
CSBA
Center for Strategic and Budgetary Assessments
FORCE PLANNING FOR THE ERA OF GREAT POWER COMPETITION
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1) Photo of an X-47B unmanned aerial vehicle. Image courtesy of DARPA.

2) Artist's concept of a future penetrating bomber.

3) USS Millinocket (JHSV-3) underway in May 2015. U.S. Navy photo by MCC Christopher E. Tucker.

4) Photo of an Echo Ranger extra-large displacement unmanned undersea vehicle. Image courtesy of Boeing.

5) The U.S. Army successfully fired a Miniature Hit-to-Kill (MHTK) missile as part of an Engineering Demonstration of the Indirect Fire Protection Capability Increment 2-Intercept (IFPC Inc 2-I). U.S. Army photo by Michael Smith.

6) Two U.S. special operations soldiers in Tbilisi, Georgia, August 15, 2016. U.S. Army photo by Staff Sgt. Marcus Fichtl.

Map data (South China Sea and Suwalki Gap/Eastern Europe) courtesy of Google Maps

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# Introduction and Executive Summary

The Department of Defense (DoD) has finally acknowledged that America's military is on the path toward becoming a hollow force. According to the Chairman of the Joint Chiefs of Staff General Joseph Dunford, "Without sustained, sufficient, and predictable funding, I assess that within 5 years we will lose our ability to project power; the basis of how we defend the homeland, advance U.S. interests, and meet our alliance commitments."[1] Reasons cited for this hollowing include years of budget cuts that forced DoD to make harmful tradeoffs between its modernization programs and the size and readiness of its forces. It is also true that planning priorities adopted by the Pentagon over the last 25 years, including its force planning constructs (FPC), delayed modernization programs and inhibited the development of new operating concepts needed to prepare for conflicts with resurging great power competitors.

DoD periodically updates its force planning construct, which defines the number, types, and frequency of operations the U.S. military should be sized and shaped to support in the future. FPCs also include baseline operating concepts and assumptions to guide the force development planning of the Service departments and other defense components.[2] Many FPCs adopted by DoD since the end of the Cold War perpetuated concepts and assumptions that contributed to the hollowing of the U.S. military. Moreover, a number of these constructs were designed to justify desired cuts to defense spending, rather than provide a baseline for assessing requirements to support DoD's National Defense Strategy.

In 1993, DoD adopted a "building block" FPC that required its components to prepare for two regional conflicts roughly analogous to Operation Desert Storm. The baseline concept of operations (CONOPS) underpinning this and several subsequent FPCs required U.S. forces to

1 Joseph F. Dunford Jr., Chairman of the Joint Chiefs of Staff, "Posture Statement of 19th Chairman of the Joint Chiefs of Staff before the 115th Congress House Armed Services Budget Hearing," June 12, 2017, available at http://docs.house.gov/meetings/AS/AS00/20170612/106090/HHRG-115-AS00-Wstate-DunfordJ-20170612.pdf.

2 For example, FPCs include personnel rotation guidelines for long-term operations and assumptions for reserve component mobilization timing that impact DoD's capability and capacity requirements.

deploy to two theaters nearly simultaneously to deter regional aggressors and, if necessary, to conduct operations to rapidly halt one or more conventional invasions of U.S. ally or partner states. The CONOPS assumed that U.S. forces would have near-unimpeded access to regional bases, would possess or rapidly achieve air superiority, and could operate in littoral waters nearly unopposed. It also assumed that regional conflicts would proceed slowly enough for sufficient U.S. forces to arrive in a theater before an aggressor could complete its offensive and consolidate its gains.

