impact but with added time at sea and delays for family reunions pending quarantines.¹⁰⁴

In fact, the Navy’s response to the pandemic has been a success overall. As of June 2, 2021,

Navy Combat Ships Nearing End of Service Life



NOTE: Figures are based on calculations for August 2021.

SOURCE: Naval Sea Systems Command, Naval Vessel Register, “Fleet Size,” <http://www.nvr.navy.mil/NVRSHIPS/FLEETSIZE.HTML> (accessed August 2, 2021).

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total cumulative COVID cases among the Navy’s active-duty uniformed personnel numbered 38,849, with six deaths since February 2020.¹⁰⁵ Of the Navy’s active-duty personnel on July 16, 2021, 78 percent were fully vaccinated, and 84.4 percent of sailors had received at least one shot, with both figures above the national average at the time.¹⁰⁶

Maintenance and Repairs. Naval Sea Systems Command completed its Shipyard Optimization and Recapitalization Plan in September 2018.¹⁰⁷ Three years later, the improvement of public shipyard capacities is just beginning. The initial step of building digital models to inform future upgrades to the Navy’s four public shipyards is expected to be complete

by the end of 2021, but attempts by Congress to accelerate the breaking of new ground remain stalled.¹⁰⁸

At a May 10, 2021 event, the Chief of Naval Operations highlighted reducing the number of days of delayed maintenance at the four public yards by 80 percent and at private yards by 60 percent, improving maintenance planning at private shipyards, and giving yards more time to plan from contract approval to starting work as positive trends.¹⁰⁹ Nevertheless, the overall capacity for maintaining today’s Navy, much less a fleet that is larger than 300 ships, remains inadequate.

Moreover, a recently declassified DOD Inspector General report that assessed readiness

issues with respect to the Navy's newest maritime patrol aircraft, the P-8A Poseidon, concluded that the platform's low capability rates were due to an inadequate sustainability strategy for the aircraft.¹¹⁰ A similar issue regarding spare parts for the *Virginia*-class nuclear submarine fleet came to light at a fall 2020 Navy League conference and in a subsequent Congressional Budget Office report.¹¹¹ Over a two-year period beginning in 2018, the cannibalization of otherwise life-of-ship parts had a marked early failure rate, reportedly because of galvanic corrosion, which occurs at the contact space of two dissimilar metals. This problem reflects either poor design decisions preceding construction of the submarine class or modification of materials used by suppliers without the Navy's knowledge. Either way, this material issue illustrates an ongoing need for better management of the transition from design to sustainment as well as better management of the Navy's supplier base.

Training, Ranges, and Live-Fire Exercises. Ship and aircraft operations and training are critical to fleet readiness. The Navy seeks to meet fleet readiness requirements by funding 58 underway days for each deployed warship and 24 underway days for each non-deployed warship per quarter. Less clear is how much of this time is spent on crew training and whether the Navy assesses this as effective in meeting needed operational proficiencies.

That said, to achieve desired days at sea, the Navy sought an increase of 6.4 percent in its FY 2022 operations budget,¹¹² slightly less than FY 2021's 6.5 percent increase to cover "ship operations funding."¹¹³ Importantly, the FY 2022 budget increases the Flying Hour program by 11.0 percent, continuing the previous year's 5.8 percent increase, to ensure that squadrons are combat-ready when deployed.¹¹⁴

To improve warfighting proficiency, 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.¹¹⁵

This training range fits into the larger five-year \$27.3 billion Pacific Deterrence Initiative (PDI), led by Indo Pacific Command, intended partly to transform the way the Navy trains for high-end conflict and improve training with U.S. allies in the Pacific.¹¹⁶ Of particular importance to the Navy are PDI investments to modernize the Pacific Missile Range Facility (PMRF); the Joint Pacific Alaska Range Complex (JPARC); and the Combined/Joint Military Training (CJMT) Commonwealth Northern Mariana Islands in order to improve training for operations across all domains: air, land, sea, space, and cyber.¹¹⁷

Not forgotten are the 2017 collisions of USS *John S. McCain* (DDG 56) and USS *Fitzgerald* (DDG 62) in which 17 sailors were lost. Findings of the subsequent investigations, which highlighted the importance of operational risk management and unit readiness, remain relevant.¹¹⁸ To ensure that these tragic events are not repeated, the following broad institutional recommendations in the Secretary of the Navy's *Strategic Readiness Review* should be implemented:

- "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."¹¹⁹

Scoring the U.S. Navy

Capacity Score: Weak

This *Index* assesses that a battle force consisting of 400 manned ships is required for the U.S. Navy to do what is expected of it today. The Navy's current battle force fleet of 297 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," which is unchanged from the *2021 Index*. Depending on the Navy's ability to fund more aggressive growth options and service life extensions, its capacity score could be lower in the next edition of the *Index*.

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 and the

rapid growth of competitor navies with 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 struggles to sustain overdue readiness corrective actions, complicated by an inadequate fleet size and overwhelmed maintenance infrastructure.

Overall U.S. Navy Score: Marginal Trending Toward Weak

The Navy's overall score for the *2022 Index* is "marginal" trending toward "weak." To correct this trend, the Navy will have to eliminate several readiness and capacity bottlenecks while seeing to it that America has an operational fleet with the numbers and capabilities postured to counter Russian and Chinese naval advances.

U.S. Military Power: Navy

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

NAVY SCORES



Procurement Through FY 2021
and Spending Pending

Aircraft Carrier

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Nimitz-Class Aircraft Carrier (CVN-68) Inventory: 10 Fleet age: 30.4 Date: 1975 <p>The <i>Nimitz</i>-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 the FY 2025 and will be replaced by the <i>Ford</i>-class carriers.</p>	(3)	(3)	Ford-Class Aircraft Carrier (CVN-78) Timeline: 2017–2032 <p>Currently in production, the <i>Ford</i>-class will replace the <i>Nimitz</i>-class aircraft carriers. The <i>Ford</i>-class design uses the basic <i>Nimitz</i>-class hull form but incorporates several improvements to achieve a 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 <i>Nimitz</i>-class. The ship completed its first Full Ship Shock Trial (FSST) on June 18 and will complete the rest by the end of summer. Then it will enter a Planned Incremental Availability for six months before operational employment so that it can undergo modernization, maintenance, and repairs. The ship's intended life expectancy is 50 years.</p>	(2)	(2)
Ford-Class Aircraft Carrier (CVN-78) Inventory: 1 Fleet age: 4 Date: 2017 <p>The <i>Ford</i>-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.</p>	(5)	(4)	PROCUREMENT SPENDING (\$ millions) 	3	\$37,803 \$15,558

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES

1 2 3 4 5
Weakest → Strongest

Procurement Through FY 2021
and Spending Pending

Large Surface Combatant

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Ticonderoga-Class Cruiser (CG-47) Inventory: 22 Fleet age: 31 Date: 1981	2	3	Zumwalt-Class Destroyer (DDG-1000) Timeline: 2016–2022	1	1
The <i>Ticonderoga</i> -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. The ship has a life expectancy of 40 years, the Navy plans to retire eight of the 22 CGs between FY 2021 and FY 2024.			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 capable of reducing 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 has been reduced to three. The first DDG-1000 was commissioned in October 2016.		
Zumwalt-Class Destroyer (DDG-100) Inventory: 1 Fleet age: 3.6 Date: 2016	5	2	PROCUREMENT  3	SPENDING (\$ millions)  \$23,427 \$753	
The <i>Zumwalt</i> -Class is a 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 <i>Zumwalt</i> -class ship was commissioned in FY 2020.					
Arleigh Burke-Class Destroyer (DDG-51) Inventory: 69 Fleet age: 18.7 Date: 1991	3	4	Arleigh Burke-Class Destroyer (DDG-51) Timeline: 1991–2029	3	4
The <i>Arleigh Burke</i> -class is a multi-mission guided missile destroyer featuring the Aegis Weapons System with a primary mission of air defense. The Navy was supposed to buy two in FY 2022, but President Biden's proposed budget would provide only one. This would break multiyear contracts and has received pushback from Congress, so the decision is still being debated. The Navy plans to extend the service life of the entire class to 45 years from its original life expectancy of 35–40 years.			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 be the Flight III design, which includes the more capable Advanced Missile Defense Radar (AMDR). The Navy was supposed to buy two in FY 2022, but President Biden's proposed budget would provide only one. This would break multiyear contracts and has received pushback from Congress, so the decision is still being debated. The destroyers are believed to have an extended life span of 45 years of operational service.		
			PROCUREMENT  87	SPENDING (\$ millions)  \$106,120 \$18,379	

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES



Weakest ← Strongest

Procurement Through FY 2021
and Spending Pending

Small Surface Combatant

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Littoral Combat Ship (LCS) Inventory: 24 Fleet age: 4.1 Date: 2008 The Littoral Combat Ship includes two classes: the <i>Independence</i> -class and the <i>Freedom</i> -class. The modular LCS design depends on mission packages (MPs) 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: 1991–2030 The LCS is intended to fulfill the mine countermeasure, antisubmarine warfare, and surface warfare roles for the Navy. It is designed to operate in near-shore environments but is also capable of open-ocean operation. It works better with smaller ships than the DDG-51 does. It will be the only small surface combatant in the fleet once the Navy's MCM ships are retired and until the new FFG(X) enters service. The Navy will have six deployed by the end of the year.	2	2
Avenger-Class Mine Counter Measure (MCM-1) Inventory: 8 Fleet age: 28.8 Date: 1983 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	FFG Frigate Timeline: 1991–2030 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. The ships will be 496 feet with a top speed of 29 miles per hour and a range of 6,000 nautical miles. Its purpose is to escort carrier battle groups and high-value convoys. It will accommodate 32 VLS cells to handle high-powered missiles and machine guns. The first ship should be delivered by 2026 and be operational by 2030. The current contract would provide 10 hulls by 2035.	33	\$21,809

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES



Procurement Through FY 2021
and Spending Pending

SSGN Cruise Missile Submarine

PLATFORM	Age Score	Capability Score	MODERNIZATION PROGRAM	Size Score	Health Score
Ohio-Class (SSGN-726) Inventory: 4 Fleet age: 38.5 Date: 1981 The SSGNs provide the Navy with a large stealthy strike and special operations mission capabilities. From 2002–2007, the four oldest <i>Ohio</i> -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 be retired 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. The SSGN had a planned service life of 42 years, but this may be extended.	1	4	None		

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES

1 2 3 4 5
Weakest ← Strongest

Procurement Through FY 2021
and Spending Pending

Attack Submarines

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Seawolf-Class (SSN-21) Inventory: 3 Fleet age: 21 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. 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-class is in production and will replace the Los Angeles-class and Seawolf-class attack submarines as they are decommissioned. 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. The planned service life of the Virginia-class is 33 years. Thirty-four have been procured so far at a rate of two per year.	2	3
Los Angeles-Class (SSN-688) Inventory: 28 Fleet age: 30 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 be retired in the late 2020s and is being replaced by the Virginia-class.	1	3	PROCUREMENT 34	2	SPENDING (\$ millions) \$105,314 \$60,202
Virginia-Class (SSN-774) Inventory: 19 Fleet age: 8 Date: 2004 The Virginia-class is the U.S. Navy's next-generation attack submarine. It 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. Thiry-four have been procured so far, at a rate of two per year.	4	4			

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES



Procurement Through FY 2021
and Spending 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 <i>Ohio</i> -class SSBN is the most survivable leg of the U.S. military's strategic nuclear triad. Its sole mission is strategic nuclear deterrence, for which it carries long-range submarine-launched ballistic missiles. The <i>Ohio</i> -class's expected service life is 42 years. Retirement of the class will begin in 2027 at an estimated rate of one submarine per year until 2039. The <i>Ohio</i> -class is being replaced by the <i>Columbia</i> -class SSBN.	2	4	Columbia-Class (SSBN-826) Timeline: TBD The 12-ship <i>Columbia</i> -class will replace the existing <i>Ohio</i> -class nuclear ballistic missile submarine force, which provides a credible and survivable sea-based strategic deterrent. The Navy's FY 2021 budget estimates that the total procurement cost for 12 ships will be \$109.8 billion. The first patrol of the lead ship, SSBN 826, is scheduled for FY 2031. However, the pandemic, technical challenges, and potential funding issues could cause the designing and building of the lead boat to be delayed. The <i>Columbia</i> -class ships will have a 42-year life expectancy.		

PROCUREMENT



SPENDING (\$ millions)

\$21,428

\$106,176

Amphibious Warfare Ship

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Wasp-Class Amphibious Assault Ship (LHD-1) Inventory: 7 Fleet age: 24.3 Date: 1989 The <i>Wasp</i> -class can support amphibious landing operations with Marine Corps landing craft through 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.	2	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 Corps 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 <i>America</i> -class is in production with three LHA 6s already procured. Advance procurement for LHA 9 will begin in FY 2023.	3	3
America-Class Amphibious Assault Ship (LHA-6) Inventory: 2 Fleet age: 3.9 Date: 2014 This new class of large-deck amphibious assault ships is meant to replace the retiring <i>Wasp</i> -class LHD. LHAs are the largest of all amphibious warfare ships and resemble small aircraft carriers. The <i>America</i> -class is designed to accommodate the Marine Corps' F-35Bs.	5	4			

PROCUREMENT



SPENDING (\$ millions)

\$11,897

\$3,055

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES



Procurement Through FY 2021
and Spending Pending

Amphibious Warfare Ship (Cont.)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
San Antonio-Class Amphibious Transport Dock (LPD-17) Inventory: 11 Fleet age: 9.9 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. Eleven of the planned 13 Flight I LPD-17-class ships are operational, and the remaining two are under construction. The class has a 40-year planned service life.		4	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.	5	4
Whidbey Island-Class Dock Landing Ship (LSD-41) Inventory: 7 Fleet age: 32.2 Date: 1985 LSD-41 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 will be retired between FY 2026 and FY 2033. LSD-41-class ships will be replaced by the LPD-17 Flight II program, which began procurement in FY 2018.		2	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, but 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.	5	4
Harpers Ferry-Class Dock Landing Ships (LSD-49) Inventory: 4 Fleet age: 25.1 Date: 1995 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	PROCUREMENT  13 SPENDING (\$ millions)  \$26,447 PROCUREMENT  2 SPENDING (\$ millions)  \$2,926		

NOTE: See page 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES



Procurement Through FY 2021
and Spending Pending

Airborne Early Warning

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score				
E-2C Hawkeye Inventory: 49 Fleet age: 38 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 the year 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. The \$17.5 billion program has a goal to build 75 new aircraft.	4	4				
E-2D Advanced Hawkeye Inventory: 45 Fleet age: 3.5 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 SPENDING (\$ millions) <table> <tr> <td>\$107</td> <td>\$5</td> <td>\$19,160</td> <td>\$6,001</td> </tr> </table>	\$107	\$5	\$19,160	\$6,001		
\$107	\$5	\$19,160	\$6,001						

Electronic Attack Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
EA-18G Growler Inventory: 158 Fleet age: 8 Date: 2009 The EA-18G Growler is the U.S. Navy's electronic attack aircraft and provides 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 412 for details on fleet ages, dates, timelines, and procurement spending.

NAVY SCORES



Procurement Through FY 2021
and Spending Pending

Fighter/Attack Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
F/A-18E/F Super Hornet Inventory: 586 Fleet age: 17 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 F-35C is the Navy's variant of the Joint Strike Fighter. The Joint Strike Fighter faced many issues during its developmental stages, including engine problems, software development delays, cost overruns incurring a Nunn-McCurdy breach, and structural problems. The Navy declared initial operational capability (IOC) of the F-35C in February 2019. The planned procurement of 273 F-35Cs will replace over 500 Super Hornets.	(2)	(3)
F-35C Joint Strike Fighter Inventory: 30 Fleet age: 1 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 the Block III Super Hornets will have a life span of 10,000 flight hours, which is 50 percent greater than that of earlier F/A-18E/F aircraft. The Biden Administration's proposed budget would decrease the Navy's aviation budget, which would eliminate the planned purchase of Super Hornets.	144	20



NOTES: See Methodology for descriptions of scores. Fleet age is the average 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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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). Together, the addition of the Space Force as the fifth uniformed service within the Department of Defense (DOD) and the onset of the global SARS-CoV-2 (COVID-19) pandemic have had a notable impact on the Air Force in the year since the *2021 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 (DAF) and allow the Air Force to focus the weight of its efforts on the core missions in 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 2021 finds the Air Force, like the rest of DOD, recovering from the effects of COVID-19. Recruiting and other training pipelines like pilot training have slowed considerably, and this has affected accessions. The service’s ability to generate sorties and flying hours for training has reached near-historic lows with equally grim readiness levels. 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.

The pandemic’s impact on the economy has reduced external hiring opportunities, particularly with the airlines, and this has helped to mitigate the separation from the Air Force of the most experienced airmen in critically manned areas.² However, because the COVID-19 vaccine’s distribution is now widespread and the economic recovery is underway, it could well become harder to retain trained personnel.

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.³ 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 also 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 were 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.⁴

Recognizing the threat from a rising China and resurgent Russia, the 2018 National Defense Strategy (NDS) directed the services to prepare for a large-scale, high-intensity conventional conflict with a peer adversary.⁵ Later that same year, the Air Force released "The Air Force We Need" (TAFWN), a study of the capacity it would need to fight and help the U.S. win such a war. Based on thousands of war-game simulations, the study found that the service needed to grow by 25 percent, from 312 to 386 squadrons, to execute that strategy. That growth included one additional airlift squadron and seven additional fighter, five additional bomber, and 14 additional tanker squadrons.⁶ That equates to an additional 182 fighter, 50 bomber, 210 air refueling, and 15 airlift platforms.⁷ During the same period, the service's most senior leaders conveyed the need for more time in the air for its aircrews,⁸ and these collective demands required a bigger budget.

In a series of speeches in 2018, Air Force Secretary Heather Wilson and Air Force Chief of Staff General David Goldfein highlighted the shortfall and the need for more funding to increase the service's capacity with next-generation platforms: in other words, to buy all-new-design aircraft rather than continuing to purchase aircraft that have been in production since the 1980s and 1990s).⁹ To meet that requirement, the Trump Administration increased DAF funding by 31 percent from 2017 to 2021.¹⁰

Considering this shortfall, one might assume that the Air Force increased its procurement budget and accelerated acquisition of fifth-generation offensive platforms and next-generation tanker aircraft during that period by a substantial margin. However, funding for aircraft procurement remained relatively flat, growing from \$22.4 billion in fiscal year (FY) 2017 to just \$25.6 billion in FY 2022—a rate of growth that did not keep up with inflation. The budget for procurement fell from \$28.4 billion in FY 2021 to \$25.6 billion in FY 2022, a straight decrease of 11 percent but, accounting for inflation, a loss of buying power that approaches 14 percent.

The budget for research, development, test and evaluation (RDT&E), on the other hand, has more than doubled since FY 2017, growing from \$20.5 billion in FY 2017 to \$40.1 billion in FY 2022, and now exceeds procurement by more than 50 percent.¹¹ Much of that funding was used to develop and field the digital backbone for the Airborne Battle Management System (ABMS) to help move information to the warfighter, process targets, and optimize their engagement.

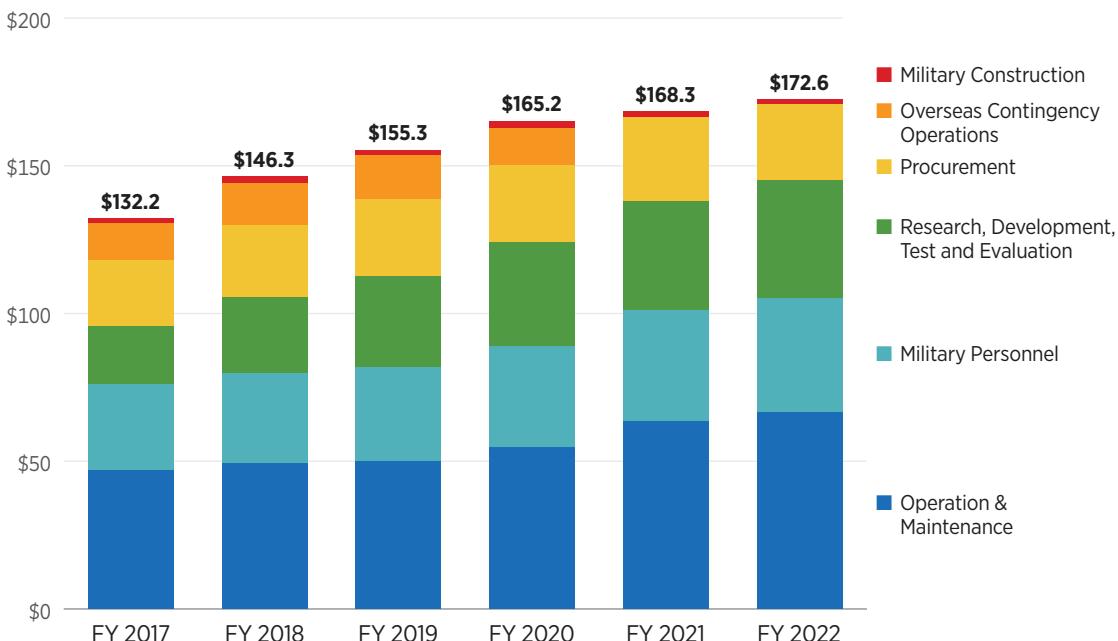
Capacity

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

CHART 11

Air Force Budgets, 2017–2022

IN BILLIONS OF U.S. DOLLARS



NOTE: FY 2022 figures are proposed.

SOURCES: 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 the Air Force, *United States Air Force Fiscal Year 2018 Budget Overview*, May 2017, p. 15, <http://www.saffm.hq.af.mil/LinkClick.aspx?fileticket=m3vZ0mfR368%3d&portalid=84> (accessed August 17, 2021), and Table 1, “Department of the Air Force Budget Summary,” in U.S. Department of the Air Force, *Department of the Air Force FY 2021 Budget Overview*, 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 17, 2021).

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strategic airlift platforms. After 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 MRCs. Those numbers for capacity have been reduced significantly over the years.

It is projected that at the end of FY 2021, the Air Force will have a total aircraft inventory (TAI) of 2,183 fighters, 140 bombers, 512 tankers, and 274 strategic airlift platforms. After just three years of adding to that inventory, the

service returned to the idea of trading capacity for some future gain through RDT&E.¹² In 2021, Chief of Staff General C.Q. Brown announced plans to cut another 137 fighters and 32 tankers from the USAF’s inventory by the end of FY 2022. While the service has not stated where those reductions will be made, it will reduce the TAI to 2,096 fighters, 140 bombers, 483 tankers, and 274 by the end of FY 2022.¹³ The Air Force will have a total force that equates to 47 percent of the fighter and bomber assets and 69 percent of the tanker and airlift assets that

it possessed the last time the United States was prepared to fight a peer competitor.

The idea that aircraft production lines will somehow surge to come to the rescue in a peer-level crisis may seem plausible to some,¹⁴ but even if Congress were to throw an unlimited amount of funding at production lines, there would not likely be enough time to bring new fighters into the force to meet the 2018 NDS's scenario and timing requirements.¹⁵

The *Index of U.S. Military Strength* uses "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 non-combat-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 2021, 1,482 are active-duty fighters, and 983 of those are combat-coded aircraft.¹⁶ It is important to separate the active-duty fighters and units from the strategic reserve because it would take several months to get elements of the latter up to manning and readiness levels that allowed their first elements to deploy. Unfortunately, there are other factors that also affect the number of fighters the service could actually employ in combat.

Most squadrons will have to pack up and deploy several thousand miles to be able to fight. Because of the additional wartime manning

requirements and the fact that most squadrons have several jets that are in disrepair at any given time, it takes the resources of approximately three active-duty squadrons to deploy two combat-capable fighter units forward.¹⁷ That effectively reduces the total number of active-duty, combat-coded fighters to 649 jets.

The strategic reserve has 518 fighters, of which 419 are combat coded. Because of the additional manning requirements and the fact that Guard and Reserve units generally have just one squadron at each location, it takes two squadrons to deploy one combat-capable unit forward.¹⁸ In terms of capacity, this means that 649 active-duty and 210 strategic reserve fighters, for a total of 859 combat-coded fighters, could be deployed into combat, leaving virtually nothing in reserve.

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. From 2017 through 2021, funding for munitions was significant, and the service, believing the inventory is now sufficiently restocked, has reduced the number of PGMs it will acquire to a total of 8,365 munitions in FY 2022.

However, even though the munitions stockpile may have returned to a level capable of supporting a surge in expenditures associated with a conflict similar to the one in which the U.S. has been engaged for the past 19-plus years, it would not likely support a peer-level fight that lasts more than a few weeks. Typically, there is a delay of 24–36 months between funding and delivery of additional munitions, and while the potential exists for a rapid expansion of production, it is hard to envision how such an expansion could be rapid enough to exceed demand before the stockpile is depleted. (See Table 5).

TABLE 5

Precision-Guided Munitions Expenditures and Programmed Acquisitions

TOTAL MUNITIONS EXPENDED

	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021*
JDAM	30,664	5,462	7,354	4,004	4,500
HELLFIRE	1,536	2,110	2,449	1,019	1,250
SDB-I/II	4,507	749	1,289	397	300
APKWS	Unknown	Unknown	Unknown	Unknown	Unknown
JASSM-ER	360	19	16	10	16
LGB	276	373	106	6,078	6,000
ARRW**	n/a	n/a	n/a	n/a	n/a
Total	38,092	9,462	11,963	11,508	12,066

TOTAL MUNITIONS ACQUIRED

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022*
JDAM	35,106	36,000	25,000	16,800	1,919
HELLFIRE	3,629	3,734	3,859	4,517	1,176
SDB-I/II	7,312	6,254	8,253	3,205	1,983
APKWS	10,621	6879	15,642	3,946	2,750
JASSM-ER	360	360	390	400	525
LGB	0	0	0	0	0
ARRW**	n/a	n/a	n/a	n/a	12
Total	57,777	53,976	53,893	29,617	8,365

* Estimate based on data from President's Budget.

** Air-launched Rapid Response Weapon (ARRW) is a hypersonic, long-range, conventional air-to-surface missile with precision-guided, prompt-strike capability from stand-off ranges.

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force munition levels, May 7, 2021; Table 2, "Department of the Air Force Budget Summary," in U.S. Department of the Air Force, *Department of the Air Force FY 2022 Budget Overview*, p. 12, https://www.saffm.hq.af.mil/Portals/84/documents/FY22/SUPPORT/_FY22%20Budget%20Overview%20Book.pdf?ver=SMbMqD0tqlJNwqZ0Q4yzA%3d%3d (accessed August 17, 2021); and U.S. Department of the Air Force, *Department of Defense Fiscal Year (FY) 2022 Budget Estimates, Air Force, Justification Book Volume 1 of 1, Procurement of Ammunition, Air Force*, May 2021, pp. Volume 1-7–Volume 1-76, https://www.saffm.hq.af.mil/Portals/84/documents/FY22/PROCUREMENT/_FY22%20DAF%20J-Book%20-%20301%20-%20Ammunition%20Proc.pdf?ver=PaFt7rWf7aiKYJhl-cpv9w%3d%3d (accessed August 17, 2021).

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 31 years, and some fleets, such as the B-52 bomber, average 60 years. In addition, KC-135s comprise 78 percent of the Air Force's 483 tankers and are more than 59 years old on average. By the end of FY 2022, 71 brand-new KC-46s will make up 15 percent of the tanker inventory, but they will not be capable of refueling aircraft during combat operations—the jet's primary mission—until sometime in FY 2024.¹⁹

The average age of the F-15C fleet is more than 37 years,²⁰ significantly exceeding the programmed service life of a fleet that comprises more than half of USAF air superiority platforms.²¹ The planes in the F-16C/D fleet are almost 31 years old on average,²² and the service has used up nearly 87 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 2050.²³ SLEPs lengthen the useful life of airframes, and these F-16 modifications also include funding for the modernization of avionics within those airframes. These modifications are costly, and the added expense reduces the amount of funding 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 will accept delivery of 19 MQ-9s to its inventory in FY 2022 for a total of 351 Reapers.²⁴ The service lost an RQ-4 to an Iranian missile in 2019 and intends to reduce its inventory by another 21 platforms by the end of FY 2022, leaving it with just 10 of these strategic reconnaissance platforms. These unmanned surveillance aircraft have largely replaced older manned platforms, but not entirely. With an average age of 39 years,²⁵ the U-2, a manned high-altitude reconnaissance aircraft, is still very much in demand and currently has no scheduled retirement date.²⁶

The E-8 Joint Surveillance Target Attack Radar System (J-STARS) and 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 42 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. However, the President's FY 2022 budget request includes the retirement of four of those platforms.²⁷

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 would require enhanced and hardened communications links. Known as the Advanced Battle Management System (ABMS),²⁸ it is envisioned as an all-encompassing approach to both airborne and ground Battle Management Command and Control (BMC2) that would allow the Air Force to fight and support joint and coalition partners in high-end engagements.²⁹

With respect to air combat, the Active Air Force has just 98 F-15Cs left in its fleet,³⁰ and

TABLE 6

Air Force Total Aircraft Inventory (Page 1 of 3)

Type	FY 2021				MISSION CAPABLE (MC)				FY 2022			
	Active Duty	Air National Guard	Air Force Reserve	Total	Average Age in Years	MC Rate FY 2019	MC Rate FY 2020	Change	Average Daily MC Aircraft, FY 2021	Programmed Retirements	Programmed Acquisitions	Total
A010C	143	85	55	281	39	71%	72%	0.80%	202	-42	239	
AC130J	26	0	0	26	4	86%	82%	-4.12%	21	4	30	
AC130U	6	0	0	6	30	86%	88%	2.38%	5	-6	0	
B-1B	61	0	0	44	33	46%	53%	6.58%	23	0	44	
B-2A	20	0	0	20	26	60%	62%	1.55%	12		20	
B-52H	58	0	18	76	59	66%	61%	-4.73%	46		76	
C-130H	2	127	42	141	30	66%	70%	4.49%	99	-13	128	
C-130J	109	16	10	146	11	77%	79%	1.98%	115	5	151	
C-5M	52		52						61%	31	52	
C-17A	146	50	26	222	17	82%	82%	0.07%	183		222	
CV022B	52	0	0	52	8	53%	54%	0.75%	28		52	
E003B	16	0	0	16	42	74%	66%	-8.61%	11	-4	12	
E003C	1	0	0	1	37	73%	77%	3.61%	1		1	
E003G	20	0	0	20	40	74%	71%	-3.66%	14		20	
E008C	0	16	0	16	20	67%	67%	-0.86%	11	-4	12	
EC130H	9	0	0	9	47	73%	67%	-6.29%	6	-2	7	
EC130J	0	7	0	7	20	57%	53%	-4.88%	4		7	
F015C	86	123	0	209	36	70%	72%	1.85%	150	-36	173	

TABLE 6

Air Force Total Aircraft Inventory (Page 2 of 3)

Type	FY 2021				MISSION CAPABLE (MC)				FY 2022			
	Active Duty	Air National Guard	Air Force Reserve	Total	Average Age in Years	MC Rate FY 2019	MC Rate FY 2020	Change	Average Daily MC Aircraft, FY 2021	Programmed Retirements	Programmed Acquisitions	Total
F015D	10	14	0	24	36	72%	71%	-1.95%	17	-12		12
F015E	218	0	0	218	28	71%	69%	-2.09%	151		218	218
F015EX	2		2	0								2
F016C	439	288	49	776	30	73%	74%	0.93%	573	-40		736
F016D	111	44	4	159	30	70%	72%	1.73%	115	-6		153
F022A	166	20	0	186	13	51%	52%	1.41%	97			186
F035A	306	20	0	326	5	62%	76%	14.50%	248		50	376
HC130J	21	12	2	35	6	80%	80%	-0.07%	28		4	39
HC130N	0	3	0	3	26	68%	74%	6.07%	2			3
HH060G	74	18	15	107	30	66%	69%	2.79%	74	-25		82
KC010A	50	0	0	50	36	79%	81%	1.50%	40	-14		36
KC046A	52	12	4	68	2	63%	67%	0.00%	45		3	71
KC135R	122	148	70	340	59	73%	73%	0.40%	248	-18		322
KC135T	30	24	0	54	60	71%	73%	1.99%	39			54
LC130H	0	10	0	10	35	40%	44%	3.42%	4			10
MC130H	16	0	0	16	32	69%	74%	4.95%	12			16
MC130J	44	0	0	44	6	78%	76%	-1.64%	33		11	55
MQ009A	306	24	0	330	7	89%	91%	1.45%	300		21	351

TABLE 6

Air Force Total Aircraft Inventory (Page 3 of 3)

Type	FY 2021				MISSION CAPABLE (MC)				FY 2022		
	Active Duty	Air National Guard	Air Force Reserve	Total	Average Age in Years	MC Rate FY 2019	MC Rate FY 2020	Change	Programmed Retirements	Programmed Acquisitions	Total
OC135B	2	0	0	2	58	82%	87%	4.14%	2	-2	0
RC135S	3	0	0	3	58	90%	88%	-2.79%	3		3
RC135U	2	0	0	2	55	91%	87%	-4.57%	2		2
RC135V	8	0	0	8	56	74%	78%	3.90%	6		8
RC135W	9	0	0	9	57	69%	81%	11.51%	7		9
RQ004B	30	0	0	30	9	76%	74%	-2.15%	22		10
T001A	178	0	0	178	26	61%	68%	7.89%	122		178
T038A	59	0	0	59	54	74%	71%	-3.18%	42		59
T038C	445	0	0	445	53	63%	65%	2.35%	291		445
U2	31	0	0	31	29	78%	73%	-5%	23		31

SOURCES: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021; Appendix, “Department of the Air Force Total Aircraft Inventory (TAI),” in U.S. Department of the Air Force, *Department of the Air Force FY 2022 Budget Overview*, p. 50, https://www.safm.hq.af.mil/Portals/84/documents/FY22/SUPPORT_FY22%20Budget%20Overview%20Book.pdf?ver=SMbMqDotqJNwqZ7ZQ4yZA%3d%3d (accessed August 17, 2021); and International Institute for Strategic Studies, *The Military Balance 2021: The Annual Assessment of Global/Military Capabilities and Defence Economics* (London: Routledge, 2021), pp. 56–59.

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 186 F-22As: 166 Active Duty and 20 Air National Guard.³¹

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 structural repair program that causes some portion of those jets to be unavailable for operational use. The program had six F-22s off the flight line at any given time³² to make alterations required to extend the airframe's service life to 8,000 hours. That program was completed in late 2020 and will now transition to a 10-year program to refurbish the low-observable coatings on the engine inlets and inspect and overhaul the aircraft's flight control system that will run through 2031.³³

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 2018.³⁴ 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.³⁵ 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.³⁶

A second top acquisition priority is the KC-46A air refueling tanker. The KC-46 has experienced a series of problems and delays, the most recent of which involves the air refueling system that currently cannot refuel fighters in an operational environment. The Air Force will have 68 KC-46s (44 Active, 12 Guard, and 12 Reserve) by the end of FY 2021 and will receive three more for a total of 71 in FY 2022.³⁷ The program plans to acquire another 108 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 59 years old) that still need to be recapitalized.³⁸

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 has 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.³⁹

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.⁴⁰ The B-21 is programmed to begin replacing portions of the B-52 and B-1B fleets by the mid-2020s.⁴¹ 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. Through 2020, the Air Force sustained a fleet of 61 B-1s, but the state of repair of 17 of those jets has deteriorated to the point where the Air Force will retire them by the end of FY 2021.⁴²

The Air Force had planned to modernize the B-2's Defense Management System but cancelled the plan in 2021 because of a software coding mismatch with its legacy computer system.⁴³ Stores Management Operational Flight Program and Common Very-Low-Frequency/Low Frequency Receiver Program elements will be fielded to ensure that this penetrating bomber remains viable in highly contested environments, keeping it fully mission capable until it is replaced by the B-21.⁴⁴

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 with upgrades

that will include a new Long-Range Standoff (LRSO) cruise missile, improved radar, new computers, new communication links, and a new suite of electronic warfare countermeasures. The aircraft will remain in the inventory through 2050.⁴⁵

When the Secretary of the Air Force and the Chief of Staff rolled out “The Air Force We Need” in 2018 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.⁴⁶ Curiously, the Air Force is now acquiring the fourth-generation F-15EX, based primarily on the ill-perceived notion that it will be cheaper to acquire and operate than the F-35A.⁴⁷ The FY 2022 budget funds 12 F-15EXs, and the Air Force has an unfunded request for 12 more. Although the service will certainly increase its numbers with that approach, the F-15EX will not be survivable in the high-threat environment in which deployed assets will be required to fight by the time fielding has been completed. The Air Force is using precious acquisition dollars to buy an aircraft that, by all indicators, will have very limited utility in a conflict with a peer competitor.

Readiness

The 2018 National Defense Strategy’s focus on peer-level war was designed to facilitate 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 2019.⁴⁸ The move was designed to make more of an all-too-small fleet of combat aircraft available to deploy in the 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 regarded them as an inaccurate portrayal of the service’s overall health.

Instead of using that historic marker for readiness, the service moved to highlight how deployable the fleet is within a short period of time⁴⁹ and shifted its focus to the number of “force elements” (fighters, bombers, and tankers) that it has across 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 2019.⁵⁰ 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 operational bombers rapidly is a capability, it is 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 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 “pacing squadrons are on track to reach 80% readiness before the end of Fiscal Year 2020.”⁵¹ In the FY 2021 posture statement, however, Goldfein and new Air Force Secretary Barbara Barrett 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 all fleets.”⁵²

The definitions for “pacing unit” and “pacing squadrons” are somewhat elusive. Assuming that a pacing squadron is an operational

TABLE 7

Mission-Capable Combat-Coded Fighters in the Active-Duty Air Force

Combat-Coded Fighters	Average Age in Years	Mission-Capable Rate	Mission-Capable Combat-Coded Fighters
A-10C	117	72%	84
F-15C	98	72%	71
F-15E	164	69%	113
F-16C	336	74%	249
F-22A	133	52%	69
F-35A	136	76%	103
Total	983		689

NOTE: Thirteen months were added because of the difference between the aircraft data capture dates for the 2021 USAF Almanac and publication of this edition of the *Index*.

SOURCES:

- “Air Force & Space Force Almanac 2021,” *Air Force Magazine*, Vol. 104, No. 6 and 7 (June/July 2021), <https://www.airforcemag.com/article/2021-usaf-ussf-almanac-equipment/> (accessed Augst 17, 2021).
- Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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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.

The FY 2022 Air Force posture statement offers no more clarity or assurances of readiness, but it has moved (again) to change the terminology. The simplified, three-phase force-generation model is designed “to more effectively articulate” otherwise undefined “readiness impacts and capacity limits.”⁵³

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.”⁵⁴ In the four 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 a unit’s aircraft that are capable of executing its 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 of aircraft within a particular fleet yields the actual operational capacity of that capability.

There are 186 F-22As in the total aircraft inventory, but 28 are dedicated trainers, and

TABLE 8

Air Force Maintenance Manning

Skill Level	Authorized	Assigned	Manning Percentage
3-level (Apprentice)	15,078	15,994	106%
5-level (J Journeyman)	36,704	36,151	98%
7-level (Craftsman)	18,443	18,390	100%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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16 are primary development aircraft inventory (used for testing new equipment). In 2020, the F-22A had an MC rate of 52 percent, which means that there were just 74 F-22As that could be committed to combat at any given time.⁵⁵ 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. Although the F-22A is an incredibly capable fighter and 74 F-22s would be a formidable capability against a regional threat, numbers are critical to winning a peer fight, particularly for offensive platforms, and 74 would not be sufficient. For a summary of the mission-capable rates for combat-coded (operational) aircraft of the five fighter weapons systems, see Table 7.

There are 33 operational B-1s in the Lancer fleet,⁵⁶ and with an MC rate of 52.78 percent, 17 are available for combat at any given time during the year. The small size of the B-2 fleet, coupled with its 62.41 percent MC rate, means that, on average, just 12 are combat capable. If the B-52 operational fleet and its mission-capable rate of 60.51 percent are added, just 64 bombers in the Air Force inventory were capable of executing combat missions on any given day in 2020.

Maintenance manning is now healthy across the board (see Table 8), but the pilot

shortage shows no signs of abating. 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.⁵⁷

The numbers continued to fall, and in the middle of FY 2020, the Air Force was short 2,100 pilots. Today, the total Air Force has a shortfall of 1,925 pilots, and while this is an improvement of 175 pilots over 2020, almost all of that improvement was due to the cessation of airline hiring caused by COVID-19.⁵⁸ 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 projected that 1,480 would graduate in 2020, but the impact of COVID-19 was such that only 1,263 received their wings. The vast majority of candidates who did not graduate washed back and will graduate some time in FY 2021.

Those projected numbers rely on a very high annual graduation rate of approximately 94 percent of the candidates that enter flight

school. According to the data the Air Force provided for the 2021 Index of Military Strength, the graduation rates for 2016, 2017, and 2018 were 93 percent, 98 percent, and 97 percent, respectively.⁵⁹ Those numbers, however, were incorrect, and the actual graduation rates were 96 percent for 2016, 92 percent for 2017, and 93 percent for 2018.⁶⁰

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.⁶¹ In the words of General Bill Creech, “Higher sortie rates mean increased proficiency for our combat aircrews,”⁶² 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.⁶³

COVID-19’s impact on flying hours hit the Air Force as it was beginning to recover from an 18-year drought in training for combat with a near-peer competitor. Flying hours and sortie rates across all fighter platforms fell to historic lows as the average line combat mission-ready fighter pilot received less than 1.5 sorties a week and 131 hours of flying time that year. That is significantly below the healthy fighter force 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.

As noted, the primary drivers for mission-capable rates are maintenance manning and O&M funding. Maintenance manning has been healthy for more than four years, and FY 2022 O&M funding is 42 percent higher than the funding O&M received for FY 2017. However, flying hours across the fleet of fighters have increased by just 9 percent over that same period, and senior Air Force leaders actually

decreased the flying hour budget for FY 2022 by some 80,000 hours (7 percent).⁶⁴ 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.⁶⁵ The maintenance organization that created that turnaround was changed in 1989 to “save money by reducing maintenance staffing, equipment, and base level support,”⁶⁶ 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.

Five years of increases in the O&M budget have not translated into a proportionate growth in flight hours or greater readiness levels. Fighter pilots received an average of 13.0 hours per month in 2017, and an incremental O&M budget increase of 16.4 percent over the next three years delivered 12.9 hours per month in 2018 and 14.1 hours per month in 2019—only 8 percent higher than in 2017.⁶⁷ (For data related to flight hours and sorties, see Tables 9 through 14.)

Combat mission-ready pilots generally fly more than average, and those assigned to a combat-coded (operational) unit received just 14.6 hours and 7.5 sorties a month in 2019,⁶⁸ which is an average below two sorties a week when they need three per week to sustain their skills.⁶⁹ The Air Force did its best to fly through the effects of COVID-19, but the pandemic had a devastating effect on hours and sortie rates. The average fighter pilot flew just over one sortie a week for the duration of 2020, which in a high-performance jet reduces competency levels to the point where excellent pilots begin to question the execution of very basic tasks.⁷⁰

It will take several more years of robust training for fighter pilots within fighter squadrons to regain what they lost in 2020 alone.

TABLE 9

Average Hours All Fighter Pilots Received per Month

	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	10.8	10.8	10.5	6.9	-34%
F-35A	10.4	10.4	14.4	10.2	-29%
F-15C	10.5	10.5	11.8	4.8	-59%
F-16C	12.2	12.2	12.1	6.7	-45%
F-15E	18.3	18.3	20.3	13.0	-36%
A-10	15.1	15.1	16.5	12.2	-26%
All Jets	13.0	12.9	14.1	8.7	-38%
Average Hours per Year	155.4	154.6	168.7	104.3	-38%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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Unfortunately, the Air Force is not moving on that path and will cut 87,479 flying hours from its budget in FY 2022—a reduction of 7 percent.⁷¹

Deployability. Because long-term inspections and depot-level work affect the

availability of support equipment and aircraft, 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

TABLE 10

Average Sorties All Fighter Pilots Received per Month

	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	6.4	6.4	7.1	5.3	-25%
F-35A	6.6	6.6	6.5	5.9	-9%
F-15C	7.0	7.0	6.6	4.5	-32%
F-16C	7.4	7.4	7.3	4.6	-37%
F-15E	7.9	7.9	7.6	6.4	-16%
A-10	7.1	7.1	7.5	5.9	-21%
All Jets	7.2	7.2	7.2	5.3	-26%
Average Sorties per Year	86.5	86.2	86.0	64.0	-26%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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TABLE 11

Average Hours Line Fighter Pilots Received per Month in Combat-Coded Squadrons

	2019	2020	Percentage Change
F-22	11.0	7.6	-31%
F-35A	15.4	14.7	-5%
F-15C	11.9	8.9	-25%
F-16C	12.7	8.5	-33%
F-15E	21.7	16.6	-24%
A-10	16.9	14.1	-17%
All Jets	14.6	10.9	-25%
Average Hours per Year	174.7	131.0	-25%

SOURCE: Headquarters U.S. Air Force, response to request for information, May 14, 2021.

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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.⁷²

Normal, active duty fighter squadron manning levels are based on a ratio of 1.25 aircrew members for every aircraft,⁷³ which means that a unit with 24 assigned aircraft should have 30 line pilots and five supervisor pilots who are

TABLE 12

Average Sorties Line Fighter Pilots Received per Month in Combat-Coded Squadrons

	2019	2020	Percentage Change
F-22	7.4	5.5	-26%
F-35A	6.7	6.8	1%
F-15C	6.8	5.0	-26%
F-16C	7.6	5.3	-30%
F-15E	8.0	7.2	-10%
A-10	7.7	6.5	-16%
All Jets	7.5	5.9	-21%
Average Sorties per Year	89.9	71.0	-21%

SOURCE: Headquarters U.S. Air Force, response to request for information, May 14, 2021.

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TABLE 13

Average Hours All Line Fighter Pilots Received per Month

	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	11.7	12.8	10.9	7.1	-35%
F-35A	10.6	12.4	15.0	10.5	-30%
F-15C	10.5	13.1	11.8	4.6	-61%
F-16C	11.9	15.5	12.5	6.9	-45%
F-15E	19.1	20.3	21.3	6.6	-69%
A-10	16.7	23.0	16.9	12.6	-25%
All Jets	13.2	16.1	14.6	8.9	-39%
Average Hours per Year	159.0	193.0	175.0	107.0	-39%

SOURCE: Headquarters U.S. Air Force, response to request for information, May 14, 2021.

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combat mission ready.⁷⁴ 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.⁷⁵ Pilots from “donor” squadrons 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 Active Air Force has reduced the number of fighter squadrons to two or even one in many wings. All operational Guard and Reserve

TABLE 14

Average Sorties All Line Fighter Pilots Received per Month

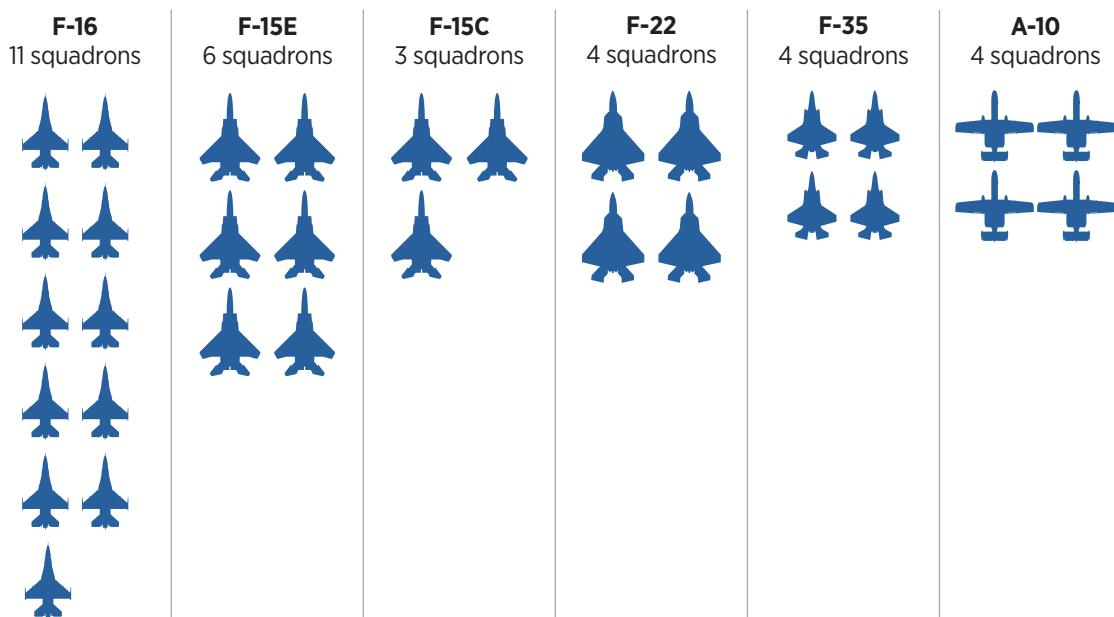
	2017	2018	2019	2020	Percentage Change, 2019 to 2020
F-22	6.3	4.5	7.3	5.5	-25%
F-35A	6.5	7.5	6.6	6.0	-9%
F-15C	7.2	8.4	6.7	4.6	-31%
F-16C	7.3	9.3	7.5	4.7	-37%
F-15E	8.0	8.5	7.9	6.6	-16%
A-10	7.2	9.7	7.7	6.1	-21%
All Jets	7.2	8.3	7.4	5.4	-27%
Average Sorties per Year	86.0	100.0	89.0	65.0	-27%

SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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FIGURE 2

Air Force Active-Duty Combat-Coded Fighter Squadrons (32 Total)



SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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wings are comprised of a single squadron, which complicates the math behind the total number of deployable fighter squadrons.

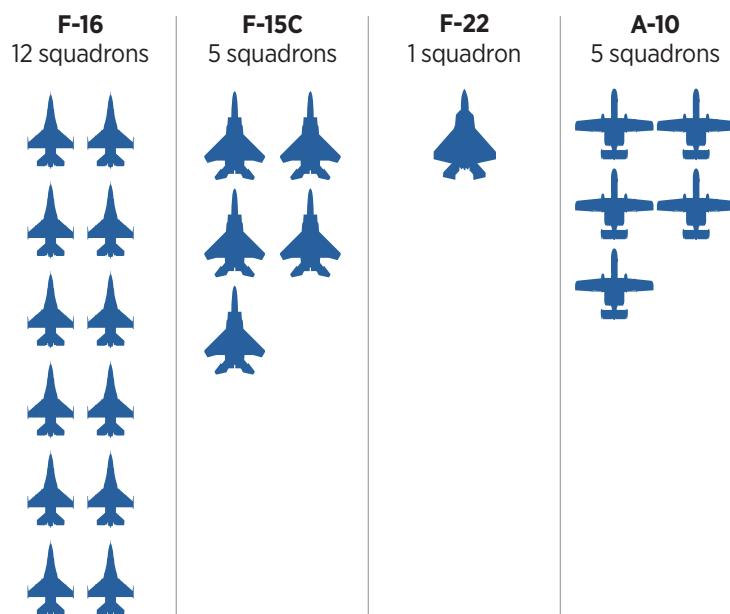
Of the 55 operational fighter squadrons on the Air Force roster, 32 are Active and 23 are Guard or Reserve Units. (See Figures 2 and 3.) Using the notion that it takes three squadrons to get two active-duty ones forward, the airframe disposition of each active-duty wing would allow just 21 active-duty fighter squadron equivalents (24 fighter aircraft each) to deploy to a fight. That equates to 480 active-duty fighters that could deploy to meet a crisis situation, which is well short of the 600 it takes to win a single MRC and means that a war with a peer competitor will draw heavily on our strategic reserve.

Guard and Reserve units face the same manning and deployment challenges that the

active-duty service faces, 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.⁷⁶ 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, allowing 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.⁷⁷ Nevertheless, it was common for Guard units to pull pilots from other units to fulfill manning requirements for “rainbow” fighter squadrons,⁷⁸ and in a conflict where there is little time from

FIGURE 3

Air National Guard and Air Force Reserve Combat-Coded Fighter Squadrons (23 Total)



SOURCE: Headquarters U.S. Air Force, Deputy Chief of Staff for Operations, written response to Heritage Foundation request for information on Air Force mission-capable rates, May 17, 2021.

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warning order to deployment, it would likely take two Guard and Reserve squadrons to enable one to deploy forward.⁷⁹

The average Guard and Reserve fighter squadron has one-third fewer jets than similar active-duty units have. By rainbowing units with similar aircraft, they could muster 12 squadrons as a strategic reserve of 288 fighters that could deploy sometime after the active-duty units deploy. In other words, the service could muster just 768 fighters (480 Active and 288 Guard and Reserve) for a peer-level fight. Unfortunately, the gravity of that mix is not fully understood. The Guard and Reserve 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 generate continually 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 readily to a crisis. Because of the pilot shortage, actual unit manning levels in fighter squadrons are below peacetime requirements (if only slightly), which obviously is not enough to meet the significantly increased demands and the 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. Thus, the only way units can 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 55 fighter squadrons that are unable to deploy immediately in a crisis could be combined to create more combat

power. The vast majority of aircraft and aircrew that are left would be used for homeland defense and to train replacement pilots or as replacement aircraft that are lost through combat attrition.

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. Adding a planning factor of 20 percent for spares and attrition reserves brings the number to 600 aircraft.

As part of its overall assessment of capacity, the 2022 *Index* looks for 1,200 active-duty, combat-coded fighter aircraft to meet the baseline requirement for two MRCs.⁸⁰ That number of fighters lines up well with the fighter requirement from the 2018 TAFWN. The bomber, tanker, and strategic air requirement from that study are also used in this assessment.

- **Two-MRC Fighter—Threshold:** 1,200 combat-coded active-duty fighters / 62 squadrons.
- **Two-MRC Fighter—Actual 2021 Level:** 983 active-duty combat-coded fighters (82 percent) / 55 total force squadrons (88 percent).
- **TAFWN Bomber Squadron—Threshold:** 14 combat-coded bomber squadrons / 140 bombers.
- **TAFWN Bomber Squadron—Actual 2021 Level:** nine combat-coded bomber squadrons (64 percent) / 114 combat-coded bombers (81 percent).

- **TAFWN Tanker Squadron—Threshold:** 54 tanker squadrons / 540 combat-coded tankers.
- **TAFWN Tanker Squadron—Actual 2021 Level:** 39 combat-coded tanker squadrons (72 percent) / 414 combat-coded tankers (76 percent).
- **TAFWN Airlift Squadron—Threshold:** 54 airlift squadrons / 540 combat-coded airlifters.
- **TAFWN Airlift Squadron—Actual 2021 Level:** 50 combat-coded airlift squadrons (93 percent) / 538 combat-coded airlifters (99 percent).

Based on a pure count of combat-coded squadrons and platforms that have achieved initial operating capability (IOC), the USAF currently is at 86 percent of the capacity required to meet a two-MRC/TAFWN benchmark. However, the disposition of those assets limits the ability of the service to deploy them rapidly to a crisis region. While the active fighter and bomber assets that are 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 7), 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." With programmed retirements that will exceed acquisitions, capacity is now trending downward.

Capability Score: Marginal

The Air Force's capability score is "marginal," based on scores of "strong" for "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 *2021 Index*. New F-35 and KC-46 aircraft continue to roll off their respective production lines, but these additions are more than offset by aircraft retirements. As a consequence, this score will probably not improve over the next three to five years.

Readiness Score: Weak

The Air Force scores "weak" for readiness in the *2022 Index*, one grade lower than it received in the *2021 Index*. The USAF's sustained pilot deficit and the impact of COVID-19 on already low sortie rates and flying hours certainly contribute to this assessment. The Air Force's mission-capable rates improved slightly in 2020, but the lack of a systemic effort to increase operational training reflects 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.⁸¹

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.

Overall U.S. Air Force Score: Weak

This is an unweighted average of the USAF's capacity score of "marginal," capability score of "marginal," and readiness score of "weak." The shortage of pilots and flying time for those pilots degrades the ability of the Air Force to generate the quality of combat air power that would be needed to meet wartime requirements. 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, and while the service cannot be blamed for the effects of COVID-19 on readiness, it elected not to surge to acquire more aircraft or significantly increase training/sortie production in the window of robust funding.