Desert Storm-like CONOPS and associated assumptions influenced DoD's force structure and capability priorities well beyond their expiration date. They are now an inadequate template for the U.S. military's future force planning, given the emergence of anti-access/area-denial (A2/AD) complexes that can threaten U.S. forces at long range and the growing ability of China and Russia to complete acts of aggression against their neighbors rapidly. In other words, a "more of the same" planning approach will not create a future force that is capable of projecting power effectively into threat environments where "every operating domain—outer space, air, sea, undersea, land and cyberspace—is contested."[3] A better choice for DoD would be to develop an FPC that is based on operating concepts, assumptions, and planning scenarios for great power aggression. These concepts, assumptions, and scenarios should reflect the new warfighting strategies that China and Russia have adopted to further erode America's ability to project power. This FPC should provide the basis for assessing changes to the size and capabilities mix of the future U.S. joint force, much of which is still equipped with weapon systems that are at parity or even overmatched in some mission areas by the capabilities of great power competitors.

## Report Purpose and Scope

In 2013, CSBA released a report that proposed a framework for assessing capabilities that could help offset A2/AD threats and support DoD's strategic shift toward the Asia-Pacific region.[4] The report traced how post-Cold War FPCs driven by near-term operational requirements and the desire for defense budget cuts, loosely called "peace dividends," were partially responsible for a U.S. military that lacked sufficient modernized forces to keep pace with China and Russia. Many of these FPCs were based on assumptions about projecting power that were derived from conflicts of the past rather than assessments of the emerging

3 "Our adversaries are modernizing their militaries to exploit our vulnerabilities. If all we do is buy more of the same, it is not only a bad investment; it is dangerous. We must rethink how our military projects power, invest in new capabilities, and devise new ways of operating." John McCain, *Restoring American Power*, defense white paper (Washington, DC: U.S. Senate, Senate Armed Services Committee, January 16, 2017), p. 3, available at http://www.mccain.senate.gov/public/_cache/files/25bff0ec-481e-466a-843f-68ba5619e6d8/restoring-american-power-7.pdf. Secretary of Defense James N. Mattis, as quoted by Jim Garamone, "Mattis Says DoD Needs Years to Correct Effects of Sequestration," *DoD News*, June 13, 2017, available at https://www.defense.gov/News/Article/Article/1213034/mattis-says-dod-needs-years-to-correct-effects-of-sequestration/.

4 Mark Gunzinger, *Shaping America's Future Military: Toward a New Force Planning Construct* (Washington, DC: Center for Strategic and Budgetary Assessments, 2013).

operating environment. These assumptions, along with budget cuts and the need to maintain readiness for overseas contingency operations, stifled defense innovation and delayed critical modernization programs.

This report recommends DoD create planning scenarios, operating concepts, force postures, and capability priorities that could enhance, in the words of Secretary of Defense James Mattis, "the lethality of the joint force against high-end competitors and the effectiveness of our military against a broad spectrum of potential threats."[5] The report also proposes an approach to sizing the force to support new operating concepts and meet the demands of protracted, low-intensity confrontations with great power competitors and their proxies. In combination, new operating concepts and a different mix of capabilities could help close the gap between DoD's strategy and its resources. Although this report does not propose a new strategy for DoD, it is intended to help inform the development of DoD's new National Defense Strategy and its next force planning construct.

## Recommendation: Address China's and Russia's New Warfighting Strategies

The resurgence of great power competition suggests it is time for DoD to adapt its force planning to account for new warfighting strategies adopted by China and Russia.[6] China and Russia are great powers with substantial nuclear arsenals, large economies, and military capabilities that, in some cases, are on par with those of the United States. Both have adopted new warfighting strategies that include actions and operations undertaken in peacetime to achieve their long-term ambitions, which include expanding their influence over their near abroad and undermining U.S. influence in their regions. These multi-dimensional peacetime actions include China's infrastructure development and financial investment in strategically important countries,[7] Russia's control of energy supplies to its neighbors,[8] and assistance to proxy

5 James N. Mattis, "Implementation Guidance for Budget Directives in the National Security Presidential Memorandum on Rebuilding the U.S. Armed Forces," memorandum to DoD leadership, January 31, 2017, available at https://media.defense.gov/2017/Feb/01/2001693094/-1/-1/0/DDD-170201-373-002. DoD's *National Defense Strategy* will include a force planning construct that supports this objective.