Although it would likely win a single MRC in any theater, there is little doubt the Air Force would struggle in war with a peer competitor. Both the time required to win such a conflict 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



Procurement and Spending Through FY 2021
Pending

Strategic Bomber

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
B-52 Stratofortress Inventory: 76 Fleet age: 60 Date: 1961 The B-52, oldest of the bombers, provides global strike capabilities with conventional or nuclear payloads. Programmed upgrades for the B-52 include new communications, avionics, and Multi-Functional Color Displays. The Air Force plans to use this aircraft through the 2050s.	1		B-21 Raider Timeline: TBD The B-21 is an advanced stealth bomber that is currently programmed to replace all B-1s and B-2s in the Air Force bomber fleet by 2032. Flight testing is scheduled for late 2021, and procurement is expected to begin in FY 2022. The Raider is projected to enter service in the mid-2020s and deliver a fleet of at least 100 aircraft.		
B-1B Lancer Inventory: 44 Fleet age: 34 Date: 1986 Nicknamed "The Bone," the B-1B Lancer is a long-range, multi-mission, supersonic conventional bomber, that has served the United States Air Force since 1985. Originally designed for nuclear capabilities, the B-1 switched to an exclusively conventional combat role in the mid-1990s. In September 2020, the entire B-1B Lancer fleet completed the Integrated Battle Station upgrade to modernize the jet's datalinks, cockpit displays, and test system. The B-1B is scheduled to be phased out in 2032.	2				
B-2 Spirit Inventory: 20 Fleet age: 27 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. At present, the plan is to begin phasing out the B-2 in 2032.		3	4		

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

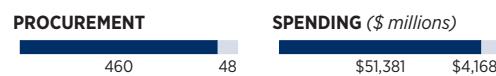
AIR FORCE SCORES



Procurement and Spending Through FY 2021
Pending

Ground Attack/Multi-Role Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
A-10 Thunderbolt II Inventory: 281 Fleet age: 41 Date: 1977 The A-10 is the only USAF platform that is designed specifically for close air support missions using both self-designated precision-guided munitions and an internal 30mm cannon. Retirement of the A-10 has been discussed for years, but it appears that it will continue flying through 2040.	2	2	F-35A Timeline: 2016–2035	4	3
F-16C Falcon Inventory: 935 Fleet age: 31 Date: 1980 The F-16 is a multi-role 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.					
F-35A Lightning Inventory: 326 Fleet age: 5 Date: 2016 The F-35 is a multi-role stealth fighter that became operational in 2016. The Air Force has received more than 326 of a planned purchase of 1,763 aircraft.	5	5			
F-15E Strike Eagle Inventory: 218 Fleet age: 29 Date: 1989 The F-15E is a multi-role aircraft capable of all-weather, deep interdiction/attack, and tactical nuclear weapons delivery. Upgrades include an AESA radar, an EPAWSS self-defense suite, a new central computer, and cockpit displays.	2	2			



NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES



Procurement Through FY 2021
and Spending Pending

Fighter Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
F-15C/D Eagle Inventory: 233 Fleet age: 37 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 that include 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	F-15 EX Timeline: 2020–2029 The F-15EX, the most advanced Eagle variant, is based on the F-15QA as a replacement for the legacy F-15C/D. The USAF awarded Boeing a \$1.2 billion contract for the first eight of up to 144 new-build F-15EX jets on July 13, 2020. FY 2021 funds procure an additional 12 aircraft and 12 more in FY 2022. The Air Force accepted the first two F-15EXs in FY 2021 and expects the next six fighters in 2023.	2	1
F-22A Raptor Inventory: 186 Fleet age: 15 Date: 2005 The F-22 is the preeminent air superiority stealth fighter aircraft, modified to enable delivery of precision-guided weapons. The jet is currently undergoing a modification called RAAMP that will improve reliability, maintainability, and performance. In FY 2022, the jet will begin fielding the Link-16, which will allow it to transmit data with legacy aircraft via the Multifunctional Information Distribution System/Joint Tactical Radio System (MIDS/JTRS).	4	5	PROCUREMENT 12 12 SPENDING (\$ millions) \$1,234 \$1,187		

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES

1 2 3 4 5
Weakest → Strongest

Procurement Through FY 2021
and Spending Pending

Tanker

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
KC-10 Extender Inventory: 50 Fleet age: 36 Date: 1981 The KC-10 is multi-role tanker and airlift platform that can refuel both boom-compatible and drogue-compatible fighters on the same mission. Recent modifications have enabled a service life extension through 2045. The USAF targeted fleet reduction to 40 aircraft in FY 2021, but Congress directed the service to maintain at least 50 aircraft to provide sufficient tanker support because of shortfalls with the KC-46.	2		KC-46 Timeline: 2019–2027	3	3
KC-135 Stratotanker Inventory: 340 Fleet age: 61 Date: 1957 The KC-135 a multi-role tanker/airlift platform. The aircraft has undergone several modifications, mainly engine upgrades to improve performance and reliability. The USAF plans to modify 395 aircraft with Block 45 upgrades (an additional glass cockpit display for engine instrumentation, a radar altimeter, an advanced autopilot, and a modern flight director) at a rate of 38 aircraft per year through 2026. Part of the fleet will be replaced with the KC-46, with the remainder scheduled to be in service through 2050.	5		PROCUREMENT  94 14	SPENDING (\$ millions)  \$15,695 \$2,380	
KC-46 Pegasus Inventory: 68 Fleet age: 1 Date: 2020 This Pegasus is a multi-role tanker/airlift platform that can refuel both boom-compatible and drogue-compatible fighters on the same mission. The Air Force accepted the first of 179 programmed aircraft in 2019. The program has significant problems that preclude use of the plane as a refueling platform in combat, but 15 of the aircraft will be delivered in 2021, bringing the total number of KC-46s in the inventory to 68.	5	1			

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES



Procurement Through FY 2021
and Spending Pending

Heavy Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C-5M Galaxy Inventory: 52 Fleet age: 34 Date: 1970 The C-5 is the USAF's largest mobility aircraft. It can transport 270,000 pounds of cargo over intercontinental ranges and can be refueled in the air. 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, a new mission computer, and improved Large Aircraft Infrared Countermeasures (LAIRCM).	(2)	(5)	None		
C-17 Globemaster III Inventory: 222 Fleet age: 19 Date: 1995 The C-17 is a heavy-lift strategic transport capable of direct tactical delivery of all classes of military cargo. It is the U.S. military's core airlift asset; it can be refueled in the air and is capable of operating on small airfields (3,500 feet by 90 feet). Ongoing modifications include next-generation Large Aircraft Infrared Countermeasures (LAIRCM), structural, safety, and sustainment modifications.	(4)	(5)			

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
C-130J Super Hercules Inventory: 146 Fleet age: 12 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 its transition to the C-130J in October 2017.	(5)	(5)	C-130J Timeline: 2006–2022 The C130J Super Hercules is an upgraded tactical airlift platform with a 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 FY2023, and second to procure an additional 24 H/MC-130 aircraft from FY 2021–FY 2025.	(5)	(5)

PROCUREMENT

182	1
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SPENDING (\$ millions)

\$16,417	\$129
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NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES

1 2 3 4 5
Weakest → Strongest

Procurement and Spending Through FY 2021
Pending

Intelligence, Surveillance, and Reconnaissance (ISR)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
RQ-4 Global Hawk Inventory: 30 Fleet age: 11 Date: 2011 The Global Hawk is a strategic, high-altitude, long-endurance (HALE), “deep look” ISR platform that complements satellite and manned ISR. Unlike the MQ-9, which is a medium-altitude, long-endurance unmanned aerial vehicle (UAV), the RQ-4 has a higher altitude and longer range.	4	2	None		
MQ-9 A/B Reaper Inventory: 330 Fleet age: 7 Date: 2007 The MQ-9B is a medium-altitude to high-altitude, long-endurance hunter-killer RPA (remotely piloted aircraft) tasked primarily with eliminating time-critical and high-value targets in permissive environments. The USAF is attempting to end the MQ-9 procurement and seeks to replace the Reaper with a more survivable, flexible, and advanced platform as early as 2031.	5	2	MQ-9 Timeline: 2007-2024	5	5
RC-135 Rivet Joint Inventory: 22 Fleet age: 58 Date: 1972 The RC-135V/W is tasked with real-time electronic and signals intelligence-gathering, analysis, and dissemination in support of theater and strategic-level commanders. The RC-135, an extensively modified reconnaissance version of the C-135, detects, identifies, and geolocates signals throughout the electromagnetic spectrum.	1	4	None		

NOTE: See page 450 for details on fleet ages, dates, timelines, and procurement spending.

AIR FORCE SCORES



Procurement and Spending Through FY 2021
Pending

Intelligence, Surveillance, and Reconnaissance (ISR) (Cont.)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
U-2 Dragon Lady Inventory: 31 Fleet age: 40 Date: 1956 <p>The U-2S is the Air Force's only manned, strategic, high-altitude, long-endurance ISR platform and is capable of SIGINT, IMINT, and MASINT collection. The aircraft's modular payload systems allow it to carry a wide variety of advanced optical, multispectral, EO/IR, SAR, SIGINT, and other payloads simultaneously. Its open system architecture also permits rapid fielding of new sensors to counter emerging threats and requirements.</p>	1	4	None		

Command and Control

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
E-3 Sentry Inventory: 35 Fleet age: 41 Date: 1977 <p>The E-3 Airborne Warning and Control System (AWACS) is tasked with 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, modernization of airborne moving target indication, and addition of high-speed jam-resistant Link 16. The E-3 is scheduled to stay in service through the 2040s.</p>	1	2	None		
E-8 JSTARS Inventory: 16 Fleet age: 41 Date: 2010 <p>E-8C 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 planned to retire this platform in the mid-2020s, but Congress blocked this. The USAF aims to re-engine the fleet with refurbished JT8D-219 turbofans as a cost-effective interim solution to improve performance and reliability.</p>	1	2			

NOTES: See Methodology for descriptions of scores. The date is the year the platform achieved initial operational capability. The timeline is from the year the platform achieved initial operational capability to its final procurement. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E).

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11. These numbers are estimates based on the requirements presented by the Air Force within the President's budget for FY 2022. For consistency, the calculations include procurement and RDT&E figures for the Space Force, as they were not separated in all previous fiscal years' budgets.
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14. In the words of Lieutenant General Mark Kelly, Deputy Chief of Staff for Operations, Headquarters U.S. Air Force: "At the end of the day, if a peer fight kicks up, we're going to have no time and all the money." Abraham Mahshie, "'Every Day Is a Shell Game': Air Force Budget Prioritizes Technology over Warfighting, General Says," *Washington Examiner*, February 13, 2020, <https://www.washingtonexaminer.com/policy/defense-national-security/every-day-is-a-shell-game-air-force-budget-prioritizes-technology-over-warfighting-general-says> (accessed July 7, 2021).
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72. Author’s experience through 26 years of Air Force operations, coupled with senior leader engagements from 2018–2019.
73. 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 July 7, 2021).
74. Even though active-duty fighter squadrons have an average of 30 aircraft per squadron, that number includes maintenance, spare, and attrition reserve platforms. Manning is based on Primary Assigned Aircraft (PAA), which is 24 aircraft for active-duty fighter squadrons.
75. Based on a squadron with 24 Primary Assigned Aircraft. For units with 18 PAA, four additional pilots are required.
76. 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.
77. “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 July 5, 2021).
78. 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.
79. Interview with senior Air National Guard leader, November 20, 2019.

80. The number of fighters needed for a two-MRC strategy is based on a Heritage Foundation study of airpower requirements and actual fighter deployments for all major combat operations and conflicts from 1950 through 2021.
81. 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 the Corps has maintained its historical, institutional, and much of its doctrinal focus on 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.¹

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 and China as the "pacing threat" against which Marine Corps capabilities are being assessed and modified. This reorientation is much more than a simple refocusing on amphibious operations. Following a

comprehensive assessment of the operational challenges that the service's operating forces are most likely to face 10 to 15 years in the future, General David H. Berger, Commandant of the Marine Corps, issued Force Design 2030 (FD 2030), his directive to the service to reorganize, re-equip, and retrain Marines in ways that will make them relevant and effective in the presumed operating environment of the 2030s.²

As necessary an effort as FD 2030 appears to be, however, the force envisioned by the project has yet to be built (though progress is being made) and certainly has not yet been proven in battle. Consequently, this *Index* can only assess the Corps that exists today, and our assessments of capacity, capability (modernity), and readiness therefore pertain to the Marine Corps' current status, not to what it might be in the future.

As reported in 2021, the Corps had 33,500 Marines deployed, roughly one-third of its operational force.³ During the year preceding its fiscal year (FY) 2022 budget request, "[T]he Marine Corps executed 156 total operations, nine amphibious operations, [and] 36 theater security cooperation events, and participated in 36 exercises" involving numerous countries in Europe, the Middle East, and Asia including Japan, South Korea, Thailand, Malaysia, Singapore, Germany, Norway, Scotland, and Romania.⁴

The Marine Corps has always prized its crisis-response contributions to national security—a point consistently emphasized by

senior service leaders over the years. Maintaining this emphasis, General Berger has made it central to the Corps' efforts to remain combat credible as adversary capabilities evolve, even at the expense of force capacity (the size of the service) and existing capabilities that, while still of value, are perceived as less relevant to the maritime environment of the Indo-Pacific. Service leadership is assuming that defense budgets will not see any appreciable growth in the next several years, so the Commandant has ordered the Corps to retire or reduce assets and capabilities such as tanks, conventional tube artillery, heavy bridging, and some aircraft and continue to reduce manpower end strength in order to make related funding available for other purposes.

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. 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. Marine Corps officials have emphasized that the results of the FD 2030 redesign will ensure that USMC forces are more capable and relevant in any fight, in any region, but the pacing challenge for Corps planners is China.

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, and both its annual budget requests and its top-level planning documents reflect this position.

However, with China as the primary threat driving Marine Corps force planning and given

China's extraordinary investment in modernizing its forces across all capabilities, to include the expansion of various sensors, weapons, and platforms that are essential to the creation of an intensely weaponized, layered defense architecture, this *Index* cannot help but note that the Corps will need greater capacity if it is to succeed in war in the very circumstances for which the Marines believe they must prepare and with which this *Index* concurs.

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.⁵

Infantry. In 2011, the Marine Corps maintained 27 infantry battalions in its active component at an authorized end strength of 202,100.⁶ 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 2015,⁷ Congress began to fund gradual increases in end strength, returning the Corps to 24 infantry battalions.

New requirements have also sapped the Corps' conventional deployable strength. In 2005, the Marines were directed to establish a special operations component to which they ultimately committed 2,700 Marines.⁸ In 2010, the Corps established a cyberspace element,⁹ redirecting more manpower to new capabilities. The point here is that new requirements arise over time. Unless the Marine Corps' end strength is increased accordingly, establishing new units and capabilities means losing capacity in other areas.

The Corps operated with 181,200 Marines in FY 2021, with plans to shrink further to 178,500 in FY 2022 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

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 regaining capability and readiness in its aviation component, achieving its objective of 80 percent aviation readiness in FY 2020¹² and achieving 86 percent to 96 percent pilot manning in its rotary wing community, a status the Corps considers healthy.¹³ The Corps has not published an update to its Aviation Plan since 2019. At that time, the service stated that it possessed 16 tactical fighter squadrons,¹⁴ compared to 19 in 2017¹⁵ and approximately 28 during Desert Storm.¹⁶ Service officials have stated repeatedly that the number of manned aircraft, and therefore squadrons, will likely continue to decline as the Corps divests itself of older aircraft without replacing them on a one-for-one basis, shifts investment to unmanned platforms, and retools the force for distributed operations undertaken by smaller units per Force Design 2030.

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 2030.¹⁷ This primary tactical air (TACAIR) capability has to be managed carefully as it is no longer in production. Through various programs, the Marines have extended the service life of their F/A-18

fleet to 10,000 flight hours, making it possible to keep them in service until FY 2030. A similar effort will keep the venerable AV-8B Harrier in use until FY 2027.¹⁸ At present, the Marines have acquired 101 F-35B—the Short Take-Off and Vertical Landing (STOVL) variant of the Joint Strike Fighter (JSF)—and nine F-35C (aircraft carrier capable) aircraft¹⁹ of a planned 353 F-35B and 67 F-35C models.²⁰ This has enabled the service to stand up 10 JSF squadrons: six operational, two fleet replacement (used to train new pilots), and one test for F-35Bs and one operational squadron of F-35C aircraft.²¹

The activation of and achievement of full operational capable status for the F-35C squadron are especially important given the end of operational service of the last squadron flying its predecessor aircraft, the F/A-18C. Marine Fighter Attack Squadron 323 (VMFA 323) returned from its final deployment aboard the USS *Nimitz* (CVN-68) with Carrier Air Wing 17 at the end of February 2021.²² The Corps’ F-35Cs will eventually replace the now operationally retired F/A-18C for duty aboard the Navy’s aircraft carriers.

In its heavy-lift rotary-wing fleet, the Corps began a reset of the CH-53E in 2016 to bridge the procurement gap between the CH-53E and the CH-53K King Stallion and aimed to “reset...the entire 143-aircraft fleet by FY20,”²³ but reporting in 2020 indicated that the Corps was moving rather slowly in this effort, and it was only one-third of the way through the process toward the close of the fiscal year.²⁴ 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.²⁵

As for the CH-53K heavy-lift helicopter, the service has reported good news about the per-unit cost, once an exorbitant \$125 million per aircraft. In testimony to the House Armed Services Committee’s Subcommittee on Tactical Air and Land Forces, Lieutenant General Mark Wise said that the cost per aircraft had dropped to \$97 million and could drop further to \$94

million per plane.²⁶ The Marines have acquired four of these new helicopters for testing and hope to have the King Stallion available for deployment by 2024.²⁷

The Corps continues to search for improvements to its MV-22B Osprey, most recently by testing a version of an electronic warfare radar jamming pod that it uses on other aircraft.²⁸ In the absence of conventional pylons on which weapons and sensors can be mounted, new capabilities have to be reconfigured to fit inside the aircraft or mounted on the aircraft fuselage.

Notably, the Corps has moved aggressively to implement aviation-related actions specified or implied by FD 2030. In May, it disestablished HMLA-367, a light-attack helicopter squadron in Hawaii, sending its still relatively new attack and utility helicopters to Davis-Monthan Airbase in Arizona where they will be placed in the “bone yard” for possible use in the future. The 27 AH-1Z Viper attack helicopters and 26 UH-1Y Venom utility helicopters that were decommissioned represented approximately one-fifth of the Marine Corps’ inventory of such aircraft.²⁹ The Marines have also started divestiture of three MV-22 squadrons, an additional light-attack helicopter squadron, and nearly three heavy-lift squadrons.³⁰

Amphibious Ships. Amphibious ships, although driven by the Corps’ articulation of what it needs to execute its operational concepts, remain a Navy responsibility. A trio of documents describe the rationale for and nature of the Marine Corps’ thinking about how it plans to contribute to the projection of naval power in highly contested environments such as that found in the Indo-Pacific region should the U.S. find itself at war with China.

- In 2017, the Corps and the U.S. Navy jointly released *Littoral Operations in a Contested Environment* (LOCE), in which the services presented general ideas about how to conduct naval operations against a very capable enemy.³¹
- Several months after taking office, General Berger published FD 2030, which set

objectives for redesigning the force so that it could do the things implied by LOCE.³²

- In February 2021, the Corps released an unclassified version of the *Tentative Manual for Expeditionary Advanced Base Operations*, in which the service provided substantial details about its evolved thinking about the tactical and organizational challenges posed by high-threat maritime environments.³³

These documents informed and reinforced Marine Corps and Navy plans to develop and acquire upwards of 35 light amphibious warships (LAWs), new amphibious vessels that would be smaller than those constituting the current fleet and optimized to support naval operations in the contested environments envisioned by LOCE and Expeditionary Advance Base Operations (EABO).³⁴ The Marine Corps held 38 amphibious ships as the minimum requirement for many years but stepped away from that as a prelude to redefining its amphibious operations capabilities.³⁵ With the evolution of FD 2030 and refinement of related supporting concepts and material requirements, the Corps is now making the case for 28 to 31 traditional amphibious ships augmented by LAWs.³⁶ Though five companies have been awarded contracts for further concept development of LAWs,³⁷ procurement is not expected to begin until FY 2023 and will extend through FY 2026.³⁸ Meanwhile, the number of traditional amphibious ships had dropped to 31 as of August 2021.³⁹

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, as indicated in the preceding section on capacity, and is covered in the Navy's section of the *Index*. The Marine Corps is focused on a force-wide redesign per FD 2030 with modernization and divestiture programs shaped accordingly. General Berger has emphasized that his force redesign initiatives are being self-funded, meaning that the service will get rid of some capabilities that are less relevant to expected operational demands and will reduce manpower to redirect that funding to other priorities of greater relevance. Nevertheless, defense funding has not kept pace with inflation, and there are some things for which the Corps needs additional money. According to one account:

Making his case [on June 15, 2021] before the House Armed Services Committee... for the Marine Corps' \$47.86 billion budget request, Berger said he has reduced headquarters staffing by 15%, cut legacy systems and end strength, and has nothing left to draw from to fund programs and projects.

"We have wrung just about everything we can out of the Marine Corps internally," Berger said. "We're at the limits of what I can do."

The Marine Corps' budget request represents a 6.2% increase from fiscal 2021, even as the service plans to reduce the size of the active-duty force by 2,700, to 178,500 Marines. The service ultimately wants to reach 174,000 by 2030—roughly the size it was in fiscal 2002.

Berger is using the money he has saved by reorganizing the Marine Corps and shedding capabilities such as tanks and artillery to invest in new technologies and platforms.⁴⁰

Programs such as the Amphibious Combat Vehicle (ACV), F-35, CH-53K, Naval Strike Missile,⁴¹ and Light Amphibious Warship are at the top of the list of major items of equipment and weapons, but the Corps is also pursuing a variety of unmanned systems (air, ground, and sea) and has placed great emphasis on smaller pieces of gear and individual-level weapons that will enable tactical units to be more effective.⁴² These latter items are typically small in cost when compared with aircraft and armored vehicles, but they can have a decisive effect in small-unit actions in the field.

Vehicles. 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 more than 49 years old and the LAV averaging 39 years old.⁴³ The Corps had moved to extend the service life of the AAV but abandoned that program as progress with the ACV accelerated.⁴⁴ The Corps has stated that:

[W]e 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).⁴⁵

The Marine Corps has also been exploring the possible replacement of its aged Light Armored Vehicle (LAV) with a collection of vehicles under the Advanced Reconnaissance Vehicle (ARV) program and has requested \$48.6 million in its FY 2022 budget submission for research and design work. General Berger, however, has said that he is "unconvinced that additional wheeled, manned armored ground reconnaissance units" are needed and that the Corps' light armored reconnaissance units "must be re-evaluated in light of the emerging concept of multi-domain mobile

reconnaissance,” indicating that the requirement for the ARV is being reconsidered.⁴⁶

The AAV program hit rough waters on July 30, 2020, with the sinking of an AAV off the California coast near San Clemente Island. In addition to halting all AAV operations until various investigations were completed, the Corps installed supplementary emergency breathing devices in the vehicle and took other steps to improve its safety and survivability.⁴⁷ AAV operations were resumed in April 2021 following inspection and modification of vehicles and related training and certification of AAV crews on the improvements.⁴⁸

The Corps has accelerated procurement of the ACV in recognition of the problems of its AAV fleet and the urgent need to update force capabilities per FD 2030. It procured 56 ACVs in FY 2020 and 72 in FY 2021 and has requested funding sufficient to acquire 92 in FY 2022.⁴⁹ Combined with the 56 vehicles acquired in previous years, the additions in 2020 and 2021 bring the number of ACVs in the Corps’ inventory to 184 out of a total program objective of 632.⁵⁰

A note about the Corps’ heavy armor: The operational challenges, organizational design, and tactical capabilities addressed in FD 2030 called for the Marines to retire their inventory of M1A2 Abrams main battle tanks and associated support capabilities like heavy bridging and recovery vehicles. The Marine Corps retired its last active-duty tank unit in May 2021,⁵¹ bringing to a close nearly a century of experience with tanks. The Corps retains some tanks in various storage configurations (for example, aboard Maritime Prepositioning Squadron ships and in equipment storage caves in Norway) but will transfer them to the Army by FY 2023.⁵²

Acquisition of the Joint Light Tactical Vehicle (JLTV) continues to move apace. Since 2017, when fielding of the HMMWV replacement began, the Marines have acquired 4,531 vehicles (out of a requirement for 9,091⁵³) and have placed another 613 on order with its FY 2022 budget request.⁵⁴ Budget documents do not indicate plans for purchase beyond FY 2022,⁵⁵

most likely because decisions extending from FD 2030 initiatives have yet to be made.

Aircraft. Fixed-wing fighter-attack aircraft continue to age while the Corps pursues delivery of replacement aircraft: the F-35B STOVL variant to replace the AV-8B, in service since 1985, and the F-35C to replace its carrier-capable F/A-18s. To account for a lengthy transition period, the Corps has undertaken various efforts to extend the service life of its Hornets and Harriers to keep them in service until the end of the decade.⁵⁶

The Corps has acquired approximately one-third of the F-35B aircraft that it plans to purchase but has only started to outfit its aviation element with the F-35C, the version designed for use aboard aircraft carriers. Though the F-35 program has been the subject of vigorous criticism ever since it began, much of this criticism is misplaced today given the superior capabilities the aircraft brings to air operations in heavily contested environments featuring peer-level enemies and the steady decrease in per-unit cost.⁵⁷ The Corps’ current concerns about the aircraft have less to do with its capabilities than they do with the overall cost of modern aircraft in general in the constrained budget environment within which the service is working to redesign its force.

Today, the USMC MV-22 Osprey program is operating with few problems and nearing completion of the full acquisition objective of 360 aircraft.⁵⁸ The Marine Corps now has 16 fully operational MV-22 squadrons in the active component.⁵⁹ 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.⁶⁰ This has resulted in increased logistical requirements as maintainers have had to be trained to each configuration and not all spare parts are 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 “2–3 aircraft installs per year.” The program was initiated in FY 2018.⁶¹

The USMC’s heavy-lift replacement program, the CH-53K, conducted its first flight on October 27, 2015.⁶² 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,⁶³ the program achieved Milestone C in April 2017. The Corps received \$1 billion in 2019 to purchase seven aircraft,⁶⁴ continued this effort by purchasing six in FY 2020 for \$848 million, and bought an additional nine in FY 2021 for \$1.1 billion.⁶⁵ This aircraft is of increasing importance because the Marine Corps maintains only 138 CH-53Es and will not have enough helicopters to meet its heavy-lift requirement of 200 aircraft without the transition to the CH-53K.

Readiness

Riding alongside the Corps’ principal Title 10 responsibility to provide “fleet marine forces [for service] in the seizure or defense of advanced naval bases and for the conduct of such land operations as may be essential to the prosecution of a naval campaign”⁶⁶ is its contribution as the crisis-response force for the military. This aspect of USMC contributions to national defense has been reinforced by service leaders who take pains to allay concerns that their focus on China and the Indo-Pacific will distract them from this important role. The Corps’ readiness must therefore account for both high-end conflict against a major opponent in the most complex operational settings and pop-up crises against lesser opponents that cannot be predicted, all of which implies a force that is ready to go at a moment’s notice.

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.⁶⁷

To this the Commandant has added an expanded perspective that includes force modernization as an essential element to ensure that combat forces remain relevant and therefore ready. As General Berger and Air Force Chief of Staff General Charles Q. Brown, Jr., have argued, only by divesting old capabilities that would not be useful in changed circumstances and investing in new capabilities that account for more capable enemies and the characteristics of key operational theaters can U.S. forces be ready. “To do this,” however, “we cannot let our focus on near-term availability consume the resources necessary to generate truly relevant future readiness through adaptive modernization.”⁶⁸

Divestiture carries with it some risk unless replacement capabilities are brought into the force as old or legacy capabilities are retired. For example, the Marine Corps’ decision to get rid of tanks and a large percentage of its tube artillery means that the service will not have these capabilities should it be called into battle before new items can be fielded. Early reports of promising replacement capabilities to compensate for the loss of the Abrams main battle tank, for example, are encouraging, but the Corps now no longer has tanks while the improved replacement remains to be fielded.⁶⁹ This has a bearing on readiness to the extent that the force has a *current* ability to win in combat. The force might be ready, but in a different posture. For a few years, the Marines could be more light-infantry than the middle-weight “two-fisted fighter” proudly described by a former Commandant a decade ago.⁷⁰

Unfortunately for this *Index*, the Corps reports its current readiness in vague, generalized terms instead of providing data by which external audiences can independently assess the status of the service, although this approach is generally used by all of the services. Detailed readiness reports are classified to prevent potential enemies from obtaining sensitive information.

In the past, the services' leaders would report to Congress in formal testimony the various percentages of key equipment that were or were not available, share the status of primary units or types of force capabilities, and perhaps provide insight into maintenance or supply backlogs. The absence of such details from Marine Corps statements during the past year reveals that the Corps prefers not to share such information, at least currently. Consequently, our assessment of the Corps' readiness must rely on the tone of statements and discussions, inferences derived from the totality of efforts and programs, and the sense one gets from anecdotal evidence of the seriousness with which the service is taking preparations for current and future employment.

As mentioned, the Marine Corps has undertaken a great reorientation to ready itself for war against China in a heavily contested maritime environment. The service believes that the changes it is pursuing to this end will be relevant and necessary for other combat environments because many countries are acquiring capabilities that are now possible and affordable with modern technologies. With this as the driver, combined with the reiteration of the Corps' role as a force in readiness, the service's words, actions, and policies strongly imply a focused commitment to combat readiness.⁷¹

To improve force capabilities from the level of the individual to the most senior operational commands, the service is pushing several initiatives. Among them:

- The Marine Corps School of Infantry has revamped its training for entry-level infantry Marines, lengthening its course

by half and including new coursework and field training intended to sharpen the thinking skills of Marines who will likely find themselves operating more independently than has been the case in the past.⁷²

- “In May [2021], the Marine Corps broke ground on a new, state-of-the-art wargaming facility intended to house various capabilities to enhance warfighter preparedness.”⁷³ The Corps intends that the center, planned for use as early as 2024, will “help Marines better visualize the threat environment” and participate in war games of various sizes with a focus on realism and that it will also “provide data to inform decisions affecting force development [and] support existing and developing weapons platforms and capabilities in all regions of the globe.”⁷⁴
- Taking this emphasis on thinking, training, and war-gaming scenarios to the field, the Corps and the Navy teamed to execute a two-week Large Scale Exercise 2021, billed as the largest the services have conducted in many years, that involved 25,000 personnel, 36 live units, 50 virtual units, and a half-dozen major commands spread across 17 time zones.⁷⁵

Such efforts, from improvements to infantry training to war gaming to large exercises, are steps that will have effects in the future rather than the present. However, they do reveal attitudes, priorities, and perspectives that reflect a level of seriousness about warfighting.

Within the Marine Corps, perhaps because it is a smaller service, changes in direction and attitude are more easily conveyed by senior leaders to the force and adopted force-wide than is the case in the larger services. While this does not directly replace hard data on mission-capable rates for equipment used by the Marines or cleanly substitute for unclassified reports about the readiness of units composing the Fleet Marine Force, it can be seen

as a surrogate for the attention being paid by the Corps to its level of readiness. In addition, now that the extended operational demands of Iraq and Afghanistan have concluded, the force can reconstitute its readiness as it

reorients toward the requirements of FD 2030, LOCE, and EABO.

Lacking any other direct reporting, this *Index's* assessment of the Corps' readiness for current operations is an optimistic one.

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).⁷⁶ This requirement is based on the presumption of a rather conventional force using known (current) equipment and capabilities against a similar opponent.

This *Index* acknowledges the service's work to develop new capabilities and approaches to fighting and is certainly aware of the trends in new technologies and associated thinking about how warfare *might* change in the future, but until this happens, one can assess only what can be known at present. Consequently, the Corps' historical need for 15 battalions (and associated enabling elements) for one major conflict 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.⁷⁷ 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.⁷⁸

Manpower is by far the biggest expense for the Marines. As allocated for the Corps' FY 2021 budget, the military personnel account was approximately \$14.68 billion (an increase of \$730 million over FY 2020),⁷⁹ dwarfing both the approximately \$8.4 billion allocated for operations and maintenance⁸⁰ and the \$2.7 billion allocated for the procurement of new equipment, with both accounts seeing a decline in spending compared with the previous year.⁸¹ 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 demand during these historical instances of Marine Corps employment. The pacing threat for the Corps is China, which is developing new tools and operational concepts that will likely require the distribution of Marine Corps forces across a large, contested littoral battlespace. But because the Corps has

not yet refined what its envisioned formations will require, much less proven them in operational employment, 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, sustain operations in the face of combat losses, and sustain its support for 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 2021 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,” the same as it was scored in the *2021 Index* 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.”

Capability Score: Strong

The Corps receives scores of “marginal” for “Capability of Equipment,” “marginal” for “Age of Equipment,” “very strong” for “Health of Modernization Programs,” and “strong” for “Size of Modernization Program.” Therefore, the aggregate score for Marine Corps capability is “strong,” an increase from the *2021 Index* score of “marginal.”

The Corps is aggressively pursuing a host of new capabilities that will modernize the force over the next decade, and those capabilities—specifically, the JLTV, ACV, and F-35B—are slowly entering the force. Admittedly, the

score was helped by the retirement of the old M1A2 Abrams tank. At the small-unit level, the force will still depend on old AAVs, HMMWVs, LAVs, cargo trucks, and various items of support equipment procured in the 1990s and early 2000s, but the increasing quantity of JLTVs and the aggressive acquisition of ACVs will offset the problem of old equipment as the Corps enters FY 2022.

Readiness Score: Strong

The Corps has exhibited an especially focused and aggressive commitment to ensuring that Marine Corps forces are ready for action. This is the point of FD 2030. That said, however, the history of military services is littered with the debris of grand vision statements and futuristic concepts unrealized in practical implementation.

The Marine Corps’ effort appears to be quite different, as evidenced by nearly irreversible decisions to cashier old equipment and implement significant changes in education and training programs, dramatic investments in experimentation and war gaming, acquisition of new capabilities, and profound redesign of operational units. The Corps seems to mean what it has been saying by making real changes in its programs and organizations that reflect its published rhetoric. This *2022 Index* believes it a low-risk proposition to apply the evidence of preparing for the future to current forces in terms of their focus on readiness for combat. The force remains encumbered by old primary equipment, but the service’s effort to spend the money needed to keep it serviceable mitigates this problem to a reasonable extent.

The Corps is still too small, but the force it has is fully focused on warfighting. Consequently, the *2022 Index* assesses Marine Corps readiness as “strong,” a marked improvement over the *2021 Index* score of “marginal” and quite a jump in a short three-year period over the *2019 Index* measure of “weak.”

Overall U.S. Marine Corps Score: Strong

The Marine Corps has made substantial strides in the past few years in regaining its

material readiness and stabilizing key modernization programs and, over the past two years, in profoundly changing its battle orientation, conceptual underpinnings, organizational design, and acquisition of the tools that it believes it will need to win in combat. This admittedly has been accomplished at the expense of capacity, but better to have a combat-relevant force, even if small, than a large force that is ill-suited for war.

The 2022 Index score of “strong” is buoyed by the status of the Corps’ modernization and

readiness efforts. The Marine Corps does run the risk of becoming too small relative to the task of enabling the projection of naval power into the most challenging combat environments, and this will be determined by the level of funding it receives in the coming years. The same holds true for its modernization efforts if the Administration and Congress elect to underfund defense.

But these are future problems. For FY 2021, the Corps achieved fine form, and its efforts augur well for FY 2022.

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 2021
Pending

Main Battle Tank

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
M1A1 Abrams Inventory: DEACTIVATED Fleet age: 18 Date: 1990 The M1A1 Abrams was the main battle tank of the USMC and provided the Marines with heavy-armored direct fire capabilities. Following the release of Force Design 2030, the Marine Corps decided to discontinue the use of their tanks in order to adapt their fighting capabilities to potential conflicts in the Pacific.			None		

Light Wheeled Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
HMMWV Inventory: 10,859 Fleet age: 23 Date: 1983 The HMMWV, better known as the "Humvee," is a light wheeled vehicle that is used to transport troops with some measure of protection against small arms, blast, and fragmentation. Initially introduced in the 1980s, HMMWVs will be replaced by the Joint Light Tactical Vehicle (JLTV).			Joint Light Tactical Vehicle (JLTV) Timeline: 2017–2022	5	5
JLTV Inventory: 4,531 Fleet age: 1 Date: 2019 The Joint Light Tactical Vehicle (JLTV) is replacing the HMMWV as a light wheeled vehicle for troop transport. The vehicle provides a long-term solution to IEDs and other unorthodox tactics with which the Humvee struggled during the conflicts in Iraq and Afghanistan. The JLTV improves reliability, survivability, and strategic and operational transportability. It achieved initial operational capability in 2019.	2	2	The JLTV program is a joint program with the Army for the eventual replacement of all HMMWVs. 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, North Carolina. PROCUREMENT 4,531 613 SPENDING (\$ millions) \$1,918 \$322		

NOTE: See page 475 for details on fleet ages, dates, timelines, and procurement spending. JLTV spending figures reflect the full joint program spending

MARINE CORPS SCORES



Procurement and Spending Through FY 2021
Pending

Amphibious Assault Vehicle

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
AAV Inventory: 692 Fleet age: 49 Date: 1972 The Amphibious Assault Vehicle (AAV) is an amphibious landing vehicle that transports Marines from large naval vessels to land. Similar to a tank in being fully tracked and armored, the AAV is designed for assault on shores in hostile territory. The AAV will eventually be replaced by the ACV.		1	Amphibious Combat Vehicle (ACV) Timeline: 2018–2021	3	5
LAV-25 Inventory: 494 Fleet age: 39 Date: 1983 The Light Armored Vehicle (LAV) is an eight-wheeled, armored reconnaissance vehicle. It is designed for off-road and moderate amphibious capabilities. This allows for highly mobile fire support, operational in most terrains. The LAV will be in service until 2035.		2	The ACV is tasked with replacing the aging AAV. The vehicle achieved IOC in November 2020, and full-rate production was ordered to begin in 2021.		
ACV Inventory: 98 Fleet age: 0.5 Date: 2020 The Amphibious Combat Vehicle (ACV) is an amphibious landing vehicle that is intended to supplement and eventually replace the AAV. It is designed for increased survivability, the most notable difference being increased ground clearance to reduce the harm from IEDs and mines. A new remote weapons system improves the ACV's situational awareness and ability to track and fire on targets. The ACV is also equipped with tires instead of tracks and has a redesigned interior.	5	5	PROCUREMENT \$1,310 \$4,200	SPENDING (\$ millions) \$1,310 \$4,200	

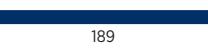
NOTE: See page 475 for details on fleet ages, dates, timelines, and procurement spending.

MARINE CORPS SCORES



Procurement Through FY 2021
and Spending Pending

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 was the attack helicopter that provided Marines with close air support and armed reconnaissance. After more than 30 years of effective and dependable service, the AH-1W was retired in October 2020. It is being replaced by the more advanced AH-1Z Viper	1	2	AH-1Z Timeline: 2014-2022 The new AH-1Z Viper program is part of a larger program for modification of the H-1 platform. Replacing the AH-1W, the Z-Variant will serve as the next generation of attack aircraft. The AH-1Z features upgrades across multiple dimensions. It is scheduled to achieve full operational capability in 2021.	5	5
AH-1Z Viper Inventory: 125 Fleet age: 7 Date: 2010 The AH-1Z Viper is replacing the AH-1W Super Cobra as the USMC's premier attack helicopter. The Viper has greater speed, payload, and range as well as upgraded landing gear, advanced weapons systems, and a fully integrated glass cockpit. The Viper provides Marines with close air support, armed escort/reconnaissance, and anti-armor capabilities. The Viper's expected operational life span is 30 years.	5	5	PROCUREMENT  189	SPENDING (\$ millions)  \$6,012	\$7

Airborne Electronic Attack Aircraft/Ground Attack Aircraft

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
AV-8B Inventory: 109 Fleet age: 29 Date: 1985 The Harrier is the Marine Corps' ground attack aircraft. It is a subsonic jet and, like a helicopter, is capable of hovering. The Harrier has a Vertical/Short Take-Off and Landing (V/STOL) system and is designed to fly from amphibious assault ships and unconventional runways. These unique capabilities allow it to operate in a variety of environments that are inaccessible to other jets. The aircraft is being replaced by the F-35B and will be fully retired in or near 2024.	5	1	F-35B/C Timeline: 2007-2031 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.	4	4

NOTE: See page 475 for details on fleet ages, dates, timelines, and procurement spending.

MARINE CORPS SCORES



Procurement and Spending

Airborne Electronic Attack Aircraft/Ground Attack Aircraft (Cont.)

PLATFORM	Age Score	Capability Score
F/A-18 A-D Inventory: 224 Fleet age: 30 Date: 1978 The F/A-18 Hornet is a fighter and attack jet that the Marine Corps uses primarily for traditional strike missions, fleet air defense, and air support. It will be replaced by the F-35C model; however, the F/A-18 fleet's life has been extended to 2030 in order to bridge the gap between the two platforms.	2	2
F-35B Lightning II (STOVL) Inventory: 130 Fleet age: 5 Date: 2015 The F-35B is the Marine Corps variant of the Joint Strike Fighter (JSF) Program. It is a fifth-generation, stealth multi-role fighter. Its next-generation technology allows it to dominate combat missions without being detected by the enemy. Unique to the other variants, the B-model is designed with a Short Take-Off and Vertical Landing (STOVL) system that allows it to operate from amphibious assault ships and unconventional runways. This combines the unique operational capabilities of the AV-8B Harrier with a supersonic, fifth-generation stealth fighter.	5	5
F-35C Lightning II (CV) Inventory: 11 Fleet age: 0.5 Date: 2020 The F-35C is the aircraft carrier variant of the Joint Strike Fighter (JSF) program used by both the Navy and the Marine Corps. It is a fifth-generation, stealth multi-role fighter. Its next-generation technology allows it to dominate combat missions without being detected by the enemy. The C-model, also known as the carrier variant (CV), is equipped for traditional carrier catapult launches and tailhook landings. It also features a slightly larger combat radius than the B-model. Although the C-model is used primarily by the Navy, the Marine Corps implemented its first squadron in December 2020 to complement its F-35B fleet.	5	5

NOTE: See page 475 for details on fleet ages, dates, timelines, and procurement spending.

MARINE CORPS SCORES



Procurement Through FY 2021
and Spending Pending

Medium Lift

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
MV-22B Osprey Inventory: 309 Fleet age: 14 Date: 2007 The Osprey is a tilt-rotor aircraft that combines the vertical capabilities of a helicopter (V/STOL) with the speed and range of a fixed-wing aircraft. Similar to the AV-8B, this allows the aircraft to take off and land in unconventional environments. The Osprey provides transport for ground personnel, cargo lift, and support for raid operations. IOC was achieved in 2007, and the program is still in production. The MV-22B's life expectancy 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 does not face any serious issues.	5	5

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 rotary-wing aircraft. The Super Stallion transports heavy equipment and supplies for amphibious assault. The aircraft will operate through 2027 and will then be replaced by the more advanced CH-53K. The CH-53E's program life 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 necessary critical technology. The helicopter is scheduled to complete initial testing in 2021 and to be fielded as early as 2023.	5	3

NOTE: See page 475 for details on fleet ages, dates, timelines, and procurement spending.

MARINE CORPS SCORES

1 2 3 4 5
Weakest → Strongest

Procurement and Spending Through FY 2021
Pending

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 a large multi-role aircraft, used primarily as a tanker and cargo transport aircraft. It is equipped for a variety of missions, including troop and equipment transport, air-to-air refueling, and medevac operations. 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 achieved initial operational capability. The timeline is from the start of the platform's program to its budgetary conclusion. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E). 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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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 (DOD) and the second service within the Department of the Air Force (DAF), the USSF functions under the direction and leadership of the Secretary of the Air Force. The 2019 NDAA specifies that a four-star general will serve as Chief of Space Operations (CSO) and as 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 Guardians [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

A 2001 RAND study estimated that 95 percent of all civilian and commercial space technologies have direct applicability to military systems or are of dual use. That fact and the capabilities that those two sectors bring to the Space Force are critical to an assessment of this new service.³ The domination of great-power competition in space relies on the interwoven efforts of all three U.S. sectors—military, civil, and commercial space—and that reliance is growing.

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.⁴

Though recognized by every President since Dwight Eisenhower in the mid-1950s, various issues kept the United States from developing a single service charged with managing space assets and capabilities. 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 This splintered approach was sustained by every Administration for the next six decades. Nevertheless, U.S. space capabilities advanced at a stunning pace.

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 DAF.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 the Global Positioning System (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. These nations have demonstrated the capability to put American space assets at risk, and until very recently, the United States had not taken overt 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 NDAA was enacted, President Donald Trump directed that a Space Force be established within the DAF.⁹ Congress concurred and created the USSF with the 2020 NDAA.

An important addition to the U.S. warfighting command structure was the reestablishment of U.S. Space Command as the 11th combatant command within the Department of Defense with the mission of conducting “operations in, from, and to space to deter conflict and, if necessary, defeat aggression, deliver space combat power for the Joint/Combined force, and defend U.S. vital interests with allies and partners.”¹⁰

U.S. Space Force Organization

The USSF Headquarters and Office of the Chief of Space Operations are located in the Pentagon. When Congress authorized the Space Force, it limited its scope to Air Force personnel and assets, equating to a total workforce of approximately 27,300¹¹ comprised of personnel and organizations within five Air Force Wings located at 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.¹²

Those personnel, organizations, and structures have been or will be restructured and rolled into three major field commands that fall directly under the CSO:

- Space Operations Command,
- Space Systems Command, and
- Space Training and Readiness Command.

These three commands are leading or will lead the next tier of organizations, called Deltas and Garrisons. Deltas are equivalent to Air Force Groups, are led by a colonel, and are tasked with and responsible for specific missions and operations. Garrisons are also the equivalent of Air Force Groups and support Deltas with functions similar to those of Air Force “Base”-level command. Squadrons are the final level of command and will fall under Deltas and Garrisons.

Space Operations Command. SpOC was established on October 22, 2020, as the first major USSF field command. Currently located at Peterson Air Force Base, Colorado, SpOC is led by a three-star general and is responsible for organizing, training, and equipping space forces assigned to combatant commands. The already standing SpOC at Vandenberg Air Force Base, California, will be redesignated as SpOC West and will continue to conduct operations in support of combatant commanders.

Space Systems Command. This command was scheduled to stand up in the summer of 2021¹³ to oversee the development, acquisition, and maintenance of satellites and ground systems, the procurement of SATCOM and launch services, and investments in next-generation

technologies. Space Systems Command will be headed by a three-star general who will oversee the Space Force's approximately \$11.3 billion annual budget for research, development, test, and evaluation (RDT&E) and the acquisition of new systems.¹⁴

At present, DOD's primary space procurement agency is the Space and Missile Systems Center (SMC), located at Los Angeles Air Force Base, California. When Space Systems Command stands up, it will absorb SMC along with two other procurement agencies: the Commercial Satellite Communications Office based in Washington, D.C.,¹⁵ and the Air Force Research Laboratory (AFRL) Space Vehicles Directorate based at Kirkland Air Force Base, New Mexico.¹⁶

Space Training and Readiness (STAR)

Command. STARCOM will be the third USSF field organization and will be based at Peterson Air Force Base in Colorado. It will be led by a two-star general and will be responsible for the education and training of space professionals. Until the two-star command stands up, a provisional command and foundational element of STARCOM, STAR Delta (P), which was established in July 2020, will serve as the parent organization for several education, training, test, and evaluation units.¹⁷

Personnel. The 2020 NDAA specified that only the Air Force was required to provide personnel for the Space Force, and with the redesignation of Air Force Space Command (AFSPC) as Space Operations Command, approximately 16,000 Air Force active-duty and civilian personnel were assigned to support the USSF.¹⁸ However, most are still wearing the same uniforms they wore before being reassigned, as well as working in the same offices. "Assigned" personnel remain in the Air Force or another service and perform work in support of the USSF. An officer that transfers will be (re)commissioned in the USSF, and enlisted personnel that transfer will execute an enlistment contract with the new service.¹⁹

The 2021 NDAA authorized 6,434 military personnel, 3,545 civilian personnel, and a total end strength of 9,979 on September 30, 2021.²⁰

More than 6,400 people have been hand selected to make the transition, and as of the end of April 2021, more than 4,840 had transferred to the new service.²¹ Methodically expanding the Space Force to include all DAF military and civilian personnel that the service intends to transfer will probably not be completed until the end of FY 2021.²²

However, 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.²³ For that to happen, a significant portion of the approximately 21,200 space professionals that remain in the Army and Navy²⁴ will need to be incorporated into the Space Force—something that is not likely to happen until FY 2024 or later.

Funding

The President's budget request for FY 2022 lays out a relatively robust level of funding for every aspect of the new service's mission set. The budget for Operations and Maintenance (O&M) is \$3.4 billion; the budget for RDT&E is \$11.3 billion; and procurement adds another \$2.8 billion for a total of \$17.4 billion, a 13 percent increase over FY 2021.

Assuming that the President's budget is fully funded, Space Force end strength will be authorized up to 12,764 military and civilian personnel, an increase of 2,785 over FY 2021.²⁵ The combination of robust funding and manpower levels will allow the CSO to continue to focus on building a strong organizational foundation and filling critical billets with the right people.

Capacity

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. The USSF's position, navigation, and timing (PNT); command and control (C2); communications

TABLE 15

U.S. Space Force Budget

In billions of dollars

	Operation and Maintenance	Military Personnel*	Research, Development, Test, and Evaluation	Procurement	Overseas Contingency Operations	Military Construction	Total
FY 2021	\$2.6	0	\$10.5	\$2.3	0.1	0	\$15.4
FY 2022	\$3.4	0	\$11.3	\$2.8	0	0	\$17.4

* U.S. Space Force personnel costs were funded by U.S. Air Force Military Personnel, FY 2021 (\$800.3 million) and FY 2022 (\$929.8 million).

NOTE: Figures may not sum to totals due to rounding.

SOURCES: Extracted from U.S. Air Force budget summaries for fiscal years 2021 and 2022. For example: Table 3, “U.S. Space Force Budget Summary,” in U.S. Department of the Air Force, *Department of the Air Force Fiscal Year 2021 Budget Overview*, p. 8, https://www.saffm.hq.af.mil/Portals/84/documents/FY21/SUPPORT/_FY21%20Budget%20Overview_1.pdf?ver=2020-02-10-152806-743 (accessed September 3, 2021).

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(Comm); and weather satellites (referred to collectively as Backbone satellites) and its intelligence, surveillance, and reconnaissance (ISR) satellites are unrivaled and provide extraordinary capabilities. Its space situational awareness (SSA) satellites and terrestrial-based capabilities, while also unrivaled, are limited and require additional resourcing. Each satellite, satellite constellation, and terrestrial space surveillance site has unique characteristics and an expected life span.

The Space Force has a total of 70 Backbone satellites that enable every facet of modern American warfare, to include the collection of real-time intelligence and the ability to communicate, adaptively maneuver, and deliver precision effects almost anywhere on the planet.

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 service operates 77 satellites vital to national security that provide

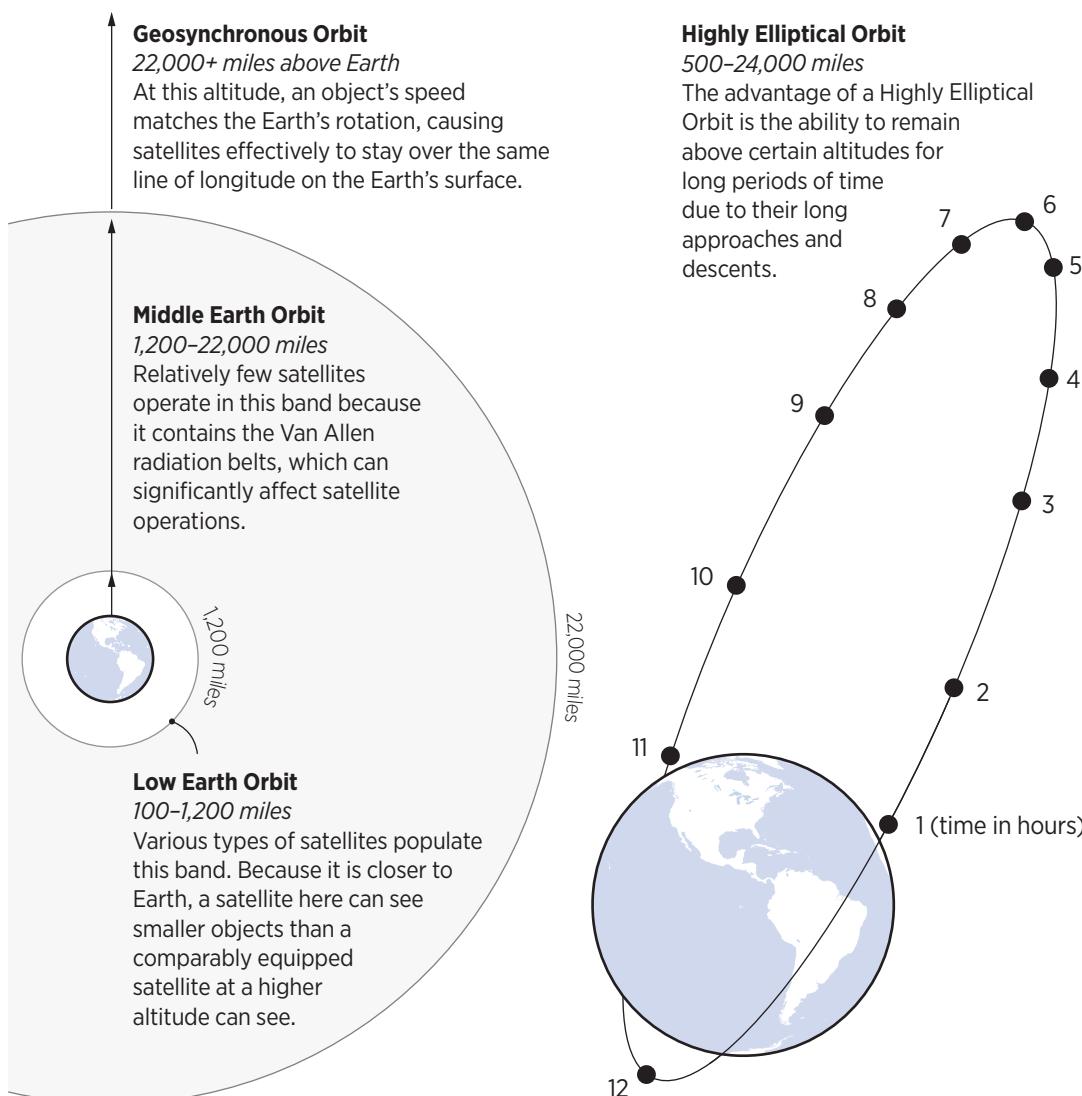
communications, command and control, missile warning, nuclear detonation detection, weather, and GPS for the world.²⁶ An estimated 90 satellites in that portfolio now reside within the Space Force. (See Table 17).

Global Positioning System (38 Satellites). Perhaps the best-known constellation of satellites under Space Force control is the Global Positioning System (GPS), which provides PNT for millions of simultaneous users around the world. It takes 24 of these satellites to provide seamless global coverage, and 31 are currently operational.²⁷ Approximately seven additional satellites that have been decommissioned and serve as on-orbit spares bring the total to 38.

GPS III is the latest upgrade to the platform and incorporates a more robust anti-jamming capability. The fifth GPS III²⁸ satellite was launched into orbit on June 17, and the scheduled launch of the sixth in September 2021 will increase the number in orbit to 39.²⁹ 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.³⁰

FIGURE 4

Types of Earth Orbits



SOURCE: Heritage Foundation research.

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Weather (Four 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).³¹ Currently, four operational DMSP satellites are in polar low-Earth orbits (LEOs).³²

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 and provide complete global coverage of weather features every 14 hours.³³ Launched between 1999 and 2009 with a life expectancy

of just five years, they have continued to deliver exceptional data well beyond their expected lifetimes.³⁴

Communications (28 Satellites). Milstar is a satellite communications (SATCOM) 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 DOD's most robust and reliable SATCOM system 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 DOD to sustain secure, jam-resistant communications and C2 for high-priority military ground, sea, and air assets located anywhere in the world. The AEHF Constellation includes six satellites³⁵ in GEO.³⁶

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,³⁷ WGS provides Super High Frequency (SHF) wideband communications, using direct broadcast satellite technology to provide C2 for U.S. and allied forces. With solid capabilities that include phased array antennas and digital signal processing technology, this system delivers a flexible architecture with a satellite life span of up to 14 years.

Space-Based Infra-Red System (Six Satellites).³⁸ 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. Because SBIRS HEO is a retaskable orbit, these satellites can be moved to more optimum orbits/viewpoints as mission requirements dictate. Five SBIRS GEO satellites have been placed in orbit, and it is expected that the final vehicle, GEO-6, will launch sometime in 2022.³⁹

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 program is intended 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 2023.⁴⁰

Defense Support Program (Five Satellites). Defense Support Program (DSP) satellites were designed to detect launches of ICBMs or Sea Launched Ballistic Missiles (SLBMs) against the U.S. and its allies. Its secondary missions include detection of space launch missions or nuclear weapons testing and detonations. The DSP constellation is in GEO and uses infrared sensors to pick up the heat from and booster plumes against the Earth's background. Phase 1 placed four satellites in orbit from 1970 through 1973⁴¹ and was followed by Phase 2, which placed six satellites in orbit from 1979–1987.⁴² Phase 3 consisted of 10 DSP satellites that were launched from 1989–2007.⁴³

Although Phase 3 DSP satellites have long exceeded their design lifetimes, reliability has exceeded expectations, and at least five⁴⁴ and as many as eight are still providing reliable data and are now integrated with and controlled by the SBIRS program ground station.⁴⁵

Space Situational Awareness Systems

Knowledge of hostile systems—their locations, their positional history, and how those satellites are maneuvering in real time—conveys intent and collectively shapes the protocols and counterspace decisions that follow. Space situational awareness is therefore critical to every aspect of defensive and offensive counterspace operations and forms the foundation for DOD counterspace activities.⁴⁶

In addition to adversary systems, other significant threats are in orbit. The National Aeronautics and Space Administration (NASA) estimates that as many as a half-million objects with diameters between 0.4 inches and four inches are circling the Earth,⁴⁷ and the Australian Space Academy says that objects in LEO are traveling between 15,600 and 17,900 miles an hour.⁴⁸

Maintaining a high level of situational awareness of satellites and debris orbiting across the depth and vast dimensions of potential Earth orbits requires a robust and seamless network of space-based and terrestrial-based sensors. Understanding the capabilities and limitations of that network naturally begins with understanding the numbers and types of space-based and ground-based systems.

Six acknowledged satellites and six dedicated and 17 collateral or contributing terrestrial-based sensors help to maintain situational awareness of satellites and other objects in space. The satellites, collectively known as the Space-Based Surveillance System (SBSS), operate in concert with ground-based sensors but without their weather-related and sunlight-related limitations.

Some satellites track objects and debris fields from LEO. Others operate from a much higher orbital position (GEO) and are capable of maneuvering to perform detailed inspections of orbiting items of especially high interest.

Space-Based Surveillance System (Six Satellites). The Geosynchronous Space Situational Awareness Program (GSSAP) is a classified surveillance constellation of four satellites that can accurately track and characterize objects in orbit.⁴⁹ Operating near GEO,

GSSAP satellites are maneuverable and therefore able to perform rendezvous and proximity operations (RPO) on objects of interest in space.⁵⁰ Launched in pairs, the first two GSSAP satellites were put in orbit on July 28, 2014, followed by the second two on August 19, 2016, and each has a life span of up to seven years.⁵¹

The first of the two remaining satellites, Space-Based Surveillance System-1 (SBSS-1), was launched to LEO in 2010 with a seven-year life expectancy.⁵² The second, Space Tracking and Surveillance System Advanced Technology Risk Reduction (STSS-ATR), is an RDT&E satellite placed in a polar LEO on May 5, 2009, with an unknown life expectancy. It was placed in orbit by the Missile Defense Agency (MDA) but is now part of the USSF portfolio.⁵³

Space Surveillance Network (Six Dedicated Ground-Based Sensors). The U.S. Space Surveillance Network (SSN) is comprised of 23 ground-based radar and optical tracking sites that have the ability to detect, track, identify, and catalog all man-made objects orbiting the Earth. Of the 23 sites, six are dedicated sensors with a primary mission of space surveillance.

Seven collateral sensors are part of the network, but their primary mission is to detect and track ICBMs and SLBMs and to test and evaluate other systems. Another 10 contributing SSN sensors controlled by other organizations or agencies provide space surveillance support upon request from the National Space Defense Center (NSDC).

Reconnaissance and Imaging Satellites (Unknown). Although 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 space-based radar satellites. That program (known as Lacrosse/Onyx) launched five satellites, each carrying a synthetic aperture radar (SAR) as its prime imaging sensor. Because SAR systems can see through clouds with high resolution, they offer the potential to provide a capability from which it is hard to hide.⁵⁴

TABLE 16

Space Launches by Country Since 2010

	U.S.	China	Russia	India
2010	17	16	16	3
2011	19	19	20	3
2012	12	19	12	2
2013	19	15	18	3
2014	21	15	22	4
2015	19	19	14	3
2016	24	22	13	7
2017	29	18	13	4
2018	29	39	13	7
2019	20	34	14	6
2020	53	19	21	14
2021	66	22	26	7
Total	328	257	202	63

SOURCE: Space Launch Schedule, <https://www.spacelaunchschedule.com/> (accessed September 8, 2021).

 heritage.org

Space Launch Capacity

The Space Force manages the National Security Space Launch (NSSL) program, 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 (ULA) 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. In 2020, the Space Force awarded two launch services procurement contracts to ULA and SpaceX, and those two vendors will provide space launch services for the Space Force through 2027.⁵⁵

In 2010, four organizations, including NASA, were involved in launching manned

and unmanned systems into space. Today, nine private corporations—twice the number that had launched systems into orbit in 2019—are engaged in placing satellites into orbit.⁵⁶ In 2021, U.S. companies are scheduled to launch 66 missions into space, and China and Russia are scheduled to conduct 22 and 26 launches, respectively.⁵⁷ America has turned the corner on this vital capability, and the access to space that these private companies provide will be a major factor in determining whether the United States is able to prevail in the great-power competition that lies ahead.