6 China and Russia are two of the five major challenges that DoD leaders now say "most clearly represent the challenges facing the U.S. military. They serve as a benchmark for our [DoD's] global posture, the size of the force, capability development, and risk management." Dunford, "Posture Statement of 19th Chairman of the Joint Chiefs of Staff," p. 2.

7 One Belt, One Road envisions a network of land (One Belt) and sea (One Road) routes forming a Eurasian economic infrastructure. To realize its ambitions, China plans to invest some $4 trillion, or roughly 30 times what the United States invested in the Marshall Plan. See "Our Bulldozers, Our Rules," *The Economist*, July 2, 2016, available at http://www.economist.com/news/china/21701505-chinas-foreign-policy-could-reshape-good-part-world-economy-our-bulldozers-our-rules; and Xie Tao, "Is China's 'Belt and Road' a Strategy?" *The Diplomat,* December 6, 2015, available at http://thediplomat.com/2015/12/is-chinas-belt-and-road-a-strategy/.

8 Damien Sherkov, "Gas in Europe: Fuel Supply Threatened By U.S. Sanctions, Warns Russia," *Newsweek*, June 21, 2017, available at http://www.newsweek.com/gas-europe-fuel-supply-threatened-us-sanctions-warns-russia-628022.

states such as Syria.[9] DoD planners should consider these peacetime actions as part of China's and Russia's overarching military strategies. In other words, their new strategies include a *continuum* of activities undertaken in peacetime, such as small-scale "gray zone" operations, that are designed to avoid inciting a major U.S. military response.

### FPC scenarios should address Informationized Warfare and New Generation Warfare

China and Russia have both adopted forms of Informationized Warfare as the core of their warfighting strategies. Informationized Warfare has been characterized as: "warfare where there is widespread use of informationized weapons and equipment and networked information systems, employing suitable tactics, in joint operations in the land, sea, air, outer space, and electromagnetic domains, as well as the cognitive arena."[10] Unlike industrial-age warfare of the past that sought to defeat an enemy by attriting its means to fight, the primary target of China's Informationized Warfare strategy is the decision-making of an enemy's leadership.[11] Shaping the information domain in peace and achieving information dominance in war are the main lines of effort in Informationized Warfare. Russia's new military strategy, which is often called "New Generation Warfare" by Russian military experts, also uses propaganda, proxy and paramilitary troops, and material support to create pro-Russian movements in its near abroad. Preparing for major conflicts with enemies whose central focus is to gain and maintain information dominance will require changes to DoD's operating concepts, capabilities mix, and force structure. Including conflict scenarios for Informationized Warfare and New Generation Warfare in DoD's next FPC would provide a baseline to assess these changes.

### DoD should plan for long-term competitions with China and Russia

Relationships between the United States and other great powers can be viewed as long-term competitions in which China and Russia both seek to shape regional and international norms

9 Jane Onyanga-Omara and John Bacon, "Russia, China Veto U.N. Plan for Syrian Sanctions," *USA Today*, February 28, 2017, available at https://www.usatoday.com/story/news/world/2017/02/28/un-resolution-syria/98518510/.

10 Dean Cheng, Senior Research Fellow, Asian Studies Center, Davis Institute for National Security and Foreign Policy, "Information Dominance: The Importance of Information and Outer Space in Chinese Thinking," testimony to the House Foreign Affairs Committee, April 26, 2017, p. 3, available at http://docs.house.gov/meetings/FA/FA05/20170426/105885/HHRG-115-FA05-Wstate-ChengD-20170426.pdf. Chinese military sources have described Informationized warfare as "an asymmetric way to weaken an adversary's ability to acquire, transmit, process, and use information during war and to force an adversary to capitulate before the onset of conflict." Office of the Secretary of Defense (OSD), *Military and Security Developments Involving the People's Republic of China 2017*, Annual Report to Congress (Washington, DC: DoD, May 15, 2017), p. 58. For Russia, see Michael J. Mazarr, *Mastering the Gray Zone: Understanding a Changing Era of Conflict* (Carlisle, PA: Strategic Studies Institute, 2015), p. 4; and Hal Brands, "Paradoxes of the Gray Zone," Foreign Policy Research Institute, *E-Notes*, February 5, 2016, available at www.fpri.org/article/2016/02/paradoxes-gray-zone/.