Capability

With an estimated 90 satellites in its portfolio, the USSF can meet much of the communications, collection, and imagery demand placed on it by the National Command Authorities and the strategic-level intelligence requirements of the Defense Department. However,

TABLE 17

U.S. Satellites in Orbit

System	Function	Satellites
GPS	Positioning, Navigation, and Timing	38
SBIRS	Missile Warning	9
DSP	Missile Warning	5
SBSS	Space Surveillance	1
STSS-ATR	Missile Defense	1
GSSAP	Space Tracking	4
DMSP	Weather	4
Milstar	Communications	5
AEHF	Communications	6
DSCS	Communications	7
WGS	Communications	10
Total		90

NOTE: Data are current as of May 20, 2021.

SOURCES:

- Union of Concerned Scientists, “UCS Satellite Database,” updated May 1, 2021, <https://www.ucsusa.org/resources/satellite-database> (accessed September 3, 2021).
- U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Environmental Satellite Data and Information Service, “Currently Flying,” <https://www.nesdis.noaa.gov/content/currently-flying> (accessed September 3, 2021).
- Gunter’s Space Page, “DSP 14, 15, 16, 17, 18, 19, 20, 21, 22, 23 (Phase 3),” last update March 19, 2020, https://space.skyrocket.de/doc_sdat/dsp-3.htm (accessed September 3, 2021).
- Table, “Spacecraft in Service over Time (As of Sept. 30, 2019),” 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_FullIssue5.pdf (accessed September 3, 2021).
- Gunter’s Space Page, “Trumpet 4, 5 / SBIRS HEO-1, 2,” last update November 4, 2020, https://space.skyrocket.de/doc_sdat/trumpet-fo.htm (accessed September 3, 2021).
- Gunter’s Space Page, “Trumpet 6, 7 / SBIRS HEO-3, 4,” last update April 29, 2021, https://space.skyrocket.de/doc_sdat/trumpet-fo-2.htm (accessed September 3, 2021).
- Gunter’s Space Page, “SBIRS-GEO 1, 2, 3, 4,” last update November 4, 2020, https://space.skyrocket.de/doc_sdat/sbirs-geo-1.htm (accessed September 3, 2021).
- Fact Sheet, “Space Based Space Surveillance,” U.S. Air Force, Air Force Space Command (Archived), current as of July 2019, <https://www.afspc.af.mil/About-Us/Fact-Sheets/Article/249017/space-based-space-surveillance-sbss/> (accessed September 3, 2021).
- Gunter’s Space Page, “STSS-ATRR,” last update July 21, 2019, https://space.skyrocket.de/doc_sdat/stss-atrr.htm (accessed September 3, 2021).
- News release, “Missile Defense Agency Space Tracking and Surveillance System Advanced Technology Risk Reduction Satellite Transfers to Air Force Space Command,” U.S. Department of Defense, Missile Defense Agency, February 26, 2011, <https://www.mda.mil/news/11news0004.html> (accessed September 3, 2021).
- Gunter’s Space Page, “GSSAP 1, 2, 3, 4, 5, 6 (Hornet 1, 2, 3, 4, 5, 6),” last update November 4, 2020, https://space.skyrocket.de/doc_sdat/gssap-1.htm (accessed September 3, 2021).

TABLE 18

U.S. Space Launches by Organization

Organization	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Space X	2	0	2	3	5	7	10	18	20	13	31	36	147
United Launch Alliance	10	12	9	11	14	12	12	8	7	4	13	12	124
Northrup Grumman	2	4	1	5	2	0	2	3	2	3	5	2	31
Rocket Lab, Ltd	0	0	0	0	0	0	0	0	0	0	2	6	8
NASA	3	3	0	0	0	0	0	0	0	0	0	2	8
Virgin Orbit	0	0	0	0	0	0	0	0	0	0	0	3	3
Firefly Aerospace	0	0	0	0	0	0	0	0	0	0	1	1	2
Blue Origin	0	0	0	0	0	0	0	0	0	0	0	2	2
Astra Space Launch Co.	0	0	0	0	0	0	0	0	0	0	1	0	1
Relativity Space	0	0	0	0	0	0	0	0	0	0	0	1	1
USAF	0	0	0	0	0	0	0	0	0	0	0	1	1
Total	17	19	12	19	21	19	24	29	29	20	53	66	328

SOURCE: Space Launch Schedule, “USA Launch Schedule,” <https://www.spacelaunchschedule.com/category/usa/> (accessed September 8, 2021).

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getting real-time satellite intelligence to war-fighters at the operational and tactical levels is still problematic. The loss of even a small number of those 90 satellites could significantly impact operational capabilities across the DOD.

Backbone Satellites. In spite of an ever-growing demand, the USSF can meet a significant amount of the strategic demand for collection, imagery, and communications placed on it by the National Command Authorities and the Defense Department. The PNT services offered by GPS are unrivaled in both capacity and capability. With 31 operational GPS satellites in orbit and seven spaceborne (dormant) spares, the system has enough redundancy and resiliency to handle losses associated with normal (not-combat-related) space operations.

The current and growing DOD demands for imagery and collection are another thing entirely. The shortfall is projected to be so

great that the Departments of the Air Force and Army, the National Reconnaissance Office, and other agencies have invested in and are employing the services of commercial organizations to provide collection and imagery on demand.⁵⁸

In the summer of 2020, the U. S. Army conducted an exercise called Project Convergence 2020 (PC20), which was designed to test the capability of commercial spaceborne systems to provide the intelligence, imagery, and communications linkages for warfighters in the service’s “close fight.” Brigade Combat Teams (BCTs), Combat Aviation Brigades (CABs), and Expeditionary Signal Battalion-Enhanced (ESB-E) were given access to 600 commercial SpaceX Starlink satellites in LEO to facilitate faster decisions.⁵⁹

When combined with other small satellites (SmallSats), the sensors on Starlink’s rapidly

TABLE 19

Satellites by Weight

Group Name	Weight	Size
Large Satellite	1,000+ kilograms	Large
Medium Satellite	500–1,000 kilograms	Medium
Mini Satellite	100–500 kilograms	Small
Micro Satellite	10–100 kilograms	Small
Nano Satellite (CubeSats)	1–10 kilograms	Small
Pico Satellite	0.1–1 kilograms	Small
Femto Satellite	<100 grams	Small

SOURCE: Table 1, “Satellites by Mass,” in Chalie L. Galliard, “Study of the Small: Potential for Operational Military Use of CubeSats,” 24th Annual AIAA/USU [American Institute of Aeronautics and Astronautics/Utah State University] Conference on Small Satellites, August 10, 2010, p. 1, <https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1199&context=smallsat> (accessed September 3, 2021).

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expanding constellation, which numbered 1,440 satellites as of May 2021,⁶⁰ will enable the Army’s concept for a Multi-Domain Operations (MDO)-Capable Force by 2028 and an MDO-Ready Force by 2035.⁶¹ The capabilities demonstrated in PC20 are similar in nature to those sought in the Air Force’s Advanced Battle Management System (ABMS) and the Navy’s Overmatch C2 development programs.⁶² Starlink reportedly also has the ability to provide a very accurate PNT backup for GPS, which will become increasingly important for all of the services as the competition in space intensifies.⁶³

Intelligence, Surveillance, and Reconnaissance. The USSF has 14 satellites dedicated to missile launch warning. While the SBIRS constellation is two GEO satellites short of design, its nine satellites, coupled with the five DSP satellites, provide global coverage and generally excellent response times.

As noted above, the current portfolio of reconnaissance satellites, while highly classified, meets many of the essential strategic requirements of the NCA and the Defense Department. However, Space Force capabilities

fall well short of the needs of the services. The Department of the Air Force is therefore investing in and employing the services of commercial organizations to meet the “on demand” collection and imagery needs of USSF customers.⁶⁴

Space Situational Awareness. The Space Force’s six acknowledged SSA satellites and the six dedicated and 17 collateral contributing ground-based sensors within the space-based surveillance system help to maintain situational awareness of satellites and other objects in space. However, the limited number and inherent limitations of the sensors within the SBSS leave significant gaps in coverage. Those gaps are addressed by prediction, and every time a satellite maneuvers, “the process of initial discovery by a sensor, creation of an initial element set, and refinement of that element set needs to be repeated.”⁶⁵

The Backbone and ISR assets within the USSF are critically important; however, the focus of the *Index of U.S. Military Strength* is primarily on assessing the classic “hard combat power” found in defensive and offensive systems.

Defensive Capabilities

Defensive systems and operations are designed to protect friendly space capabilities against kinetic anti-satellite weapons, high-powered lasers, laser dazzling or blinding, and high-powered microwave systems.⁶⁶

The first challenge in defense is detecting an attack, and a host of sensors exist that can detect the launch of terrestrial-based anti-satellite (ASAT) weapons. With 14 satellites dedicated to detecting missile launches, it is possible for the USSF to determine an ASAT's trajectory, identify the targeted satellite, and alert operators in time for them to take evasive action with those systems. Unfortunately, the gaps in the SSA network highlighted earlier make the timely assessment of and response to such an attack on a specific U.S. satellite difficult.

Detecting other (non-missile) attacks presents another problem, and the Space Force has fielded a system that can deal with one part of that challenge. Operated by ground-based units, Bounty Hunter can detect an adversary's attempts to deceive, disrupt, deny, or degrade satellite communications by monitoring electromagnetic interference across multiple frequency bands. Operators can locate sources of intentional and unintentional interference and minimize them.⁶⁷ Bounty Hunter achieved initial operational capability (IOC) in the summer of 2020. While this system is a significant improvement, it has no known capability to detect or counter laser.

USSF satellites need a sensor package that allows them to self-detect hostile system engagement and report it to operators who are positioned to take defensive actions. That capability is currently not known to exist.

Cyberattacks present a different challenge to space-based systems. Like other kinetic and non-kinetic attacks, cyber intrusions can cause service disruptions, sensor interference, or the permanent loss of satellite capabilities. Additionally, an effective cyberattack could corrupt the satellite's data stream to reliant elements or systems—or even allow an adversary to seize control of a satellite.⁶⁸ A recent Royal Institute

of International Affairs report states that the U.S. is well behind its peer competitors in this area and should assume that its satellite constellations have already been penetrated and compromised.⁶⁹

In spite of its current limitations, protective measures that the service can take now to safeguard its spaceborne systems can be separated into two categories of systems and actions: active and passive.

- An active defense is really offensive in nature and includes engagements to destroy, nullify, or reduce enemy systems that put U.S. and allied systems and capabilities at risk.
- Passive defense measures increase survivability through asset diversification, including the deployment of more space systems in different orbits, as well as real-time satellite maneuverability and self-protection.⁷⁰

Shortly before the USSF became an independent service, the Air Force made clear that it wanted to build a constellation of thousands of SmallSats in low-Earth orbit to provide a redundant, diversified portfolio of capabilities. Over time, it is has become apparent that those expanding constellations will be comprised of both military and civilian satellites.⁷¹

In 2018, the Air Force signed a \$28 million contract with SpaceX to evaluate its LEO-based Starlink constellation of satellites that provide broadband services. In 2019, the service tested Starlink's ability to provide communications linkages with airborne service aircraft and other spaceborne systems during its Global Lightning program.⁷²

Starlink had 1,440 satellites in orbit as of May 2021, but while significant in number, that constellation would be unable to provide seamless global coverage. Ultimately, however, Starlink is on track to field some 4,500 satellites by the end of 2023, which will lift that limitation.⁷³ Continuing this relationship with Starlink will bode well for the USSF and its

ability to support U.S. forces with satellite access, resilience, and the overall survivability of the network of satellites available to the DOD.

Offensive Systems

The Air Force's FY 2017 budget included \$158 million to develop offensive space capabilities over a period of five years.⁷⁴ The only offensive space system of record within the USSF that can be found in open-source literature is a system called Meadowlands.

Meadowlands is a mobile, terrestrial-based, counter-communications system (CCS) that delivers effects to thwart adversary SATCOM in a given area of responsibility (AOR). The effects of Meadowlands are reversible: When the system is turned off, the communications linkages it was targeting return to their original functionality.⁷⁵

Readiness

The Space Force was born of a congressionally mandated study that included a plan for the incremental transition of operational Air Force space assets and personnel to the new service. Throughout the plan's execution, the USSF has been deliberate in its hiring and is on a path to developing a solid cadre of personnel and a strong organizational culture.

Scoring the U.S. Space Force

Capacity Score: Weak

The number and types of Backbone and ISR assets are sufficient to support global PNT requirements and the majority of strategic-level communications, imagery, and collection requirements of the National Command Authorities and the Department of Defense. However, the Space Force is not capable of meeting current—much less future—on-demand, operational, and tactical-level warfighter requirements.

As noted in the readiness section, the gaps in the SBSS are covered by prediction, and operators of adversarial satellites can time their maneuvers to take advantage of those gaps.

The operations assumed by the USSF to support strategic and high-end operational-level support have proceeded uninterrupted, and to that end, readiness has remained high, but those operations were primarily supportive in nature and did not include robust, nearly real-time support to tactical units. While the service is undoubtedly moving forward on credible defensive and offensive readiness, there is little evidence that it is ready for the threat envisioned by Congress when it formed the Space Force.

Available government and commercial systems have the capability and capacity to meet the imagery, collection, and communication linkage demands and throughput requirements of warfighters at the operational and tactical levels. However, the entities driving to fill the gaps in capability, capacity, and the readiness levels required to infuse that intelligence to the operational and tactical levels is coming from the other services.

The Space Force needs to take the reins of this challenge in every dimension (capacity, capability, and readiness) to further the efforts of warfighters at all levels in the other domains, and it should move aggressively to fill the gaps that exist in the readiness that is required to defend our assets and threaten those of our adversaries.

With the influx of small satellites (see Table 19), the potential for the number of U.S. military satellites in orbit to grow from a few hundred to several thousand over the next three years is very real. Add new commercial, allied, and adversary SmallSats to the mix and it is highly likely that the number of operational satellites in orbit will double over that same period. Although increasing numbers alone will challenge the current Space Surveillance Network, the number of unannounced orbital changes among those satellites will make it markedly more difficult to keep track of bad actors.

The U.S. had announced plans to build a second, strategically located Space Fence like the

one on Kwajalein Atoll in Western Australia in 2021, but that site has yet to be funded. Even if a second Space Fence does eventually materialize, the Space Force will still need more satellites that are dedicated to this mission.⁷⁶

The service’s two counterspace weapons systems (Meadowlands and Bounty Hunter, respectively) cover only a fraction of the offensive and defensive capabilities required to win a conflict in space. Other counterspace systems are likely being developed or, like cyber, are already in play. Nevertheless, the current visible capacity of the Space Force is not sufficient to support, fight, or weather a war with a peer competitor.

Capability Score: Weak

The current space asset modernization plan that is visible to the public follows the same incremental replacement and fielding design that has been in practice for decades. The vast majority of Backbone and ISR assets have exceeded their designed life spans and the DAF’s willingness to delay and/or defer the acquisition of replacement systems remains a legacy of that department.

The capability of Backbone and ISR satellites is marginal, but it is more than offset by the gaps in SSA and the apparent lack of defensive and offensive capabilities (“very weak”). The capability score is therefore

“weak,” the result of being scored “weak” in “Size of Modernization Program,” “weak” for “Age of Equipment” and “Health of Modernization Programs,” and “weak” for “Capability of Equipment.”

Readiness Score: Weak

The mission sets, space assets, and personnel that transitioned to the Space Force and those that have been assigned to support the USSF from the other services have not missed an operational beat since the Space Force stood up in 2019. Throughout that period, the readiness levels have seamlessly sustained backbone and ISR support to the NCA, DOD, combatant commanders, and warfighters around the world.

However, there is little evidence that the USSF has improved its readiness to provide nearly real-time support to the operational and tactical levels (“marginal”) or that it is ready in any way to execute defensive and offensive counterspace operations to the degree envisioned by Congress when it formed the Space Force (“very weak”).

Overall U.S. Space Force Score: Weak

This is an unweighted average of the USSF’s capacity score of “weak,” capability score of “weak,” and readiness score of “marginal.”

U.S. Military Power: Space

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

SPACE FORCE SCORES

1 2 3 4 5
Weakest → Strongest

Procurement Through FY 2021
and Spending Pending

Navigation

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Global Positioning System (GPS) Inventory: 38 Fleet age: 14.5 Date: 1997 GPS satellites provide timing, velocity, and precise navigation for millions of simultaneous users around the world. It takes 24 GPS satellites to provide seamless global coverage; currently, 32 are operational with an additional four decommissioned satellites serving as on-orbit spares.	5	4	GPS III Timeline: 2019-TBD GPS III is the latest upgrade to the GPS platform and incorporates more robust anti-jamming capabilities. It is interoperable with other countries' Global Navigation Satellite systems, and this interoperability adds resilience to the GPS system.	5	5



Missile Warning

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Space Based Infrared System (SBIRS) Inventory: 9 Fleet age: 7.5 Date: 2006 An integrated constellation of satellites, SBIRS is designed to deliver early missile warning and provide intercept cues for missile defenses. The satellites are retaskable, which means they can be moved to more optimum or viewpoints as mission requirements dictate. The program was ended early because of cost, schedule, and performance issues.	4	4	Next Generation Persistent Infrared (Next-Gen OPIR) Timeline: TBD		
Defense Support Program (DSP) Inventory: 5 Fleet age: 32.5 Date: 1970 These satellites were designed to detect intercontinental ballistic missile and sea-launched ballistic missile launches against the U.S. and its allies. They can also detect space launch missions and nuclear weapons testing and detonations. Phase 3 satellites were launched from 1989 to 2007 and have long exceeded their designed lifetimes, but they are still providing reliable data and are integrated with the SBIRS program.	1	3			

NOTE: See page 500 for details on fleet ages, dates, timelines, and procurement spending.

SPACE FORCE SCORES



Procurement Through FY 2021
and Spending Pending

Space Surveillance

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Space Based Surveillance System (SBSS) Inventory: 1 Fleet age: 11 Date: 2010 This system uses multiple types of sensors to track man-made objects and debris fields in orbit.	(3)	(3)	None		

Missile Defense

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Space Tracking and Surveillance System Advanced Technology Risk Reduction (STSS-ATR) Inventory: 1 Fleet age: 12 Date: 2009 This research, development, testing, and evaluation (RDT&E) satellite was originally launched by the Missile Defense Agency to explore different capabilities and technology but was transferred to the Air Force in 2011.	(3)	(4)	None		

Space Object Tracking

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Geosynchronous Space Situational Awareness Program (GSSAP) Inventory: 4 Fleet age: 6 Date: 2014 This classified surveillance satellite constellation can accurately track and characterize objects in orbit using electro-optical and emissions sensors. Their maneuverability allows these satellites to conduct rendezvous and proximity operations (RPO) on space objects, enabling them to conduct offensive operations against other nations' assets.	(5)	(5)	None		

NOTE: See page 500 for details on fleet ages, dates, timelines, and procurement spending.

SPACE FORCE SCORES

1 2 3 4 5

Weakest → Strongest

Procurement Through FY 2021
and Spending Pending

Weather

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Defense Meteorological Satellite Program (DMSP) Inventory: 4 Fleet age: 17 Date: 1999 Since 1962, defense weather satellites in the DMSP have been collecting weather data and providing forecasts for U.S. military operations. The current four satellites were launched between 1999 and 2009 with only a five-year life expectancy, but they have continued to provide accurate meteorological data well beyond that timeframe and are still in use today.	1	4	Weather System Follow-on Microwave Satellite (WSF-M) Timeline: TBD		

Communications

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Milstar Inventory: 5 Fleet age: 22.5 Date: 1994 Milstar is a satellite communications system designed in the 1980s to provide the National Command Authorities with global communications that were assured and survivable and carried low probability of interception or detection. Designed to overcome nuclear effects and enemy jamming, it was considered the most robust and reliable DOD SATCOM system at the time of fielding.	1	3	Advanced Extremely High Frequency System (AEHF) Timeline: 2010–2021 PROCUREMENT  SPENDING (\$ millions) \$8 \$0	TBD	TBD
Advanced Extremely High Frequency System (AEHF) Inventory: 6 Fleet age: 6 Date: 2010 The AEHF system is a network of six satellites that provides DOD with secure, jam-resistant communications and command and control for military ground, sea, and air assets located anywhere in the world.	5	5			

NOTE: See page 500 for details on fleet ages, dates, timelines, and procurement spending.

SPACE FORCE SCORES



Procurement Through FY 2021
and Spending Pending

Communications (Cont.)

PLATFORM	Age Score	Capability Score	REPLACEMENT PROGRAM	Size Score	Health Score
Defense Satellite Communications System (DSCS) Inventory: 7 Fleet age: 28.5 Date: 1982 This system of seven satellites provides nuclear-hardened, global communications with anti-jamming capabilities to the Defense Department, State Department, and National Command Authorities.	1	2	Advanced Extremely High Frequency System (AEHF) Timeline: 2010–2021	TBD	TBD
Wideband Global SATCOM (WGS) Inventory: 10 Fleet age: 8 Date: 2007 WGS, formerly known as the Wideband Gapfiller Satellite, is a joint-service program funded by the U.S. Air Force and U.S. Army along with international partners Australia and Canada. It uses direct broadcast satellite technology to provide command and control for U.S. and allied forces. Satellites have a life span of as many as 14 years.	4	5	PROCUREMENT SPENDING (\$ millions) \$8 \$0		

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 achieved initial operational capability. The timeline is from the start of the platform's program to its budgetary conclusion. Spending does not include advanced procurement or research, development, test, and evaluation (RDT&E).

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U.S. Nuclear Weapons Capability

Patty-Jane Geller

U.S. nuclear weapons have played a critical role in preventing conflict between major powers since the end of World War II. Given their ability to deter large-scale attacks that threaten the U.S. homeland, allies, and forward-deployed troops and to assure allies and partners, nuclear deterrence has remained the number one U.S. national security mission.¹ Operationally, all U.S. military operations rely on the backstop of U.S. nuclear deterrence.² It is therefore critical that the United States maintain a modern and flexible nuclear arsenal that can deter a diverse range of threats from a diverse set of potential adversaries.

An Increasingly Threatening Global Environment

The nuclear threat environment has changed drastically from a stability paradigm based on mutually assured destruction involving the United States and the Soviet Union during the Cold War to a multipolar nuclear threat environment that presents complex challenges. As the threat increases, several negative trends, if not addressed, could undermine the overall effectiveness of U.S. nuclear deterrence. Today, U.S. nuclear forces face three great challenges:

- Aging nuclear warheads, their associated delivery systems, and systems for their command and control;
- An aging and crumbling nuclear weapons infrastructure; and

- An aging workforce.

The United States must 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 warhead life-extension programs—all while operating under the current nuclear testing moratorium. Despite these challenges, the United States must ensure that its nuclear capabilities are sufficient to address the rising nuclear threat for the decades to come.

For the first time in history, the United States must deter two nuclear peers—Russia and China—while contending with a larger number of nuclear weapons states. Russia is engaged in an aggressive nuclear buildup, having added several new nuclear systems to its arsenal since 2010. The United States is only beginning to modernize its existing nuclear systems, but Russia's modernization effort is about 86 percent complete.³ Russia is also developing “novel technologies,” such as a nuclear-powered cruise missile and nuclear-capable unmanned underwater vehicle, and arming delivery platforms with nuclear-tipped hypersonic glide vehicles.⁴

In addition, Russia maintains a stockpile of at least 2,000 non-strategic nuclear weapons, unconstrained by any arms control agreement.⁵ Lieutenant General Robert Ashley, Director of the Defense Intelligence Agency, has said that Russia is expected to increase this category of nuclear weapons—a category in which it

“potentially outnumber[s]” the United States by 10 to 1.⁶ This disparity is of special concern because Russia’s recent nuclear doctrine indicates a lower threshold for use of these tactical nuclear weapons. According to the 2018 Nuclear Posture Review (NPR), Moscow “mistakenly assesses that the threat of nuclear escalation or actual first use of nuclear weapons would serve to ‘de-escalate’ a conflict on terms favorable to Russia.”⁷

China is engaging in what Admiral Charles A. Richard, Commander of U.S. Strategic Command (STRATCOM), has described as a “breath-taking” expansion of its nuclear capabilities as it attempts to project power into the South China Sea and throughout the world. China is well on its way to more than doubling its nuclear stockpile by the end of the decade. It is deploying advanced intercontinental ballistic missiles (ICBMs), completing its nuclear triad with the addition of a strategic nuclear-capable bomber, and deploying numerous theater-range ballistic missiles in the Indo-Pacific that can strike U.S. bases and allied territory with precision. Satellite imagery has also detected three ICBM silo construction sites in China that could hold at least 100 ICBM silos each.⁸ STRATCOM has described this expansion as a “strategic breakout” and has stated that China’s nuclear capabilities will eventually exceed those of Russia.⁹ Current U.S. nuclear posture is not designed to deter two peer nuclear threats.

Evidence also suggests that China is shifting a portion of its nuclear forces to Launch-on-Warning posture as it improves its early warning systems.¹⁰ Combined with a refusal to discuss its forces or intent with the United States, this shift in posture increases the likelihood of mistakes and miscalculations.¹¹

North Korea is also advancing its nuclear weapons and missile capabilities. It continues to produce fissile material to build new nuclear weapons, recently paraded a new “monster” ICBM supposedly able to carry multiple warheads, and has recently tested ground-based and sea-based ballistic missiles.¹²

Iran, in addition to being the world’s principal state sponsor of terrorism, continues to

enrich uranium at dangerous levels and may be able to develop a nuclear weapon within just a few months. According to a recent report:

A worst-case breakout estimate, which is defined as the time to produce enough WGU for one nuclear weapon, is as short as 2.3 months. Iran could produce a second significant quantity of WGU early in the fifth month after breakout commences, and a third quantity could be produced early in the seventh month. For comparison, if no explosion had occurred at the FEP [Natanz Fuel Enrichment Plant], the minimum breakout timeline would have been 1.75 months, reflecting a longer breakout by one month. However, it should be noted that the post-explosion breakout estimate has additional uncertainties that suggest that it may be lengthier.¹³

As current U.S. nuclear capabilities continue to age, the advancing nuclear threat increases the importance of nuclear weapons to U.S. national security. Noting this rapid deterioration of the threat environment since 2010, the 2018 NPR outlined 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.¹⁴

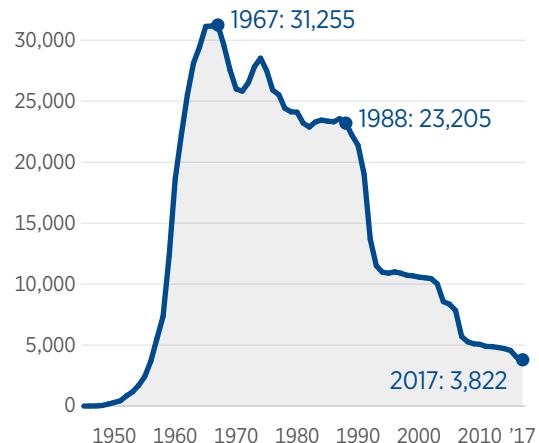
To achieve these objectives, the U.S. nuclear portfolio must balance the appropriate levels of capacity, capability, variety, flexibility, and readiness. Deterrence in a multipolar world is more complicated than in a bipolar world, as it requires a U.S. nuclear force capable of deterring multiple separate adversaries at the same time. What matters most in deterrence is

A Smaller and Less Diverse Nuclear Arsenal

TYPES OF WARHEADS IN THE U.S. NUCLEAR STOCKPILE



TOTAL WARHEADS IN THE U.S. NUCLEAR STOCKPILE



NOTE: The 2017 figure of 3,822 warheads reflects the last year the U.S. government declassified stockpile quantities. These quantities include deployed warheads and warheads in reserve, but the U.S. is limited by New START to only 1,550 deployed warheads.

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not necessarily what the United States thinks will be effective. What matters most are the psychological perceptions—among both allies *and* adversaries—of America’s willingness to use nuclear forces to defend its interests. If an adversary believes that he can fight a limited nuclear war, for instance, U.S. leaders

must convince that adversary otherwise. In addition, military roles and requirements for nuclear weapons will differ from adversary to adversary based on each country’s values, strategy, and goals.

The United States also extends its nuclear umbrella to more than 30 allies and partners

that rely on the U.S. to defend them from existential threats. This additional responsibility imposes requirements for U.S. nuclear force posture beyond defense of the U.S. homeland. U.S. nuclear forces underpin the broad nonproliferation regime by assuring allies—including NATO, Japan, South Korea, and Australia—that they can forgo their own development of nuclear capabilities. Erosion of the credibility of American nuclear forces could lead a country like Japan or South Korea to pursue an independent nuclear option, and this could have a profoundly negative impact on stability across the region.

In addition to deterrence and assurance, the United States historically has committed to achieving its political and military objectives if nuclear deterrence fails. As a result, U.S. forces must be postured to engage their targets successfully if such a failure makes it necessary to use nuclear weapons.

Finally, U.S. nuclear capabilities must have the capacity to hedge against an uncertain future. Nuclear weapon capabilities take years or decades to develop, as does the infrastructure supporting them—an infrastructure that the United States has neglected for decades until quite recently. Decisions regarding nuclear forces made today will impact the United States decades into the future. Since the United States cannot predict what the level of the threat will be decades in the future, it is critical that the U.S. maintain a nuclear enterprise that can respond to changes in the global security environment.

A robust, well-resourced, focused, and reliable nuclear enterprise that is able to respond to unforeseen contingencies is itself an important piece of deterrence and will enable a nuclear force that is resilient and adaptable. The U.S. nuclear enterprise today, however, is largely static, leaving the United States at what could well be a technological disadvantage. Such a posture puts the security of the United States, the security of its allies, and the entire free world at risk.

Challenges to Maintaining Nuclear Forces

To provide assurance against failures in the U.S. stockpile or changes in a geopolitical

situation, the United States must maintain the ability to adjust its nuclear force posture. To this end, the United States 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.”¹⁵

The United States preserves upload capability on its strategic delivery vehicles, which means that the nation could increase the number of nuclear warheads on each type of its delivery vehicles. For example, the U.S. Minuteman III ICBM can carry up to three Mk12A/W78 nuclear warheads, although it is currently deployed with only one.¹⁶ Certain modernization decisions (e.g., 12 versus 14 *Columbia*-class ballistic missile submarines with 16 rather than 24 missile tubes per submarine) will somewhat limit upload capacity on the strategic submarine force. U.S. heavy bombers will continue to retain a robust upload capability that can be used if a geopolitical or technical emergency requires more deployed nuclear warheads.

The United States has not designed or built a 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 lives of existing weapons in the stockpile, some dating back to the 1960s. Not all of the existing inactive stockpile, however, will go through a life-extension program. Consequently, our ability to respond to contingencies by uploading weapons kept in an inactive status will inevitably decline with the passage of time.

In addition, while LEPs replace or upgrade most components in a nuclear warhead, all warheads will eventually need to be replaced because their nuclear components—specifically, plutonium pits that comprise the cores of warheads—are also subject to aging.¹⁷ It is therefore unwise for the United States to rely solely on LEPs to sustain needed levels of reliability. Moreover, the United States is the only nuclear state that lacks the capability to

produce plutonium pits in quantity. An effort is underway to restart plutonium pit production, but various challenges have been encountered that could upset U.S. plans to sustain its nuclear weapons.

Part of the U.S. hedge against uncertainty in deterrence is the ability to conduct a nuclear test if testing is ever required to ensure the safety and reliability of U.S. warheads. Presidential Decision Directive-15 (PDD-15) requires the United States to maintain the ability “to conduct a nuclear test within 2–3 years” of direction by the President.¹⁸ However, “the steady degradation” of test readiness after three decades of no testing calls into question the U.S.’s ability to meet this goal.¹⁹ The lack of congressional interest in funding any significant improvements in test 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 testing are retired. This means that the certification of weapons that were designed and tested as far back as the 1960s 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 former 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.²⁰

The Stockpile Responsiveness Program (SRP), mandated by Congress and being implemented by NNSA, has been effective in exercising critical nuclear weapons design and development skills not fully exercised since the end of the Cold War. It is essential that those skills are available when needed to support modern warhead development programs for U.S. submarine-launched ballistic missiles (SLBMs) and ICBMs.

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 former Acting Administrator Dr. Charles Verdon:

The U.S. nuclear weapons stockpile is currently safe, secure, and militarily effective. However, the legacy stockpile systems are aging, and NNSA’s production infrastructure has atrophied considerably. America must invest in the weapons and infrastructure modernization programs to provide the capabilities needed to ensure the deterrent’s viability into the future. Future American political leaders will not have the weapons and infrastructure in place to support the nuclear arsenal unless we reestablish that capability now.

The need to modernize the nuclear weapons stockpile and recapitalize the supporting infrastructure needed to produce and maintain that stockpile has reached a tipping point. Approximately 60 percent of NNSA’s facilities are more than 40 years old and more than 50 percent are in poor condition. Assessments of facilities throughout the enterprise have identified numerous single-point failures. Production capabilities allowed to lapse are needed once again and reestablishing these capabilities is both a priority and a challenge. If not appropriately addressed, the age and condition of NNSA’s infrastructure will put at risk NNSA’s missions, and the safety of its workforce, the public, and the environment.²¹

As a result of this neglect, at the same time the nation faces a great challenge in modernizing its aging nuclear warheads, “NNSA is undertaking a risk-informed, complex, and time-constrained modernization and recapitalization effort.”²²

In recent years, bipartisan congressional support for the nuclear mission has been strong, and nuclear modernization has received additional funding.²³ Preservation of that bipartisan consensus will be critical as

these programs mature and begin to introduce modern nuclear systems to the force.

In its budget requests, the Trump Administration advanced the comprehensive modernization program for nuclear forces that was initiated by President Barack Obama. Despite some opposition, Congress funded the two previous Presidents' budget requests for these programs. Because such modernization activities require consistent, stable, long-term funding commitments, this continued bipartisan support has been critical.

The NNSA received \$19.7 billion in fiscal year (FY) 2021, \$3 billion more than it received in FY 2020, which included full funding for major efforts like modernization of plutonium pit production and five warhead modernization programs.²⁴ The FY 2022 budget

would continue these efforts but with a flat NNSA topline of \$19.7 billion.²⁵ 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 Raider bomber—also continue to progress in 2021 with the FY 2022 budget supporting these programs. The 2018 NPR proposed two supplements to nuclear capabilities in light of the worsened security environment with Russia and China: a low-yield warhead for SLBMs in the near term, which was deployed in 2020, and a low-yield, nuclear-armed, sea-launched cruise missile, for which funding was first included in the FY 2022 budget request after the completion of a preliminary analysis of alternatives.²⁶

Assessing U.S. Nuclear Weapons Capabilities

Assessing the state of U.S. nuclear weapons capabilities presents at least three serious difficulties.

- The United States has not taken 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 United States has largely elected to extend the life of aging nuclear warheads based on designs from the 1960s, 1970s, and 1980s that were in the stockpile when the Cold War ended.
- The lack of detailed publicly available data about the readiness of nuclear forces, their capabilities, and the reliability of their weapons makes analysis difficult.
- 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, U.S. strategic bombers perform a significant conventional mission and do not fly airborne alert with nuclear weapons today, as they did routinely during the 1960s, nor stand at quick-reaction strip alert as they did up until the early 1990’s.

Additionally, the three key national security laboratories no longer focus solely on the nuclear weapons 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. Moreover, the Nuclear Command, Control, and Communications System entails many assets such as early warning and communications satellites that serve non-nuclear missions, such as routine military communications and detecting and tracking conventional missiles.

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.

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 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; 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 meeting U.S. national security requirements or having a sustainable, viable, and funded plan in place to do so, to “very weak,” defined as not meeting current security requirements and with no program in place to redress the shortfall. The other three possible scores are “strong,” “marginal,” and “weak.”

Reliability of Current U.S. Nuclear Stockpile Score: Strong

U.S. warheads must be safe, secure, effective, and reliable. The Department of Defense defines reliability as “the probability that a weapon will perform in accordance with its design intent or military requirements.”²⁷ Since the cessation of nuclear testing in 1992, reliability has been assessed and maintained 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 results in a smaller margin

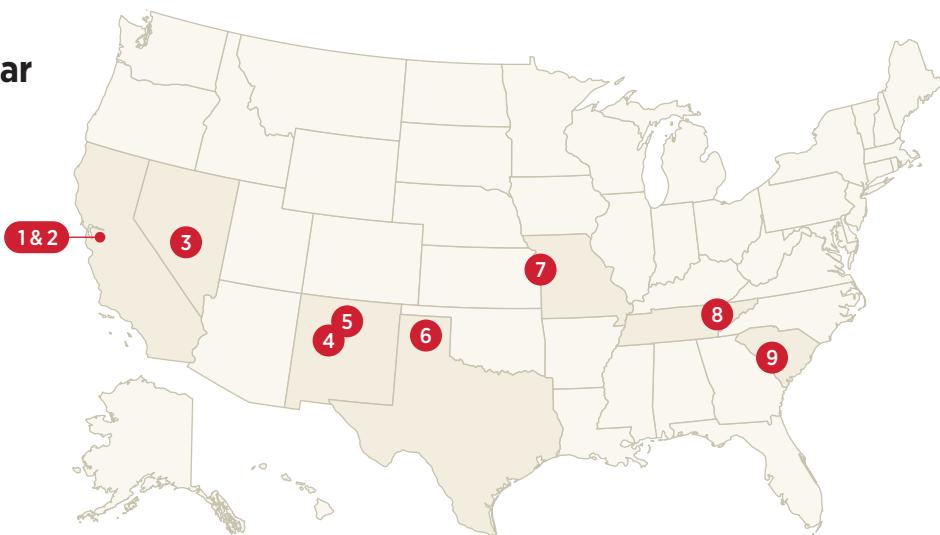
of error if all of one type are affected by a technical problem that might cause a weapon type or its delivery system to be decommissioned. Loss of diversity in the stockpile also increases the risk of “common-mode” failure that could affect multiple systems simultaneously, making the push for commonality with potential single points of failure in U.S. warheads worrisome. 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 United States 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.²⁸

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 effects of aging could compromise the integrity 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 without proper authorization. Some U.S. warheads have modern safety features that provide additional protection against accidental detonation; others do not.

Grade: 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

U.S. Nuclear Weapons Complex



1 Lawrence Livermore National Laboratory

Livermore, CA
Nuclear weapons R&D

2 Sandia National Laboratories

Livermore, CA
Nuclear weapons R&D and systems engineering

3 Nevada National Security Site

Nye County, NV
Subcritical experiments and test readiness

4 Sandia National Laboratories

Albuquerque, NM
Nuclear weapons R&D and systems engineering

5 Los Alamos National Laboratory

Los Alamos, NM
Nuclear weapons R&D and plutonium pit production

6 Pantex Plant

Panhandle, TX
Assembly of nuclear warheads

7 Kansas City Plant

Kansas City, MO
Production of non-nuclear components for nuclear warheads

8 Y-12 National Security Complex

Oak Ridge, TN
Manufacture of highly-enriched uranium parts for nuclear warheads

9 Savannah River Site

Aiken, SC
Pit production and tritium production

SOURCE: Heritage Foundation research.

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laboratories' directors and the weapons scientists and engineers on their staffs. This judgment, albeit based on experience, non-nuclear experimentation, and extensive modeling and simulation, does not benefit from the objective data that could be 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 also was used to certify current nuclear warheads, as well as to detect

potential problems and confirm the effectiveness of fixes to those problems.

The sustained political decision to maintain the nuclear stockpile without nuclear testing—a decision made across multiple presidential Administrations—creates some inherent uncertainty concerning the adequacy of fixes to the stockpile when problems are found. These growing numbers of additional uncertainties include updates 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 former 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.”²⁹ However, while the United States does not test as part of its stockpile stewardship efforts, it has been U.S. policy to lift its test moratorium and conduct the required testing if the President deems it necessary to do so based on information from the lab directors, the Secretary of Defense, and the Secretary of Energy.

In light of concerns that are inherent in a lack of nuclear testing, the United States maintains the most advanced Stockpile Stewardship Program in the world and continues to make scientific and technical advances to help certify the stockpile. For example, NNSA is working on upgrades to the Enhanced Capabilities for Subcritical Experiments facility in Nevada (such as adding the capability to produce high-speed, high-fidelity X-ray images of subcritical experiments) to improve our understanding of plutonium.³⁰ In addition:

The Exascale Computing Initiative (ECI) will provide NNSA with next-generation simulation capabilities to support weapons design, warhead assessment and certification, and continued development of the underpinning science needed to support the nuclear stockpile long-term. NNSA remains on track to accept and operate NNSA’s first Exascale high performance computing system for program use in 2023.³¹

Such advanced capabilities can help the NNSA to certify the stockpile more accurately and without testing. As Deborah Rosenthal, President Biden’s nominee to serve as Assistant Secretary of Defense for Nuclear, Chemical, and Biological Defense Programs, explained in her confirmation hearing, “The modernization of the NNSA infrastructure

is critical to keeping our stockpile safe, secure, and reliable without testing.”³² She also highlighted the importance of producing new plutonium pits to help avoid the need to test if confidence in aging warheads decreases.

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 provided to Congress as well. The Commander of U.S. Strategic Command also assesses overall nuclear weapons system reliability, including the reliability of both warhead and delivery platforms.

In spite of concerns over aging warheads, “[i]n FY 2021, the science-based Stockpile Stewardship Program allowed the Secretaries of Energy and Defense to certify to the President for the 25th consecutive year the nuclear weapons stockpile remains safe, secure, and militarily effective.”³³ Admiral Richard stated in 2021 “that there are no identified conditions at this point that would require nuclear weapons testing to restore that confidence.”³⁴

In light of our overall assessment, and based on the results of the existing method used to certify the stockpile’s effectiveness, we grade the U.S. stockpile conditionally as “strong.” This grade, however, will depend on whether support for an adequate stockpile, both in Congress and in the Administration, remains strong.

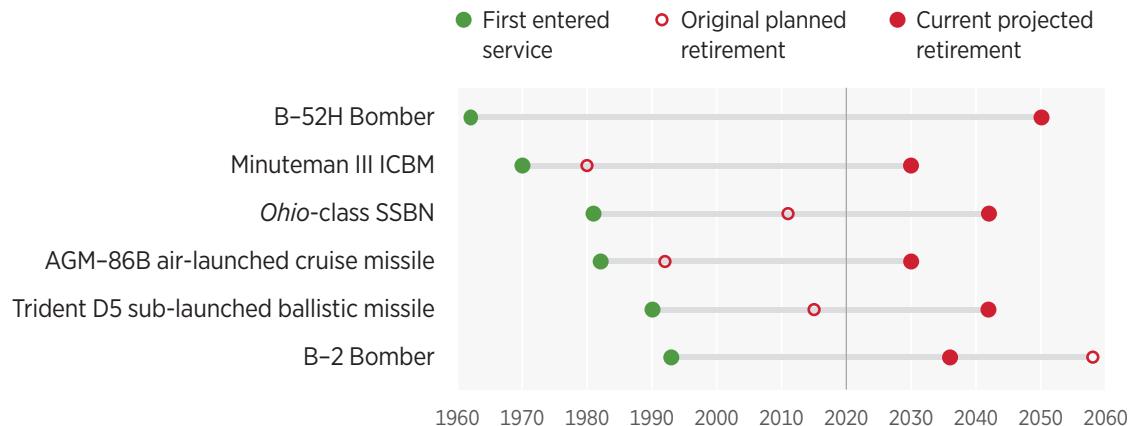
Reliability of Current U.S. Delivery Platforms Score: Strong, Trending Toward Marginal or Weak

Reliability encompasses not only the warhead, but strategic delivery vehicles as well. For ICBMs, SLBMs, and air-launched cruise missiles (ALCMs), in addition to a successful missile launch, this includes the separation of missile boost stages, performance of the missile guidance system, separation of the

FIGURE 5

U.S. Nuclear Delivery Systems Outdated

Current U.S. nuclear delivery systems are between 28 and 59 years old, and some are expected to be retired within a decade.



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 recently stated that 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 350 hours of flying time each year, it could continue flying until 2067.

SOURCE: Heritage Foundation research.

 heritage.org

reentry vehicles from the missile post-boost vehicle, accuracy of the final reentry vehicle in reaching its target, and the ability of weapons systems (cruise missiles, aircraft carrying bombs, and reentry vehicles) to penetrate to their targets.³⁵

The United States 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 tested the AGM-86B ALCM, launched from the B-52H bomber, most recently in 2017.³⁶ The DOD must perform upgrades to existing platforms and develop their replacement programs simultaneously, and already diminished capabilities make this task more difficult.

Grade: In July 2018, the Air Force suffered its first unsuccessful ICBM test since 2011,³⁷ but it has conducted six successful tests since then. These successes include a test in February 2020—the first one to be hosted by Vandenberg Air Force Base since it became part of the U.S. Space Force³⁸—and a test in August 2020 that launched a missile armed with three

reentry vehicles.³⁹ However, the May 2020 test experienced a ground abort prior to the launch, which has provoked speculation about the reliability of the Minuteman III missile as it approaches its retirement starting at the end of the decade.⁴⁰ The SLBM tests were successful in 2019 and 2020 and have been thus far in 2021.⁴¹

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 U.S. systems work and the U.S. nuclear deterrent is ready if needed. The aged systems, however, occasionally have reliability problems, as evidenced by the failed July 2018 and May 2020 Minuteman III launches. Although delivery systems are likely reliable enough today, the evidence indicates that this reliability could dwindle with aging. For instance, because of its obsolescence against Russian air defense systems, the B-52H bomber already no longer carries gravity bombs.⁴² Despite the fact that the AGM-86B passed its most recent public test in 2017, General John Hyten has stated that because of its age, "it's a miracle that [the missile] can even fly" and that the current ALCMs "do meet the mission, but it is a challenge each and every day."⁴³ Admiral Richard has also stated that "Minuteman-III is increasingly challenged in its ability" to "fly and make it to the target."⁴⁴

Aging will continue to affect delivery platform reliability until platforms are replaced, but no publicly released data or statements from senior leaders have thus far indicated that U.S. delivery systems cannot currently meet mission requirements. Until that changes, this factor receives the grade of "strong." However, this grade will trend to "marginal" if not "weak" in just a few years if modernization programs are not fully pursued and these aging systems are not replaced on time.

Nuclear Warhead Modernization Score: Marginal

During the Cold War, the United States focused on designing and developing modern

nuclear warheads to counter Soviet advances and modernization efforts and to leverage advances in our understanding of the physics, chemistry, and design of nuclear weapons. Today, the United States focuses on extending the life of its aging stockpile rather than on fielding modern warheads while trying to retain the skills and capabilities needed to design, develop, and produce such warheads. Relying only on sustaining the aging stockpile could increase the risk of failure caused both by aging components and by not exercising critical skills. It could signal to adversaries that the United States is less committed to nuclear deterrence.

Meanwhile, potential U.S. adversaries and current and future proliferants are not limited to updating Cold War designs and can seek designs outside of U.S. experiences. Other nations can maintain their levels of proficiency by having their scientists work on new nuclear warheads.⁴⁵ 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 potential lack of adherence to this standard as well.⁴⁶

Fortunately, the NNSA has made noticeable improvements in this category in recent years. In FY 2016, Congress established the Stockpile Responsiveness Program to "exercise all capabilities required to conceptualize, study, design, develop, engineer, certify, produce, and deploy nuclear weapons."⁴⁷ Congress doubled funding for the SRP from \$34 million in FY 2019 to \$70 million in FY 2020 and appropriated \$70 million again in FY 2021.⁴⁸ The budget request for FY2022 also includes \$70 million for the SRP.⁴⁹

Although it has been operating for only a few years, the SRP has demonstrated some important accomplishments in ensuring critical skills retention. The design and development work planned for the Navy's W93/Mark 7 warhead for the Trident II D5 SLBMs and the W87-1 warhead for GBSD will build on the success of the SRP in exercising these skills on modern warhead programs.

Fielding modern weapons like the W93 would allow American engineers and scientists to improve previous designs and devise more effective means to address evolving military requirements (e.g., adaptability to emerging threats and the ability to hold at risk hard and deeply buried targets). Future warheads could improve reliability (i.e., remedy some ongoing aging concerns) while also enhancing the safety and security of American weapons. The ability to work on modern warhead design options would help to ensure that today's experts and those of the next generation remain engaged and knowledgeable, help to attract the best talent to the nuclear enterprise, and help the nation to gain additional insights into adversaries' nuclear weapon programs.

The nuclear enterprise displayed improved flexibility when it produced the W76-2 warhead, a low-yield version of the W76 warhead designed to counter Russia's perception of an exploitable gap in the U.S. nuclear force posture, within a year. Such efforts warranted an improvement in this score from "weak" to "marginal" in 2019. Additionally, in FY 2021, Congress appropriated initial funding for the W93/Mark 7 warhead program, which will eventually replace the W76-1 and W88 warheads carried by the Trident II D5 SLBMs.⁵⁰ The FY 2022 budget continues funding for the W93 program with \$72 million requested for NNSA in line with the FY 2022 projection in the FY 2021 budget.⁵¹

The effort to restore the ability to produce plutonium pits for future warheads has likewise progressed after Congress provided the NNSA with its full funding request for FY 2021. The NNSA reached the first critical milestone for pit production at Los Alamos National Laboratory in April 2021 and at the Savannah River Site in June 2021.⁵² While production at Los Alamos remains on schedule, the plan to produce 50 plutonium pits per year at the Savannah River Site by 2030 has shifted, and the goal is now somewhere between 2032 and 2035.⁵³

Grade: Before the score for this category can move up to "strong," the NNSA, with the support of Congress, will need to achieve

enough progress in the W93/Mk 7, W87-1, and plutonium pit production projects to demonstrate that those projects will be completed on schedule and that the delay in pit production at the Savannah River Site will not significantly affect the ability to meet warhead requirements. An improved score will also depend on other advancements in nuclear warhead modernization.

Specifically, in addition to the W93/Mark 7 program to replace existing SLBM warheads, the NNSA will need to begin a program for a future strategic land-based warhead to succeed the W87-1, a program that remains notional.⁵⁴ Future assessments will also need to examine whether the NNSA's current warhead modernization effort is sufficient to address the increasing threat. For instance, an earth-penetrating warhead is not part of the NNSA's warhead modernization plan, despite Russian progress in hardening and deeply burying facilities to withstand strikes by current U.S. weapons.⁵⁵

For now, the score for this category remains at "marginal," but it could trend toward "strong" in future years.

Nuclear Delivery Systems Modernization Score: Strong

All U.S. delivery systems were built during the Cold War and are overdue for replacement. The Obama Administration, in consultation with Congress, initiated a plan to replace current triad delivery systems within the constraints of the New Strategic Arms Reduction Treaty (New START) with Russia. President Trump advanced this modernization program in his budget requests with bipartisan support from Congress. Under this modernization program:

- The Navy is fully funding the *Columbia*-class submarine to replace the *Ohio*-class submarine;
- The Air Force is funding the B-21 Raider Long-Range bomber, which will replace conventionally armed bombers before

they become certified to replace nuclear-capable bombers, 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 beyond the end of the decade, 50 years after their intended lifetime, and in 2029 will start to be replaced by the GBSD; and
- 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.⁵⁶

All of these programs have remained on track for the past few years, but they face high risks of delay. For instance, the U.S. Government Accountability Office (GAO) found risks in the GBSD schedule related to technology maturation, the complexity of concurrently operating Minuteman III missiles and GBSD missiles during the transition, limited schedule margin for testing, and an aggressive plan for construction activities.⁵⁷ Additionally, 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 *Columbia*-class submarine in 2031.⁵⁸ After a contract for development of the LRSO was awarded early, Congress reduced funding in FY 2021 by \$89 million.⁵⁹ Fortunately, the budget for FY 2022 would boost funding for the LRSO beyond what was previously projected for that year.

These risks in schedule are especially dangerous because modernization programs have zero margin for delay after the United States has deferred recapitalization for years. In September 2020, then-Under Secretary of Defense for Acquisition and Sustainment Ellen Lord testified that even a minor cut in funding for the GBSD would affect its schedule.⁶⁰ Since these modernization programs are just-in-time, they would be significantly affected by any continuing resolution.

The impacts of schedule delays are significant. As systems like the Minuteman III, AGM 86-B, and *Ohio*-class submarines continue to age, they take on greater risks. 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 can have serious implications for U.S. deterrence and assurance. Should GBSD fail to reach initial operating capability by 2029, the United States will be left with a less-capable—and therefore less credible—ICBM fleet, which will also begin to dip below 400 missiles as the Air Force continues to use missiles for annual testing. With respect to the Navy, the GAO has reported that the consequence of failing to deliver the first *Columbia*-class submarine on time would be a failure for the Navy to meet STRATCOM's force-generation operational requirement, which means a weaker sea-based deterrent.⁶¹

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 2021. For instance, the Air Force awarded a contract for GBSD to Northrop Grumman in 2020.⁶² Congress did not cut any major funding for nuclear recapitalization systems in FY 2021, and the budget for FY 2022 would provide the funding necessary to continue these programs on schedule.

Despite these successes, potential modernization delays and congressional funding cuts still hold nuclear delivery system modernization at risk, especially as some Members of Congress push for major funding cuts and unilateral reductions in U.S. nuclear forces.⁶³ Moreover, this plan simply replaces the force structure designed by the Obama Administration in 2010 before China commenced its strategic breakout and the strategic environment was assumed to be much more benign than it is today. Future U.S. nuclear posture will need to adjust to the drastic change in the threat

environment since 2010 and account for two nuclear peers. The FY 2022 budget includes funding for the initial stages of a program to develop a nuclear-armed sea-launched cruise missile that, if fielded, would introduce additional regional nuclear capabilities beyond current non-strategic gravity bombs to address the rising threat.

Based on the commitment to nuclear weapons modernization demonstrated by Congress and the Administration this year, this category (for now) again earns 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 (nuclear weapons research and development, or R&D, and plutonium pit production);
- Lawrence Livermore National Laboratories (nuclear weapons R&D);
- Sandia National Laboratory (nuclear weapons R&D and systems engineering);
- Nevada National Security Site (subcritical experiments, test readiness);
- Pantex Plant (assembly of nuclear warheads);
- Kansas City Plant (production of non-nuclear components for nuclear warheads);
- Savannah River Site (second site for pit production, tritium production); and
- Y-12 National Security Complex (manufacture of highly enriched uranium parts for nuclear warheads).

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.⁶⁴

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. According to the 2010 NPR, “As the United States reduces the numbers of nuclear weapons, the reliability of the remaining weapons in the stockpile—and the quality of the facilities needed to sustain it—become more important.”⁶⁵

The existing nuclear weapons complex, however, is not fully functional. The United States cannot produce some of the nuclear components needed to maintain and modernize the stockpile.⁶⁶ For instance, the United States has not had a substantial plutonium pit production capability since 1993. A plutonium pit is the core of a nuclear weapon that contains the nuclear material. The NNSA currently plans “to produce no fewer than 80 pits per year during 2030, consistent with federal law, national policy, and DoD requirements,” which is a challenging timeline by the agency’s own admission.⁶⁷

If the NNSA’s facilities are not properly funded, the U.S. will gradually lose the ability to conduct the high-quality experiments needed to ensure the reliability of the stockpile without nuclear testing. In addition to demoralizing the workforce and hampering

recruitment, old or obsolete facilities and poor working environments make maintenance of a safe, secure, reliable, and militarily effective nuclear stockpile difficult. The NNSA's facilities are old: About 40 percent date back to World War II, about 60 percent are over 40 years old, and more than half are in poor condition.⁶⁸ As a consequence, the NNSA had accumulated about \$5.8 billion in deferred maintenance as of FY 2020.⁶⁹ Aging facilities have also become a safety hazard: In some buildings, for example, chunks of concrete have fallen from the ceiling.⁷⁰

The U.S. currently retains more than 5,000 old plutonium pits in strategic reserve in addition to pits for use in future LEPs. Uncertainties regarding the effect of aging on plutonium pits and how long the United States will be able to depend on them before replacement remain unresolved. In 2006, a JASON Group study of NNSA assessments of plutonium aging estimated that, depending on pit type, the minimum pit life was in the range of 100 years.⁷¹ A work program was recommended to address additional uncertainties in pit aging, but that did not reach fruition. Moreover, numerous pits have been in the stockpile for decades—some for more than 50 years—and will need to be replaced. Depending on the rate at which NNSA can produce new pits, replacement will need to start sooner rather than later.

Today, the production rate is insufficient to replace aging pits. The United States 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 30 by 2026.

A second plutonium pit production facility is being planned to exploit the Mixed Oxide Fuel (MOX) facility that was being constructed at the Savannah River Site in South Carolina. The MOX building is being repurposed for plutonium pit production with a required production of no fewer than 50 pits per year by 2030 for an overall requirement of no fewer than 80 per year. Unfortunately, the NNSA

reported this year that it will not be able to meet the required timeline for the Savannah River Site. Achieving this timeline is difficult because the NNSA is concurrently embarking on the most ambitious warhead sustainment program since the end of the Cold War, overhauling some five warhead types and stressing the capacity of both workforce and facilities. Meanwhile, certain warhead types will require modern pits.

Aside from plutonium, the NNSA must also maintain production of several other key materials and components that are used to build and maintain nuclear weapons. For instance, NNSA plans to increase the supply of tritium as demand increases. Other projects currently underway include a new lithium processing facility and the new Uranium Processing Facility at Y-12. So far, this facility is moving forward on schedule and cost.

Grade: Modernizing U.S. nuclear facilities is critical because the NNSA's warhead modernization plans depend on the ability to produce certain components like plutonium pits. The W87-1, for example, will be composed of all newly manufactured components.⁷²

On one hand, the United States maintains some of the world's most advanced nuclear facilities. On the other, some parts of the complex 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 or increasing critically essential but always decaying tritium gas is likewise essential; delays only increase production needs for its timely replenishment.⁷³

Significant progress has been made over the past decade in getting funded plans in place to recapitalize plutonium pit production capacity and uranium component manufacturing in particular. This effort, however, faces great technical challenges in addition to the challenge of ensuring stable funding to support it. The recent shift in deadline for plutonium pit production at the Savannah River Site from 2030 to the 2032–2035 range is one example. After years of deferred modernization, any

unexpected failure or disruption at a critical facility could significantly affect schedules for nuclear warhead modernization.⁷⁴

According to former Acting NNSA Administrator Charles Verdon, “Continued recapitalization is imperative, otherwise there will be a point at which no amount of money will be able to mitigate the operational risks and losses to infrastructure capabilities that accrued over time.”⁷⁵ Until demonstrable progress has been made toward completion of infrastructure modernization, the grade for this category will therefore remain at “marginal.”

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. The U.S. is currently under a self-imposed nuclear testing moratorium, but 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 (which is still U.S. policy), “a capability to conduct a nuclear test within 6 months up to FY 1996, and to conduct a nuclear test within 2–3 years after that time will be assumed by the Department of Energy [now NNSA].”⁷⁶ 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.⁷⁷

However, whether this approach can assure that the United States 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 United States might need to test to assure certain weapon characteristics that only nuclear testing can

validate or potentially verify render-safe procedures. The ability to conduct timely yield-producing experiments is likewise important, especially if the United States needs for political reasons to respond to another nation’s nuclear weapons tests or communicate its unquestioned resolve.