11 Fan Gaoming, "Public Opinion Warfare, Psychological Warfare, and Legal Warfare: the Three Major Combat Methods to Rapidly Achieving Victory in War," *Global Times* [Chinese], March 8, 2005, available at http://big5.xinhuanet.com/gate/big5/news.xinhuanet.com/mil/2005-03/08/content_2666475.htm, as cited in Cheng, "Information Dominance," p. 4.

in their favor, in part by undermining U.S. influence in their regions.[12] Their military strategies are evolving to incorporate "peacetime" activities as part of their long-term efforts to achieve these objectives. Informationized Warfare and New Generation Warfare combine non-military diplomatic, information, and economic actions with low-intensity gray zone military operations supported by high-end military capabilities to gain influence and territory without having to escalate to a major conflict. DoD should address this spectrum of activities within its FPC planning scenarios rather than consider them as separate peacetime activities.[13] Because China's and Russia's strategies seek to achieve their objectives without significant escalation, DoD's planning scenarios should address sustained low-intensity military operations that do not rise to the level of conflict that U.S. forces have traditionally prepared for. In short, if great power aggressors intend to avoid creating a pretext for an intense, large-scale U.S. military response, focusing DoD's planning on large-scale attrition warfare of the past could create a future force that is optimized for the wrong fight.

### DoD should plan for operations in the gray zone

Conflict in the gray zone has been described as an "intense political, economic, informational, and military competition . . . short of conventional war."[14] Gray zone actions can include combinations of information operations, cyberattacks, electronic warfare (EW), paramilitary operations, and limited strikes in targeted areas. Russia's gray zone aggression in Crimea and eastern Ukraine is part of its long-term campaign to discredit the North Atlantic Treaty Organization (NATO) and regain influence over former Soviet and Warsaw Pact states. China has used its coast guard and paramilitary naval forces to expand its influence in the South and East China Seas and erode ally and partner confidence in the United States as a regional security guarantor. Incorporating similar scenarios in DoD's FPC would require planners to develop concepts and capabilities that could better prepare the U.S. military to operate in the gray zone without escalating to a major conflict.

## Recommendation: Shape and Size the Force for the Era of Great Power Competition

The need to plan for long-term competitions and gray zone aggression does not obviate the need for DoD to organize, train, and equip its forces for large-scale combat operations. The emerging military strategies of China and Russia are partly in response to U.S. conventional

12 Hal Brands and Eric S. Edelman, *Why is the World So Unsettled? The End of the Post-Cold War Era and the Crisis of Global Order* (Washington, DC: Center for Strategic and Budgetary Assessments, 2017), pp. 11–15.

13 These scenarios should be supported by net assessments of technology trends as part of an overall evaluation of the military balance between the United States and its great power competitors. Net assessments should identify opportunities to develop operating concepts and new technologies that would create advantages for the U.S. military or exploit the weaknesses of its competitors.

14 Joseph L. Votel, Charles T. Cleveland, Charles T. Connett, and Will Irwin, "Unconventional Warfare in the Gray Zone," *Joint Forces Quarterly* 80, 1st quarter, 2016, p. 102.

superiority. If DoD shifts its planning and resource priorities entirely to peacetime competitions and low-intensity, smaller-scale scenarios, the subsequent erosion of its conventional military superiority may incentivize China and Russia to escalate confrontations with their neighbors.

This said, post-Cold War FPCs that centered on two major conflict scenarios are inadequate templates for DoD's force planning activities in the era of great power competition. Including various combinations of the following "pacing" scenarios in DoD's next FPC would provide its components with a better baseline for assessing new operating concepts, capability mixes, and force capacities needed in the future:

- Multiple, simultaneous, long-duration operations requiring force rotations;
- Scenarios for Chinese and Russian aggression in the gray zone;
- Large-scale Informationized Warfare conflicts with China;
- Large-scale New Generation Warfare conflict scenarios with Russia against one or more former Soviet states, including the highly vulnerable Baltic states; and
- Catastrophic homeland defense events.

Concepts, capabilities, and forces needed for combinations of these scenarios should then be stressed against other contingencies, such as conflicts with lesser state aggressors and long-term counter-terror operations. It is important to emphasize that multiple long-duration operations that require regular force rotations could create capacity requirements that exceed requirements to support short-duration surges to two major conventional conflicts (MRCs, or major regional contingencies). This is a reversal from some post-Cold War FPCs that assumed a joint force that is fully resourced for surges to two MRCs would also be capable of supporting smaller-scale contingencies (SSC) and other long-term operations.

## Recommendation: Create Regional Force Postures to Better Offset A2/AD Threats

DoD's current overseas posture, which consists of permanently stationed and rotationally deployed forces in Europe, the Pacific, the Middle East, and other regions, has a significant impact on its force structure requirements. Accordingly, DoD should consider posture changes that are needed to sustain regional deterrence and respond to future crises as it creates a new FPC.

During the Cold War, the United States maintained a large standing force in Europe to deter a major Warsaw Pact invasion. After the Cold War, DoD cut or redeployed many of its overseas forces to garrisons in the United States and created much smaller regional postures in Europe and the Pacific to maintain forward presence. The shift to forward presence was based in part on the assumption that U.S.-based forces could quickly deploy to distant theaters in response

to threatened or actual acts of aggression by a regional power. China, Russia, and other adversaries learned from Desert Storm that affording the United States the time and space needed to assemble a large force on their borders was a recipe for defeat. This is part of their rationale for creating A2/AD complexes that could prevent timely U.S. military interventions.

Creating force postures in Europe and the Pacific that are better capable of countering great power A2/AD threats and their initial offensive actions could deny great powers from achieving the objectives of their aggression. Moreover, postures to defend forward would increase U.S. options to escalate horizontally relative to current postures that require significant reinforcements from the U.S. homeland, which could be escalatory in a vertical sense. Rather than simply recreate Cold War postures that were designed to deter large conventional military invasions, DoD should forward-station additional land- and sea-based air and missile defenses, precision fires, and electromagnetic warfare (EMW) capabilities that would help counter A2/AD threats. These forward-stationed forces should be complemented by periodic rotational deployments of additional forces and quick-response long-range surveillance and strike systems that are based in lower threat areas.

## Recommendation: Develop New Operating Concepts for the Future Force

Many FPCs resulting from DoD's post-Cold War strategic reviews were driven more by pressures on the defense budget than by considered assessments of alternative defense strategies, emerging threats, and new technologies. This had the effect, even if unintended, of reinforcing existing operating concepts and force structures. The beginning of a new administration provides an opportunity for DoD to adopt a force planning approach that encourages innovation. This approach should require planners to assess operating concepts and technologies that have the potential to maintain the U.S. military's competitive advantages before determining capacities needed to support the National Defense Strategy. The next four sections identify candidate concepts and capabilities DoD should consider as it develops its next FPC.

## Shaping Future Combat Air Forces

**Air superiority operations.** Over the last 25 years, adversaries have developed operating concepts and capabilities to prevent U.S. forces from dominating the air domain. Gaining sufficient air superiority to execute joint and combined operations in contested environments is more than a matter of procuring improved versions of what are now considered "fighter" aircraft. A future family of penetrating counterair systems could include manned and unmanned platforms with all-aspect broadband stealth, long-range sensors, secure networked connectivity, and the capacity to carry large payloads of long-range air-to-air weapons.[15]

15 See John Stillion, *Trends in Air-to-Air Combat: Implications for Future Air Superiority* (Washington, DC: Center for Strategic and Budgetary Assessments, April, 2015).