The NNSA is mandated to maintain a capability to conduct a nuclear test within 24 to 36 months of a presidential decision to do so. However, the FY 2020 Stockpile Stewardship and Management Plan (SSMP) states that “[a]ssuring full compliance with domestic regulations, agreements, and laws relating to worker and public safety and the environment, and international treaties, would significantly extend the time required for execution of a nuclear test.”⁷⁸ According to the FY 2018 SSMP, it would take 60 months to conduct “a test to develop a new capability.”⁷⁹ 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.⁸⁰

Grade: As noted, the United States can meet the legally required readiness requirement only if certain domestic regulations, agreements, and laws are waived. In addition, the United States 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. In recognition of these concerns, Admiral Richard testified in 2021 “that I am concerned about the Nation’s test-readiness and that I endorsed the [NNSA] lab director’s calls... for a national review of our test-readiness to understand where we sit.”⁸¹

The Senate-passed version of the FY 2021 National Defense Authorization Act (NDAA) included an additional \$10 million within existing budgets to practice test readiness capabilities, which would have made only a minor improvement in test readiness.⁸² A July 2020 amendment to the House bill would have prohibited the use of funds to conduct nuclear

tests.⁸³ The conference report on the NDAA did not include either provision.⁸⁴

Opposition to a mere \$10 million for test readiness and willingness to prohibit testing altogether are matters of great concern. The effort to improve the NNSA's technical and scientific capabilities to certify the stockpile without testing for the foreseeable future is worthwhile, but the United States must maintain at least the mandated level of test readiness so that it can deal with an emergency that requires testing if one should arise.

Thus, testing readiness earns a grade of “weak.”

Personnel Challenges Within the National Nuclear Laboratories Score: Marginal but Trending Toward Strong

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.⁸⁵

The ability to maintain and attract a high-quality workforce is critical to ensuring 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. The SRP offers one visible means 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 if not increased.

The United States currently relies on non-yield-producing subcritical experiments and other 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 “clean sheet” design, engineering development, production, and fielding. The SRP is remedying some of these shortfalls by having its workforce exercise many of the nuclear weapon design and engineering skills that are needed.

The average age of the NNSA's enterprise-wide workforce had decreased slightly to 46.9 years as of September 2018, the most recent year for which data are available.⁸⁶ 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 5 years.”⁸⁷ Given the distribution of workforce by age, these retirements, if not addressed in plans for the hiring and mentoring of new hires, will create a significant knowledge and experience gap.

Grade: In addition to employing world-class experts, the NNSA labs have had good 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 annual assessments and certifications of nuclear warheads will rely increasingly on the judgments of people who have never tested or designed a nuclear weapon. Moreover, demand for skilled personnel will increase as NNSA ramps up production capabilities and moves some operations to around-the-clock, seven-days-a-week scheduling.⁸⁸ Admiral Richard has emphasized the importance of investing in the workforce now: If “[w]e lose those talent bases, you can’t buy it back, it will take five to ten years to...retrain and redevelop the people.”⁸⁹

In light of these issues, the NNSA workforce earns a score of “marginal,” but will trend toward “strong” with these continued improvements.

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 2021, the services have continued to align resources to preserve strategic capabilities in the short term. Nevertheless, long-term stable funding will be essential for the timely execution of programs and associated readiness activities.

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.⁹⁰ Sustained attention to this issue remains critical

to ensuring the strong recruitment and training of personnel.

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. General Timothy Ray, Commander of Air Force Global Strike Command, has testified that “our combat mission readiness rates among our bomber aircrews is at its highest in the history of the command.”⁹¹ 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.⁹²

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. The United States extends nuclear assurances to more than 30 allies who in turn have maintained the commitment to forgo nuclear programs of their own. If allies were to resort to building their own nuclear weapons because their confidence in U.S. extended deterrence had been degraded, the consequences for nonproliferation and stability could become dire.

In Europe, the United States can coordinate with France and the United Kingdom, which already have nuclear weapons. The U.S. also deploys B-61 nuclear gravity bombs in Europe as a visible manifestation of its commitment to its NATO allies and retains dual-capable aircraft that can deliver those gravity bombs. The United States provides nuclear assurances to Japan, South Korea, and Australia, all of which face increasingly aggressive nuclear-armed regional adversaries: China, Russia, and North Korea. Continued U.S. nuclear deterrence assurances 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. A decision to do so would be a major setback for U.S. nonproliferation policies.

The 2018 NPR took a positive step when it placed “Assurance 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.⁹³ The recent successful deployment of the W76-2 low-yield warhead is an important component of America’s ability to deter regional aggression against its Asian and NATO allies.

Grade: At this time, 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 growing non-strategic nuclear capabilities not limited by New START. The NATO Secretary General’s annual report and the recent NATO summit in the United Kingdom reiterated NATO’s commitment to remaining a nuclear alliance as long as nuclear weapons exist.⁹⁴ While significant percentages of South Koreans continue to express support for an indigenous nuclear weapons capability or nuclear-sharing agreement with the United States,⁹⁵ neither South Korea nor Japan has expressed serious concern about the U.S. commitment to extended deterrence.

Allied assurance will likely remain strong as long as the United States remains committed to modernizing its own nuclear deterrent and rejects calls to reduce its nuclear forces unilaterally. The Biden Administration has emphasized a renewed focus on allies and partners in American foreign policy; achieving this goal will require the prioritizing of extended deterrence. Continued commitment from the Administration and Congress to development of the nuclear sea-launched cruise missile, which can be deployed as a regional nuclear capability in both the European and Indo-Pacific theaters, is one important way to meet this goal.⁹⁶

Rejecting calls for a “no first use” or “sole purpose” declaratory policy will also be critical, as such policies are not popular with most of our allies because, among other things, they could call into question America’s commitment to extending its nuclear deterrent for non-nuclear, but still existential, attacks on its allies.⁹⁷

The score for allied assurance therefore remains “strong.”

Overall U.S. Nuclear Weapons Capability Score: Strong but Trending Toward Marginal or Weak

It is necessary to emphasize that the grade of “strong” assumes that the United States maintains its commitment to modernization of the entire nuclear enterprise—warheads, platforms, command and control, personnel, and infrastructure—and allocates needed resources accordingly. Without this commitment, this overall score will degrade rapidly to “weak.” Since every other military operation—and therefore overall national defense—relies on a strong nuclear deterrent, the United States cannot afford to fall short in fulfilling this imperative mission.

There have been major issues with nuclear capabilities since the end of the Cold War, ranging from degraded infrastructure to the inability to produce plutonium pits to delivery platforms at risk from aging. Yet progress in modernization efforts, combined with assurances from senior leaders that the forces remain reliable, warrants an improvement to the grade of “strong” this year.

Although modernization programs have yet to produce many tangible results (e.g., delivery systems have not yet entered production), a sustained bipartisan commitment to nuclear modernization extending through the previous two Administrations reflects a positive trend. Both the 2010 and 2018 NPRs strongly articulate a core nuclear weapons policy that is solidly grounded in the realities of today’s threats and growing international concerns, as well as a continued commitment to extended deterrence. Moreover, presidential budgets and congressional appropriations in recent

years have continued to provide the necessary funding for modernization programs. As a result, this is a more optimistic assessment of the nuclear portfolio than we have been able to provide in previous editions.

That being said, this score of “strong” with a conditional trend toward “marginal” or “weak” reflects a greater risk than in previous years of a degradation in nuclear deterrence. Current

forces are assessed as reliable today, but nearly all components of the nuclear enterprise are at a tipping point with respect to replacement or modernization and have no margin left for delays in schedule. Failure of on-time appropriations and lack of Administration support for nuclear modernization could lead to a rapid decline in this portfolio to “weak” in future editions.

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				✓	

Endnotes

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89. Stenographic transcript of hearing *To Receive Testimony on United States Strategic Command and United States Space Command in Review of the National Defense Authorization Request for Fiscal Year 2022 and the Future Years Defense Program*, p. 74.
90. In January 2014, the Air Force discovered widespread cheating on nuclear proficiency exams and charged more than 100 officers with misconduct, leading DOD to conduct a review that identified issues that included a lack of leadership attention and a lack of resources with which to modernize the atrophied infrastructure. Since then, DOD and the Air Force in particular have implemented a number of changes to improve the morale of nuclear forces.

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Missile Defense

Patty-Jane Geller

Missile defense is a critical component of the U.S. 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, for example, cruise missiles and hypersonic weapons that fly on ballistic and non-ballistic trajectories.

The Growing Missile Threat

Missiles remain a weapon of choice for many U.S. adversaries who view them as cost-effective and symbols of power compared to other types of conventional 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 pursuit of a nuclear intercontinental ballistic missile (ICBM) program—including a new “monster” ICBM supposedly able to carry multiple warheads and decoys—that will allow it to strike the United States. It also recently tested ground-based and sea-based ballistic missiles and appears to direct its missile advancements toward overcoming U.S. missile defenses.²

Iran continues to modernize and proliferate its regional missile systems. Its recent successful solid-fuel rocket launch demonstrates that Iran has the ability to build and successfully

launch sophisticated missiles, which implies that it has or is developing the ability to advance to the ICBM level of capability.³

China and Russia, in addition to their vast ballistic missile inventories, are investing in new ground-launched, air-launched, and sea-launched cruise missiles that uniquely challenge the United States in different domains and are deploying new hypersonic glide vehicles.⁴ China is rapidly building up its missile inventory, to include hundreds of new silo-based ICBMs and road-mobile ICBMs that reportedly can carry 10 warheads, as well as theater-range missiles that can strike U.S. assets with precision.⁵ Russia is developing entirely new capabilities, such as a nuclear-powered cruise missile, that are intended to avoid U.S. sensors and missile defenses, and its conventionally armed sea-launched and air-launched cruise missiles can strike strategic nodes within the U.S. homeland, even from Russian territory.⁶

The Strategic Role of Missile Defense

Because they are designed to detect and 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 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 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 U.S. assets, it mitigates an adversary’s ability to intimidate the United States into conceding important security, diplomatic, or economic interests.

Missile defense systems 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 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 U.S. forces and assets if the United States intervenes in a regional conflict. Missile defenses in place, by making it easier for the U.S. military to introduce reinforcements that can move more freely through a region, can 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 ranging from preemptively attacking an adversary to attacking his missiles on launch pads or even acceding to an enemy’s demands or actions. By assuring some level of protection from a missile attack, robust missile defense systems would affect the dynamics of decision-making by removing the need to take immediate action.

In other words, missile defense creates additional options and provides more time to sort through them and their implications to arrive at the one that best serves U.S. security

interests. This can make them profoundly stabilizing.

The U.S. Missile Defense System

The U.S. missile defense system has three critical physical components:

- Sensors,
- Interceptors, and
- 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. Components of missile defense systems can be classified based on the phase of flight during which intercept occurs, although some—for example, the command and control infrastructure or radars—can support intercepts in various phases of flight. Interceptors can shoot down an adversarial ballistic missile in the boost, ascent, midcourse, or terminal phase of its flight. As cruise missiles and hypersonic glide vehicles continue to proliferate, the Missile Defense Agency (MDA) and the services must therefore consider intercept in the boost, glide, or terminal phase of flight.

Another way to classify missile defense systems is by the range of an incoming missile (short-range, medium-range, intermediate-range, or intercontinental-range) that an interceptor is designed to shoot down. An interceptor’s flight time determines both the time available to conduct an intercept and the optimal interceptor placement to improve intercept probability. With ICBMs, the United States has “30 minutes or less”⁷ to detect the missile, track it, provide the information to the missile defense system, find the optimal firing solution, launch an interceptor, and shoot down the incoming missile, ideally with enough time to fire another interceptor if the first attempt fails. The time frame for intercepting short-range, medium-range, and intermediate-range ballistic missiles is shorter.

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 Shemya, AK

- Cobra Dane radar
- IDT

2 Pearl Harbor, HI (base)

- Sea-based X-Band radar

3 Clear, AK

- UEWR

4 Ft. Greely, AK

- 40 GBIs
- GMD
- GFC
- IDT

5 Vandenberg AFB, CA

- 4 GBIs
- 2 IDTs

6 Beale AFB, CA

- UEWR

7 Schriever AFB, CO

- GFC

8 Ft. Drum, NY

- IDT

9 Cape Cod, MA

- UEWR

10 Thule, Greenland

- UEWR

11 Fylingdales, UK

- UEWR

12 Rota, Spain (base)

- Sea-based Aegis BMD
- SPY-1 radar

13 Kurecik AFB, Turkey

- TPY-2 radar

14 Israel

- TPY-2 radar

15 CENTCOM-Middle East

- TPY-2 radar

16 Shariki, Japan

- TPY-2 radar

17 Kyogamisaki, Japan

- TPY-2 radar

18 Outer space

- Defense support program satellites
- Space-based infrared system satellites
- Space tracking and surveillance system-demonstrator

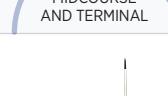
NOTE: Locations are approximate.

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FIGURE 6

U.S. Missile Defense: Interceptors

				MISSILE THREAT TYPE
				Intercontinental 5,500 km
				Intermediate-Range 3,000 km
				Medium-Range 1,000 km
				Short-Range 1,000 km
				
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	

SOURCE: Lieutenant General Daniel L. Karbler, USA, Commanding General, U.S. Army Space and Missile Defense Command, and Commander, Joint Functional Component Command for Integrated Missile Defense, statement on “Fiscal Year 2022 Authorization Request for Missile Defense” before the Subcommittee on Strategic Forces, Committee on Armed Services, U.S. Senate, June 9, 2021, pp. 18 and 19, <https://www.armed-services.senate.gov/imo/media/doc/Karbler%20Written%20Statement%20to%20SASC%206-091.pdf> (accessed August 17, 2021).

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Finally, missile defense can be framed by the origin of interceptor launch. At present, U.S. interceptors are launched from the ground or from the sea. In the past, the United States explored possible ways to launch interceptors from the air or from space, but efforts

on that front have been limited since the U.S. withdrawal from the Anti-Ballistic Missile Treaty in 2002.⁸

The current U.S. missile defense system is a result of investments made by successive U.S. Administrations. President Ronald Reagan

envisioned the program—the Strategic Defense Initiative (SDI)—as a layered ballistic missile defense (BMD) system, including BMD interceptors in space, that would render nuclear weapons “impotent and obsolete.”⁹ These layers would have boost, ascent, mid-course, and terminal interceptors, including directed-energy interceptors, providing the United States with more than one opportunity to shoot down an incoming missile.

The United States stopped far short of this goal, even though the SDI program generated tremendous technological advances and benefits.¹⁰ Instead of a comprehensive layered system, the U.S. has no boost-phase ballistic missile defense systems and no defense against the advanced ballistic missile threats from China or Russia. The volatility and inconsistency of priority and funding for missile defense by successive Administrations and Congresses—Administrations and Congresses controlled by *both* major political parties—have yielded a system that is numerically and technologically limited and incapable of defending against more sophisticated or more numerous long-range missile attacks.

Beginning with the National Missile Defense Act of 1999, it was U.S. policy to protect the homeland only from a “limited ballistic missile attack.”¹¹ The National Defense Authorization Act (NDAA) for Fiscal Year 2017 dropped the word “limited” even as it continued to focus on ballistic missiles.¹² Then 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.”¹³ 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 in 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 2019 MDR addresses the dangerous threat environment that has evolved since the previous MDR in 2010 and advocates a comprehensive approach to all missile threats—no longer only ballistic—that integrates offensive capabilities, active defenses, and passive defenses. It acknowledges that the United States is no longer vulnerable only to ballistic missiles and recognizes that future missile defense systems must defend against cruise and hypersonic missiles as well.¹⁴

For fiscal year (FY) 2022, the Biden Administration requested \$8.9 billion for the MDA,¹⁵ a decrease from the FY 2021 budget request’s projection of \$9.1 billion¹⁶ and a decrease of \$1.6 billion from the FY 2021 enacted budget of \$10.5 billion.¹⁷

Interceptors

Interceptors are 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 the composition of today’s U.S. missile defense reflects these choices.

While the United States is working to improve its ability to strike down cruise missiles and hypersonic glide vehicles, the primary mission of its fully operational missile defense systems today is to intercept ballistic missiles. In particular, missile defense interceptors are designed to intercept ballistic missiles in three different phases of flight.

- **The boost phase** extends from the time a missile is launched 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, a second shot if the first intercept attempt fails.
- **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 missiles in their boost phase. Technologically, boost-phase intercept is the most challenging option 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.¹⁸ This phase, however, is 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 technical, operational, or cost challenges. The current MDR discusses the option of incorporating the F-35 initially as a sensor platform and later as an interceptor platform for boost-phase intercepts. However, this effort has not progressed.

Midcourse-Phase Interceptors. Intercepting missiles in their midcourse phase offers more time for intercept and presents fewer technological challenges than intercept in the boost phase presents, but it also allows the missile time to deploy decoys and countermeasures that are designed to complicate interception by confusing sensors and radars. The United States deploys two systems that can shoot down incoming missiles in the midcourse phase of flight:

- The Ground-Based Midcourse Defense (GMD) system and
- The Aegis defense system.

The Ground-Based Midcourse Defense system is the only operational system capable of shooting down a long-range ballistic missile headed for the U.S. homeland. It consists of 40 Ground-Based Interceptors (GBIs) at Fort Greely, Alaska, and four at Vandenberg Air Force Base, California. A GBI consists of a multi-staged rocket booster and an Exoatmospheric Kill Vehicle (EKV), which intercepts the incoming missile with hit-to-kill technology. In March 2019, the MDA conducted a groundbreaking and successful “salvo” GMD test against an ICBM target during which one GBI intercepted the target and a second intercepted the biggest piece of debris from the exploded target.¹⁹

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 interceptors is limited, the United States can shoot down only a handful of ballistic missiles that have relatively unsophisticated countermeasures.

In 2017, Congress approved a White House request to increase the number of GBIs from 44 to 64 to keep up with the advancing ballistic missile threat, particularly from North Korea. Construction of 20 new silos has been underway, but they remain empty.²⁰ The MDA intended to produce a Redesigned Kill Vehicle (RKV) to top 20 additional GBIs to fill these silos, but this program was canceled in 2019 because of technological difficulties. The MDA instead initiated the Next Generation Interceptor (NGI) program to build an entirely new interceptor that would add both capacity and capability to the GMD system. NGIs will begin to fill the 20 empty silos in 2028 and eventually will replace at least some of the existing 44 GBIs, the result of which will likely be a mixed fleet of interceptors. Unlike the GBIs, the NGI will feature multiple kill vehicles, enabling a single NGI to shoot at multiple objects ejected from one incoming missile.²¹

Contracts to develop the NGI were awarded to Lockheed Martin and a Northrop Grumman-Raytheon team in March 2021.²² The FY 2022 budget request includes \$926 million for

NGI to support these two competing designs through Preliminary Design Review.²³

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 Aegis system also has capability against aerial threats and cruise missiles.²⁴

“Under the FY2021 budget submission,” according to the Congressional Research Service, “the number of BMD-capable Navy Aegis ships is projected to increase from 48 at the end of FY2021 to 65 at the end of FY2025.”²⁵ The increase reflects an increase in demand for these assets.

The Aegis Ashore system in Romania and another 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. 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 being built in Japan to help protect U.S. allies and forces in the Indo-Pacific from the North Korean and Chinese threats, but the Japanese canceled the project in June 2020 because of costs and technical issues.²⁶ Instead, Japan will build two additional destroyers to deploy SM-3 interceptors.²⁷

Moreover, the former Commander of U.S. Indo-Pacific Command (INDOPACOM), Admiral Philip Davidson, has testified that “the most important action we can take to increase the joint force’s lethality [in the region] is to introduce a 360-degree, persistent, air and missile defense capability on Guam (Guam Defense System (GDS)),” a capability that only the Aegis Ashore system can provide.²⁸ The FY 2022 budget request includes \$78.3 million to support the continued assessment of systems

to defend Guam as well as \$40 million to begin procuring components for a missile defense system.²⁹

In November 2020, the U.S. Navy and the MDA shot down an intercontinental-range ballistic missile using the SM-3 interceptor class Block IIA against an ICBM target.³⁰ The test, FTM-44, was the first step in a plan 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 the GBIs miss.³¹ Deploying such an underlay would require a concept of operations that includes optimal locations for the deployment of SM-3 interceptors on Aegis ships or at Aegis Ashore sites across the United States.

The November 2020 test was against a simple ICBM target; the next step will be to test against a more complicated and realistic ICBM target that could be armed with decoys or other missile-defense countermeasures. The FY 2022 budget request supports the continued pursuit of a layered homeland defense (LHD) approach with funding for continued assessment of the SM-3 Block IIA against ICBMs.³²

Terminal-Phase Interceptors. The United States currently deploys three terminal-phase missile defense systems:

- Terminal High Altitude Area Defense (THAAD);
- The Patriot missile defense system; 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.³³ It consists of a launcher, interceptors, the Army Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) radar, and fire control.³⁴ 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 temporarily deployed a THAAD battery to Romania in support of NATO ballistic missile defense in the summer of 2019 as Romania's Aegis Ashore system was being updated³⁵ and signed a deal in 2020 to deliver THAAD to Saudi Arabia.³⁶ In FY 2022:

[The MDA will also] continue to evaluate a new Terminal High-Altitude Area Defense (THAAD) interceptor prototype to support Contiguous United States Defense as part of the LHD effort. This effort will result in a series of technology demonstrations allowing for expansion of engagement options and coverage areas for the THAAD weapon system culminating in a flight test in FY 2023.³⁷

Patriot is an air-defense and short-range ballistic missile defense system. A battery is comprised of a launcher, interceptors, AN/MPQ-53/65 radar, an engagement control station, and diesel-powered generator units. The Patriot family of missile defense interceptors has been upgraded over time, from the initial Patriot Advanced Capability-1 (PAC-1) deployed in Europe in 1988 to the PAC-3 configuration deployed around the world today. The most recent Patriot upgrade, the PAC-3 Missile Segment Enhancement, expands the lethal battlespace with an advanced solid rocket motor.³⁸ The system is transportable, and the United States currently deploys it in several theaters around the world.³⁹

Assessment. Interceptor strength is difficult to assess because, while deploying more interceptors to increase capacity or defend more targets would always be better, deploying more short-range to medium-range interceptors to unprotected locations or increasing interceptor capacity *ad infinitum* is simply not feasible. Congress provided funding in FY 2021 to procure additional PAC-3, SM-3, and THAAD interceptors, and the FY 2022 budget continues this effort for PAC-3 and SM-3 interceptors. However, the FY 2022 budget sharply reduces support for THAAD interceptor procurement.⁴⁰

To increase the defended battlespace, the MDA is also pursuing the Patriot Launch-on-Remote (THAAD) capability, which integrates the PAC-3 and THAAD systems by enabling a PAC-3 launch using a THAAD AN/TPY-2 radar. Launch-on-Remote is an important capability that can help to increase the defended area by spreading out missiles.⁴¹ The MDA conducted two flight tests for this capability in 2020, and both failed.⁴² However, the test failures do not necessarily indicate lack of progress; the MDA can now use the test data to proceed with development of this capability. The Army plans to field this capability "across all Patriot battalions beginning in Fiscal Year 2023."⁴³

In addition, Congress provided funding for an eighth battery that appeared on the Army's unfunded priorities list. Nine THAAD batteries have long been required, but sufficient funds have not been available to support more than seven.⁴⁴

One way to improve interceptor capability would be to fully fund an Aegis Ashore system on Guam using SM-3 interceptors in FY 2022. Such a system for Guam has appeared on the INDOPACOM unfunded priorities list for the past three years, but efforts to build the system have yet to begin. This year's budget includes funding to study a missile defense architecture on Guam and begin procuring components that would be common to any missile defense system. However, the budget does not commit to any specific system that will be built on Guam. Congress could move this critical capability forward by providing the additional \$231.7 million requested for the Guam Defense System on INDOPACOM's FY 2022 unfunded priorities list.⁴⁵

In terms of capacity and capability to defend the homeland, the Commander of U.S. Northern Command (NORTHCOM), General Glen VanHerck, recently stated that he is "comfortable with my ability to defend the homeland, including Hawaii, against a limited state actor such as DPRK, which the system is designed for, for the foreseeable future" but that we need "to maintain the timeline of no later than 2028 for NGI, to ensure that we

maintain capacity and capability to defend against a ballistic missile threat.”⁴⁶ Among General VanHerck’s specific concerns are the increasing capacity of North Korean ballistic missiles to strike the U.S. homeland and North Korea’s ability to deploy decoys.⁴⁷

The recent NGI contract award follows a delay in schedule of more than a year. Fortunately, both competitors have been challenged to meet or exceed the schedule of 2028 for an operational capability.⁴⁸ This program also seems to enjoy bipartisan support in Congress.

In addition to accelerating the NGI program, Congress provided additional funds in both FY 2020 and FY 2021 for a GMD service life extension program (SLEP). The GMD system was largely built in the early 2000s, and many parts—like the GBI kill vehicles and boosters—are subject to degradation from aging. Regardless of how quickly NGI can be delivered, GBIs will likely remain a part of the fleet of interceptors beyond this decade.

Moreover, it is important to distinguish between GBIs, which are the interceptors themselves, and GMD, which is the entire homeland defense system that encompasses other components like silos, fire control, and even training methods for personnel. The MDA has begun to replace aging boosters on the GBIs, for instance, but as MDA Director Admiral Jon Hill has stated, “It’s not just about the GBIs but it’s also about the weapon system and its support.”⁴⁹ Since the NGI will be integrated into the GMD system for the long term, upgrading the entire GMD system to last beyond the fielding of NGI will remain critical.

In FY 2020, to compensate for the delay in adding 20 additional interceptors to the fleet, the Trump Administration proposed that an underlay using SM-3 Block IIA and THAAD interceptors be developed. General VanHerck agreed to the value of an underlay, stating that “an underlayer would give us additional capacity and capability” to address threats to the homeland, but he also specified that an underlay should focus on more than just ballistic missiles, to include other threats like cruise missiles or unmanned aerial vehicles.⁵⁰

Despite the MDA’s original plan to field an underlay quickly as U.S. forces await NGI, the Department of Defense (DOD) has yet to specify a concept of operations for employing the SM-3 Block IIA and THAAD for homeland defense, as requested by Congress. The FY 2022 budget request states that homeland underlay systems “could begin fielding as early as 2025” but does not address where in the United States those systems could be deployed or how many would be required.⁵¹ The utility of exploring the use of SM-3 and THAAD interceptors for ICBMs can also extend beyond an underlay for the continental United States, as they can also work for other missions or defended assets like Hawaii, Alaska, and Guam. Therefore, using SM-3 and THAAD interceptors to defend against ICBMs is a worthwhile effort, but the DOD will eventually need a more specific deployment plan.

The cruise missile threat to the homeland, for which the United States does not have a dedicated missile defense system, is also advancing. That Russia can strike key strategic nodes in the U.S. homeland from its own territory is of particular concern. To address the cruise missile threat, General VanHerck has emphasized improving domain awareness, because early identification of a threat allows for options like left-of-launch operations or diplomacy to avoid having to shoot down cruise missiles in the U.S. homeland.⁵² Ensuring that the NORTHCOM Commander has the capabilities needed to address this advancing threat will therefore be important.

The Army’s Indirect Fire Protection Capability (IFPC) Increment 2 program has been moving very slowly but has seen recent improvement. The IFPC 2 would defend against short-range rockets, artillery, and mortars, as well as cruise missiles, against which the United States, as noted, lacks a sufficient defensive capability.⁵³ 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 in response to the increasing cruise missile threat, the Army purchased two Iron Dome batteries manufactured by the Israeli company Rafael.⁵⁴ Despite prior concerns about integrating Iron Dome as part of an enduring IFPC solution, the Army is preparing the Iron Dome systems for operational deployment and integration into its future missile defense command and control system.⁵⁵ In April 2021, the Army issued the solicitation for its own enduring IFPC 2 system, to reach combat capability by 2023.⁵⁶

Overall, the United States has multiple capable interceptors, but there is much room for improvement. The most important step for the near future will be on-time or early delivery of the NGI to ensure protection of the homeland from North Korea.

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. These sensors 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. They 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).

Land-Based. 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. They include the phased array early warning radars based in California, the United Kingdom, and Greenland that scan objects up to 3,000 miles away.⁵⁷ 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, but

their certifications have been delayed.⁵⁸ These sensors focus on threats that can be detected 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.”⁵⁹ A shorter-range (2,000-mile) radar called the Cobra Dane is based in Sheyma, Alaska.⁶⁰

The United States also deploys mobile land-based sensors, called AN/TYP-2s. These sensors can be forward deployed for early threat detection or kept in terminal mode to provide tracking and fire control support for the THAAD interceptors.⁶¹ Of the United States’ 12 AN/TPY-2 systems, five are forward deployed with U.S. allies.⁶²

In cooperation with the Republic of Korea, the United States deploys a THAAD missile system accompanied by an AN/TPY-2 on the Korean Peninsula. Despite China’s long-standing opposition to a U.S. radar deployed so close to its homeland, the THAAD system is critical to countering the North Korean threat.⁶³

To fill a gap in missile discrimination capability for tracking North Korean missiles over the Pacific, the MDA is developing the Long Range Discrimination Radar (LRDR) in Northern Alaska to improve coverage in the northern Pacific. There had been plans to develop the Homeland Defense Radar-Hawaii (HDR-H) as well to fill a tracking and discrimination gap over Hawaii. In its FY 2021 budget request, the Trump Administration omitted funding for HDR-H because of budget constraints, but Congress provided the full funding needed to proceed with the radar. The FY 2022 budget does not include funding for HDR-H, so this radar’s future again lies with Congress.

Sea-Based. There are two types of sea-based sensors. The first is the Sea-Based X-band (SBX) radar, which is mounted on an oil-drilling platform and can be relocated to different parts of the globe as threats evolve.⁶⁴ SBX is employed primarily in the Pacific. The second radar is the SPY-1 radar system, which is mounted on all U.S. Navy vessels equipped with the Aegis Combat System and therefore

is able to provide data that can be utilized for ballistic missile missions. Of these ships, 40 are BMD-capable vessels that carry missile defense interceptors.⁶⁵

Space-Based. Finally, U.S. missile defense sensors operate in space. From the ultimate high ground, space-based sensors can detect and track missile launches from almost any location from boost to terminal phase, compared to ground-based radars that are limited in their tracking range.⁶⁶ The MDA, the U.S. Space Force, and the Space Development Agency (SDA) all control aspects of the space missile defense sensor system.

Of the systems that contribute to the missile defense mission, the oldest is the Defense Support Program (DSP), a constellation of satellites that 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.⁶⁷ For instance, SBIRS can scan a wide swath of territory while simultaneously tracking a specific target, making it a useful means for observing tactical, or short-range, ballistic missiles.⁶⁸

The Air Force and Space Force have launched five SBIRS satellites out of a planned total of six.⁶⁹ The Air Force originally planned to launch eight SBIRS satellites, but due to congressional funding delays, it decided to end production of SBIRS early and move on to development of its replacement, the Next-Generation Overhead Persistent Infrared (Next-Gen OPIR) satellite, in 2017.⁷⁰ The seventh and eighth SBIRS satellites will be switched to Next-Gen OPIR satellites, the first of which is to be delivered “no later than FY 2025.”⁷¹ The Next-Gen OPIR satellites are designed to be more survivable against cyber and electronic attacks.

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.⁷² 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 and are now providing risk reduction to support a future space tracker. After more than a decade of serving risk reduction efforts, the MDA recently announced its plans to deorbit the STSS-D satellites within “the next couple [of] years.”⁷³

In addition, the United States is developing a system of satellites capable of providing global detection, tracking, and discrimination of any missile launch. Dating back as far as President Reagan’s Strategic Defense Initiative, successive Administrations have called for a proliferated layer of sensing satellites in space to track the flight of any type of missile—not just ballistic—from birth to death.

A layer of space-based sensors can be particularly useful in tracking hypersonic vehicles, which fly at lower altitudes than ballistic missiles and can maneuver during their trajectories. Comparatively, the DSP and SBIRS systems were designed for ballistic missiles and can lose track of missiles flying at lower altitudes. Since many new threats are not flying on ballistic trajectories, the Trump Administration paid close attention to developing this space sensor layer as endorsed by the MDR.

As a result, the SDA, in conjunction with the MDA, is developing a space Tracking Layer of satellites proliferated in Low-Earth Orbit (LEO) as part of the SDA’s National Defense Space Architecture. According to the SDA:

Once fully operational, the SDA Tracking Layer will consist of a proliferated heterogeneous constellation of Wide Field of View (WFOV) space vehicles (SVs) that provide persistent global coverage and custody capability combined with the Missile Defense Agency (MDA) Hypersonic and Ballistic Tracking Space Sensor (HBTS) Medium Field of View (MFOV) SVs that provide precision global access capability.⁷⁴

Once deployed, the Tracking Layer will be able to detect, track, and discriminate among any types of missile launches throughout the entirety of the missiles' flights. The SDA is also exploring the ability of space sensors to provide fire control information directly to weapon platforms like the NGI (as opposed to the data's going through a ground station).

Last year, Congress provided \$130 million—about \$30 million above the President's budget request—for the HBTSS and affirmed that the MDA, not the SDA, would develop the system.⁷⁵ It also fulfilled the President's request for \$48 million for the SDA.⁷⁶ This year's budget request includes \$256 million for the HBTSS to enable an on-orbit demonstration for two contractors in FY 2023.⁷⁷

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 from the high ground throughout their entire flight. According to Admiral Charles Richard, Commander of U.S. Strategic Command (STRATCOM):

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.⁷⁸

Fortunately, the U.S. government has progressed in the space-based sensor effort despite a slow start. In FY 2019, FY 2020, and FY 2021, the program was plagued by insufficient funding requests and bureaucratic infighting over whether the SDA or MDA would develop the HBTSS.⁷⁹ These issues seem to have been resolved as clear roles for the SDA and MDA have been defined. The space-based sensor effort must continue to be fully funded, especially in view of commanders' urgent need for

improved missile tracking as well as the technological challenges associated with developing a sensor that can perform in LEO.⁸⁰

Development of land-based sensors to fill the missile discrimination capability gap over the Pacific has progressed slowly. Development of the LRDR has been delayed by at least a year.⁸¹ The HDR-H project resumed in FY 2021, but local opposition to its development threatens to create delays.⁸² Because the DOD originally proposed the HDR-H to fill the critical discrimination gap identified over Hawaii, the lack of funding for HDR-H again in the FY 2022 budget also demonstrates a disconnect with DOD priorities. Additionally, the Pentagon initially planned to build a radar elsewhere in the Pacific (HDR-Pacific), but the FY 2021 budget request excluded this program, and Congress did not restore its funding. If NGI is the solution to a strong homeland missile defense, the NORTHCOM Commander must have the sensor coverage necessary to execute the mission.

With respect to Next-Gen OPIR, Congress fulfilled the FY 2021 budget request, which should keep the program on schedule, and this year's budget request continues to fund the program.⁸³ The Army is also progressing quickly on development of 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; the current Patriot radar can scan only one-third of the sky at a time.⁸⁴

Fortunately, the space-sensor project is now on track compared to previous years. It is important that land-based radar coverage move forward in order to stabilize the future sensor architecture.

Command and Control

Command and control of the U.S. ballistic missile defense system requires bringing together data from U.S. sensors and radars and relaying those data to interceptor operators so that they can destroy incoming missile threats against the U.S. and its allies. The operational hub of missile defense command and control

is the Joint Functional Component Command for Integrated Missile Defense (JFCC IMD), a component of STRATCOM housed at Schriever Air Force Base, Colorado. JFCC IMD brings together Army, Navy, Marine Corps, Space, and Air Force personnel and is co-located 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.⁸⁵

Command and control of the GMD system to defend the homeland utilizes the Ground-based Midcourse Defense Fire Control (GFC) system, which consists of a suite of hardware, software, and personnel located in Fort Greely, Alaska, and Vandenberg Air Force Base, California.⁸⁶ The system involves collecting data on missile movement from sensors and radars to inform the launch of GBIs.

Once a missile is launched, data from the U.S. global network of sensors and radars travel through secure satellite communications and ground-based redundant communications lines to the Command Launch Equipment (CLE) software that can task GBIs to fire at the incoming missile. Then, 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.⁸⁷ When the selected missiles have been fired, they maintain contact with In-Flight Interceptor Communications System (IFICS) Data Terminals (IDTs) to receive updated flight information that helps to guide them to their target.⁸⁸

To prepare for and execute GMD operations, the NORTHCOM Commander can also utilize situational awareness data from the Command and Control, Battle Management and Communication (C2BMC) system. Through its software and network systems, C2BMC helps to process and integrate sensor information to provide a more complete picture of the battlespace.⁸⁹ The GMD Fire Control system acts

as the primary decision aid for GMD execution, and the C2BMC system provides integrated battlefield awareness information before and during GMD operations.⁹⁰ It also provides information to other missile defense systems like THAAD and Patriot. Dozens of C2BMC workstations are distributed throughout the world at U.S. military bases.

C2BMC has undergone multiple technical upgrades, called “spirals,” since 2004 to bring more missile defense elements into the network. In 2019, the MDA completed an upgrade that will help to expand Aegis missile defense coverage by enabling Aegis Weapons Systems to engage on remote.

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, and they can provide their sensor data to the GMD system through C2BMC.⁹¹

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.⁹² Like IFPC, IBCS would also link defenses against smaller threats with ballistic missile defense.

Assessment. A strong global command and control system is critical to missile defense because linking information from sensors can increase domain awareness and decision time, thereby improving the probability of intercept. According to General VanHerck, “Decision space starts with that domain awareness.” With more information about the threat, decision-makers can move “further left” to engage a target sooner.⁹³ For instance, it was recently reported that the MDA provided U.S.

Indo-Pacific Command with a hypersonic missile defense capability, largely as a result of C2BMC improvements that allow sensors to see the threat sooner.⁹⁴ Future spirals that are planned will continue to increase the integration of ballistic missile defense elements across the world.

The MDA planned to complete another upgrade to incorporate the LRDR into C2BMC in FY 2021, but this upgrade has been delayed, primarily by the COVID-19 pandemic.⁹⁵ Domain awareness can also allow decision-makers to use other tools to deescalate conflict before missiles are launched. This option is especially important in dealing with cruise missile threats to the homeland, for which the U.S. does not have a comprehensive interceptor capability.

The United States will need a more advanced command and control capability as global missile threats shift to include cruise and hypersonic missiles in addition to ballistic missiles. The DOD is currently developing a Joint All Domain C2 (JADC2) system to integrate non-compatible sensors across all domains into a single network so that it can respond to the complex threat more efficiently. Missile defense command and control will strengthen as the services begin to field JADC2 capabilities.

North American Aerospace Defense Command is also pursuing a program called Pathfinder that “ingests data from multiple sources, infuses that data and uses machine learning and intelligence capabilities to process and share in real time.”⁹⁶ Sensor information can tend to exist in stovepipes, and if it is not integrated, the result can be failure to detect a threat.⁹⁷ Pathfinder’s use of artificial intelligence can help to ensure that the commander receives a full data picture.

IBCS will also provide an important improvement in regional missile defenses. The system will link all missile defense sensors and interceptors to one fire control center, as opposed to today’s more stovepiped approach in

which each unit operates its co-located sensor and launcher independently. By permitting air and missile defenses to function as a joint kill web rather than as a linear kill chain, IBCS will be able to determine the best shooter to take down an incoming missile, in turn increasing the defended battlespace.

IBCS was originally scheduled to reach initial operating capability in FY 2019, but it was delayed to FY 2022 because of technical issues.⁹⁸ The program remains on this new schedule today and successfully engaged two targets during a limited user test conducted last year.⁹⁹ Advancements underway in missile defense command and control will become increasingly necessary to enable defense against the growing missile threat.

Conclusion

By successive choices of 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 that protects the homeland and on deploying and advancing regional missile defense systems.

Although 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 be improved to defend against today’s threat more efficiently. At the same time, the development of missile threats, both qualitative and quantitative, is outpacing the speed of missile defense research, development, and deployment to address those threats. Senior leaders continue to stress the importance of U.S. missile defense, but if the nation is to realize the strategic benefits that missile defense provides, Congress must make sure that the funding of critical programs like NGI, space sensors, and JADC2 is commensurate with that importance.

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Cyber Warfare and U.S. Cyber Command

James Di Pane

The world of cyber operations is notoriously secretive. Nevertheless, even a rudimentary understanding of the domain, the threats and opportunities associated with it, and the ability of the Department of Defense (DOD) to protect the U.S. from cyberattack and enable military operations against enemies is of the greatest importance. To supplement the concise overview of military cyber capabilities provided in this chapter, more detailed discussions of the characteristics of cyber warfare can be found in “National Defense and the Cyber Domain”¹ and “The Reality of Cyber Conflict: Warfare in the Modern Age.”² These essays, published in previous editions of the *Index of U.S. Military Strength*, provide a wealth of information about the cyber domain and how it fits into the world of national defense.

Cybersecurity has been very much in the forefront of public attention this year, with several large cyber incidents from foreign actors drawing considerable public attention. The Solar Winds hack and the Colonial Pipeline and other notable ransomware attacks demonstrate the potential threat to the homeland from malicious cyber actors and provide a window into the types of threats the U.S. could face on a broader scale during wartime. They also demonstrate the link between private networks and public networks, as well as the broad approach that is necessary to ensure cybersecurity.

The vulnerability of allies and the private sector has an indirect effect on military affairs because the compromise of just one can lead to complications for the military services. In the

words of Kenneth P. Rapuano, former Assistant Secretary of Defense for Homeland Defense and Global Security:

Their vulnerability means that adversaries could disrupt military operations without actually targeting military networks and systems themselves.... To address these challenges, we are strengthening alliances and attracting new partners to take a whole-of-society approach to enabling better security and resilience of key assets.³

Because of this, cybersecurity for the military is very expansive and goes beyond the Department of Defense alone.

The use of cyber as a military tool to target enemy forces and capabilities falls into categories similar to those of other military operations. Cyber tools can be used in the form of conventional operations, like the operations against the Islamic State that were used to disrupt command and control nodes and the group’s ability to distribute propaganda.⁴ In this type of campaign, cyber accompanies the other military capabilities as a way to target enemy forces.

Or they can take the form of special operations-type activity like the Stuxnet cyber operation against Iran, which could be compared to the U.S. Navy SEAL raid to kill Osama Bin Laden.⁵ In these operations, cyber is used to achieve targeted goals, sometimes in a covert way that, like special operations, falls below the threshold of traditional armed conflict.

In conventional operations, cyber is used to support forces and commanders by ensuring that they can operate uninhibited in cyberspace or by disrupting the enemy's ability to operate in order to achieve necessary objectives more effectively. In this way, cyber is used to gain an advantage over an adversary similar to the way advantage is sought in the other domains.⁶ This is similar to the use of naval forces to restrict the enemy's ability to use the seas to achieve strategic ends.

Like naval power, cyber is an important means with which to maximize one's own access and effectiveness while restricting the opponent's access and effectiveness. However, it differs from other domains in the sense that time and space are incredibly compressed. A cyber force can launch an attack from anywhere in the world and strike very quickly, unlike more traditional forces that take time to move and launch attacks.

U.S. Cyber Command

U.S. Cyber Command (USCYBERCOM) is a capability-based Unified Combatant Command similar to U.S. Special Operations Command and is the military's primary organization for both offensive and defensive cyber activity. It is currently commanded by General Paul Nakasone, who serves simultaneously as Director of the National Security Agency (NSA). The two organizations have a close cooperative relationship: The NSA and Cyber Command operate, respectively, under Title 50 and Title 10 of the U.S. Code, the sections that govern intelligence and military affairs.⁷

U.S. Cyber Command was founded in 2010 as a sub-unified command under U.S. Strategic Command. In 2018, the Trump Administration elevated it to full Unified Combatant Command status, and it reached full operational capability in that same year.⁸ Over the past approximately 11 years, Cyber Command has grown from a very small organization that was largely dependent on the NSA for personnel and resources into the much more robust and independent organization that exists today.

Missions

U.S. Cyber Command has a wide range of missions, from offensive and defensive cyber operations to monitoring DOD networks and assisting with the defense of critical infrastructure. Its primary role is to ensure the DOD's ability to operate in a world that is increasingly dependent on cyber. To this end, according to General Nakasone:

Our three enduring lines of operation are as follows:

- Provide mission assurance for the Department of Defense (DoD) by directing the operation and defense of the Department of Defense Information Networks (i.e. the DoDIN) and its key terrain and capabilities;
- Defeat strategic threats to the United States and its national interests; and
- Assist Combatant Commanders to achieve their missions in and through cyberspace.⁹

These “lines of operation” are critical to ensuring the success of the military enterprise and national defense, as any compromise in the ability to communicate or operate could jeopardize the full range of U.S. military activities.

The types of operations that Cyber Command is tasked with performing encompass defensive cyber activity coupled with offensive options to impose costs on an adversary. For example, USCYBERCOM is helping to lead the government's response to the SolarWinds hack.

Discovered in December 2020, the Solar Winds hack was one of the most significant breaches of computer networks in history, and its effects are still being felt because of the number of organizations affected and the sophistication of the hackers. A Russia-aligned hacking organization known as Cozy Bear was most likely behind the breach. Thousands of private-sector organizations, as well as government agencies like the Departments of the Treasury, Commerce, and Homeland Security, were compromised following the corruption

of the widely used Orion software. Cyber Command has worked to search for compromise within networks and expel the adversary when found, and it will provide options to policymakers for imposing costs on the attacker.

With respect to election security, U.S. Cyber Command conducted a number of operations aimed at preventing meddling in the 2020 presidential election. Another example was the 2018 targeting of the Russian Internet Research Agency (IRA), “a troll farm that led the effort to spread disinformation around the 2016 presidential election and 2018 midterm elections.”¹⁰ USCYBERCOM proactively shut down the organization’s Internet access to prevent it from engaging in influence operations against the United States.

In 2021, Cyber Command has also continued to support the ongoing counterterrorism fight, including force protection and target prosecution in Afghanistan in support of U.S. Central Command. These efforts are continuous and extend to other regions as well, including support for U.S. Special Operations Command. Cyber is used to disrupt terrorist organizations’ financing and ability to communicate in addition to intelligence collection and targeting.

A key part of these missions is the concept of “defending forward.” As described in the 2018 DOD Cyber Strategy, “[t]his includes working with the private sector and our foreign allies and partners to contest cyber activity that could threaten Joint Force missions and to counter the exfiltration of sensitive DoD information.”¹¹

Defending forward means operating as close to the origins of the cyber threat as possible before it reaches critical networks in the U.S. with the goal of collecting threat intelligence or disrupting attacks. This is contrasted with passive defense, which involves monitoring within U.S. networks for intrusions. Cyber compresses time and space in the battlespace by its very nature, and attacks can emanate from anywhere in the world with similar speed. U.S. forces must therefore engage adversaries in their networks and work to disrupt attacks in their early stages because it is often too late once the networks have been compromised.

Budget

Analyzing the budget for cybersecurity is difficult because of the large degree of classification involved, but there are some data that can be tracked with respect to USCYBERCOM and the broader Department of Defense. President Joseph Biden’s FY 2022 DOD budget request includes \$10.4 billion for cyberspace.¹² This is slightly higher than the \$9.8 billion requested for FY 2021.¹³

General Nakasone has testified that U.S. Cyber Command alone executed a budget of \$605 million in FY 2021.¹⁴ This was \$9 million over the reported executed budget for FY 2020, which was \$596 million.¹⁵

Capacity

The Cyber Mission Force is the operational arm of U.S. Cyber Command, and CMF teams are distributed across various mission sets. In 2013, a force of 133 teams with 6,200 personnel was envisioned based on the mission requirements at that time. All 133 CMF teams reached full operational capability in 2018.¹⁶ These teams are distributed across functional areas. Specifically, there are:

- 13 National Mission Teams that defend the U.S. against high-impact cyberattacks and provide for election security;
- 68 Cyber Protection Teams that are focused on defending DOD networks and systems and ensuring that the department is not compromised by a hack;
- 27 Combat Mission Teams that support the combatant commands with integrated cyber effects in various theaters across the globe, either in tandem with or independent of other military forces, and ensure that the Combatant Commanders have cyber tools at their disposal; and
- 25 Support Teams that support the national mission and combat teams with analysis and planning.¹⁷

The teams are supported by four service components: Army Cyber Command (ARCYBER); Air Force Cyber Command (AFCYBER); Navy Fleet Cyber Command (FLTCYBER); and Marine Corps Forces Cyberspace Command (MARFORCYBER). These four commands, created at the same time that U.S. Cyber Command was created, provide the operational forces that make up the teams.

- ARCYBER supplies 41 teams to the CMF;¹⁸
- AFCYBER supplies 39 teams;¹⁹
- FLTCYBER supplies 40 teams, which reached full operational capability a year ahead of schedule in 2017;²⁰ and
- MARFORCYBER provides 13 teams.²¹

As of January 2021, according to General Nakasone, Cyber Command had “roughly 6,000 service members and civilians out of an authorized total of 6,187 positions.”²² The Biden Administration is proposing a 10 percent increase to expand the CMF by approximately 600 personnel to meet its growing demands for FY 2022.²³

In addition, there are about 12,000 personnel outside of U.S. Cyber Command who maintain DOD networks and fall under the command of the various services. Asked by House Armed Services Committee Chairman James Langevin (D–RI) to specify “how many people will be part of the new Cyber Operations Force,” General Paul Nakasone, Commander of U.S. Cyber Command and Director of the National Security Agency, testified that “I would say the 6,187 that are part of our Cyber Mission Force. And then I would say probably double that with regards to our cybersecurity service providers across all four services.”²⁴

The recruiting and retaining of cyber talent is one of the key challenges for U.S. Cyber Command, which has invested in retention and incentive programs in an effort to keep

the talent it cultivates. The high demand for cyber personnel in the private sector makes this a difficult challenge.

Capability

Due to the nature of cyber and the classification of methods, analyzing USCYBERCOM’s capability as reflected in open-source (i.e., unclassified) literature is nearly impossible. However, the United States is considered to be one of the world’s most capable cyber actors, an assessment that is based on its wide range of infrastructure and strategies and the advanced technologies that the U.S. is known to employ.²⁵

Readiness

Because of the lack of open-source reporting, it is also nearly impossible to assess the readiness of America’s cyber forces. The U.S. Government Accountability Office has identified some issues of training consistency in the past.²⁶ Standardizing and improving training is one of the main priorities for U.S. Cyber Command, along with retaining its talent, and both are critical to maintaining readiness.

Conclusion

Cyber is a key domain for the U.S. military. It also is increasingly important and expansive in the modern world generally. As seen in the various breaches and ransomware attacks that have come to light, cybersecurity for defense extends well beyond the Department of Defense. For the Joint Force, cyber supports military capabilities both by ensuring that U.S. forces can operate in cyberspace without disruption and as a tool on its own to achieve goals.

U.S. Cyber Command is the primary organization for the full spectrum of military cyber operations, and it has grown as an organization, reaching full operating capability in 2018. Now that USCYBERCOM has reached its authorized manning levels, the emphasis has shifted to training the force to ensure that in the coming years, it will be as capable as possible in helping to advance and protect the nation’s interests.

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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 it should be, and is burdened by readiness levels that are more problematic than they should be. 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 *2022 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. In other words, the Army is aging faster than it is modernizing. It remains “weak” in capacity with 62 percent of the force it should have but has significantly increased the readiness of the force, scoring the highest level of “very strong.” 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 *2022 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 2021, 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 that is needed to make more ships available. Funding to improve any of these serious deficiencies remains problematic.
- **Air Force as “Weak.”** The USAF scores “marginal” in capacity and capability but has dropped to “weak” in readiness. Retirement of aircraft is outpacing the introduction of new aircraft, worsening the service’s capacity problem. 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 “Strong.”** The score for the Marine Corps was raised to “strong” from “marginal” for two reasons: (1) because the *2021 Index* changed the threshold for capacity, 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

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

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

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				✓	

ready for a broad range of smaller crisis-response tasks, and (2) because of the Corps' extraordinary efforts to modernize (which improves capability) and enhance its readiness during the assessed year. However, in the absence of additional funding in FY 2022, the Corps intends to reduce the number of its battalions even further from 24 to 21, and this reduction, if implemented, would harm the Corps' overall ability to perform the role it has set for itself: enabling the projection of naval power into heavily contested combat environments. The service has moved ahead aggressively with a redesign of its operating forces and the acquisition of new warfighting tools, but it remains hampered by old equipment and problematic funding.

- **Space Force as “Weak.”** 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. The *2021 Index* provided an overview of the new service, explaining its mission, capabilities, and

challenges, but did not offer an assessment. With an additional year to gain more insight, the *2022 Index* scores the USSF as “weak” in all measured areas. The service has done quite well in transitioning missions from the other services without interruption in support, but it does not have enough assets to track and manage the explosive growth in commercial and competitor-country systems being placed into orbit. The majority of its platforms have exceeded their planned life span, and modernization efforts to replace them are slow and incremental. The force also lacks defensive and offensive counter-space capabilities.

- **Nuclear Capability as “Strong” but Trending Toward “Marginal” or even “Weak.”** The U.S. nuclear enterprise rates a score of “strong” primarily because of the serious attention it has received during the past couple of years. There has been strong, largely bipartisan political support for modernizing warheads, delivery platforms, command and control systems, and supporting infrastructure

U.S. Military Power

	VERY WEAK	WEAK	MARGINAL	STRONG	VERY STRONG
Army			✓		
Navy			✓		
Air Force	✓				
Marine Corps				✓	
Nuclear				✓	
Space	✓				
OVERALL			✓		

and for the development of essential personnel. However, it should be emphasized that the U.S. must maintain its commitment and allocate resources accordingly. Without this sustained commitment, the overall score for America's nuclear capability will degrade rapidly to "weak."

In the aggregate, the United States' military posture is rated "marginal." The 2022 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 major regional contingencies.

In general, 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 the failure of resources to keep pace with inflation leads to cancellations, truncation, or delay. The services have 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.

Mounting U.S. federal debt and creeping inflation will pressure defense accounts further at a time when competitor countries like China and Russia are redoubling their efforts to expand and improve their military forces. If it continues on this trajectory, the U.S. risks falling very short in its ability to secure its core national interests.

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
AFCYBER	U.S. Air Force Cyber Command
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
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
ARCYBER	U.S. Army Cyber Command
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
ASUW	anti-surface warfare
ASW	anti-submarine warfare
AUSMIN	Australia–United States Ministerial
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	conventional takeoff/barrier landing
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	counterintelligence
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
CMF	Cyber Mission 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
DDOS	distributed denial of service
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
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
EMD	engineering and manufacturing development
EMP	electromagnetic pulse
EOD	explosive ordnance disposal
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
FLTCYBER	U.S. Navy Fleet Cyber Command
FOC	full operational capability
FONOP	freedom of navigation operation

FRAGO	fragmentary order
FSTM	full spectrum training miles
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
IMF	International Monetary Fund

INDOPACOM	U.S. Indo-Pacific Command
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
JeM	Jaish-e-Mohammed
JLTV	Joint Light Tactical Vehicle
JOAC	Joint Operational Access Concept
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
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 missile
LRDR	long range discrimination radar
LRIP	Low-Rate Initial Production
LRS-B	Long-Range Strike Bomber
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
MARFORCYBER	U.S. Marine Corps Forces Cyberspace Command
MARFOREUR	U.S. Marine Corps Forces Europe
MARFOPAC	U.S. Marine Corps Forces, Pacific
MARSOC	U.S. Marine Corps Special Operations Command
MCM	mine countermeasure (ship)
MCMV	mine countermeasure vessel (ship)
MCO	major combat operation (see MRC, MTW)
MDAP	Major Defense Acquisition Program
MDO	multi-domain operations
MDT	mutual defense treaty
MDTF	Multi-Domain Task Force
MEB	Marine Expeditionary Brigade
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MIRV	multiple independently targetable reentry vehicle
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
MRAP	Mine-Resistant Ambush-Protected (vehicle)
MRBM	medium-range ballistic missile
MRC	major regional conflict (see MTW, MCO)
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
NDAA	National Defense Authorization Act
NDN	Northern Distribution Network
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
NSA	National Security Agency
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
O-FRP	Optimized Fleet Response Plan
OIF	Operation Iraqi Freedom

OMFV	optionally manned fighting vehicle
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
OT&E	operational test and evaluation
OTFSTM	Operating Tempo Full Spectrum Training Miles

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
PFLP	Popular Front for the Liberation of Palestine
PFLP-GC	Popular Front for the Liberation of Palestine-General Command
PGM	precision-guided munition
PIM	Paladin Integrated Management
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	People's Liberation Army Rocket Force
PLASSF	People's Liberation Army 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 grenade

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
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
TPP	Tehrik-e-Taliban Pakistan

U

UAE	United Arab Emirates
UAV	unmanned aerial vehicle
UCCLASS	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
USAREUR	U.S. Army Europe
USARPAC	U.S. Army Pacific
USASOC	U.S. Army Special Operations Command
USCYBERCOM	U.S. Cyber 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 that power 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. We understand that 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, but we also 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, using only quantitative metrics to assess

military power or the nature of an operating environment 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 economic, diplomatic, and 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.
- 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. Though they are not scored according to the stated metrics, the chapter on military power includes explanatory overviews of U.S. ballistic missile defense, cyber, and space capabilities.

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 the four regional characteristics that are 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 because 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 successes in critical “first battles” more quickly. Being routinely present in a region also helps the U.S. to maintain

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.

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 the adequacy of American military power, *Index* staff and outside reviewers, working independently, evaluated the threats according to their level of provocation (i.e., 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 span.
- Whether the required capability is being met by legacy or modern equipment.
- The scope of improvement or replacement programs relative to the operational requirement.

- 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:** Over 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 made up of legacy platforms.
- Strong:** 20 percent–39 percent of capability is made up of legacy platforms.
- Very Strong:** Less than 20 percent of capability is made up of 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; lacks sufficient investment to advance; cost overruns include 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 capacity, the Army, Navy, and Air Force (be it end strength or number of platforms) are 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; see the explanatory note below and a more expanded discussion within the

Corps' specific assessment.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; it relies instead 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. 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 July 20, 2021).
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.

The Honorable John F. Lehman

We are honored to dedicate the *2022 Index of U.S. Military Strength* to the Honorable John F. Lehman.

From 1981 to 1987, Dr. Lehman served as Secretary of the U.S. Navy. As the chief executive of the Navy, he was responsible for the management of 1.2 million people, an annual budget of \$95 billion and total assets equivalent to those of the seven largest Fortune 500 corporations combined. Prior to being appointed Secretary of the Navy, Dr. Lehman served as president of the aerospace consulting firm Abington Corporation, a delegate to the Mutual Balanced Force Reductions negotiations, Deputy Director of the Arms Control and Disarmament Agency, and a senior staff member to Dr. Henry Kissinger at

the White House. For more than two decades, Dr. Lehman flew various tactical aircraft for the Naval Reserve.

Previously, he has served on the boards of Ball Corporation, TI Group plc, Westland Helicopter plc, Sedgwick plc and many of JFLCO's investments. He is also Chairman of the Princess Grace Foundation and an Overseer of the School of Engineering at the University of Pennsylvania. Previously, he was also a member of the 9/11 Commission and the National Defense Commission.

A native of Pennsylvania, Dr. Lehman earned a BS from St. Joseph's University, a BA and MA from Cambridge University, and a PhD from the University of Pennsylvania.



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