Teams of stealthy Unmanned Combat Air Systems (UCAS) and manned aircraft could fly combat air patrols (CAP) to defend friendly penetrators, intercept enemy strike aircraft before they can launch their weapons, and perform other counterair missions. A family of penetrating counterair systems should also have the ability to cue long-range air-to-air weapons launched by large-payload, non-penetrating "arsenal" planes. This could increase the density of air-to-air weapons in contested areas while "maximizing tradeoffs between range, payload, survivability, lethality, affordability, and supportability."[16]

**Change operating concepts and force postures to maintain an advantage in the salvo competition.** Continuing to rely almost exclusively on operating combat aircraft from airbases and aircraft carriers that are located in areas covered by Chinese and Russian A2/AD envelopes could greatly reduce the size of U.S. strikes in future salvo competitions.[17] Shifting toward using theater airbases that are located out of range of most great power missile threats would improve the U.S. military's ability to generate ISR (intelligence, surveillance, and reconnaissance) and strike sorties. This shift would take advantage of the U.S. military's long-range combat air forces that are more fuel-efficient than air forces operated by China and Russia. Moreover, instead of allocating large numbers of smaller-payload, shorter-range fighters to conducting strikes over long ranges, the U.S. military should preferentially use them for counterair operations. These fighters should be capable of conducting distributed operations from networks of military, civilian, and expeditionary forward operating locations instead of concentrating at a small number of theater main operating bases (MOB), as is presently the case.

**Global "swing" forces to deter or deny great power aggressors.** DoD's force capacity shortfalls will likely exist for some time even under the most optimistic defense budget projections. Given this reality, the Air Force, Navy, and Marine Corps should develop joint operating concepts to quickly redeploy elements of their forces between geographically separate theaters to deter or prevent a second aggressor from achieving its objectives. Swinging forces between theaters to deter or respond to great power aggression will likely require weapon systems that are capable of gaining access and operating effectively in A2/AD threat environments. For instance, a future swing force could consist of long-range, penetrating ISR and strike aircraft, carrier-launched stealth unmanned combat aerial vehicles (UCAV), and embarked elements of a Marine air-ground task force (MAGTF) that are capable of theater entry operations.

**Airbase air and missile defense operations.** New operating concepts and capabilities could increase the U.S. military's ability to defend airbases that are located inside enemy A2/AD envelopes. Penetrating long-range ISR and strike aircraft could help reduce the size of an adversary's salvos by suppressing its military airfields, missile transporter erector launchers (TEL), and weapons resupply infrastructure. Other left-of-launch operations could include

16 U.S. Air Force, *Air Superiority 2030 Flight Plan* (Washington, DC: Headquarters, U.S. Air Force, May 2016), p. 5.

17 "Salvo competition" describes the dynamic between two militaries that each have PGMs and precision defensive capabilities. In salvo competitions, combatants seek to gain advantages by improving their capabilities to attack with precision and defend against precision strikes. See Mark Gunzinger and Bryan Clark, *Sustaining America's Precision Strike Advantage* (Washington, DC: Center for Strategic and Budgetary Assessments, 2015).

using fighters to intercept enemy aircraft before they reach their weapons release points. High-capacity, medium-range ground-based defenses, coupled with active and passive counter-C3ISR (command, control, communications, intelligence, surveillance, and reconnaissance) operations, could dissuade an enemy from launching some airbase attacks that it perceives to be too difficult or too costly.

**Close air support (CAS) operations.** Rather than simply replacing its existing A-10 CAS aircraft, DoD should first develop and assess new operating concepts for performing CAS in all threat environments. These concepts should team precision-enabled manned and unmanned air forces to provide integrated close air support. Considering that many CAS missions might occur in permissive or semi-permissive conditions, DoD should assess opportunities to create a "high-low" mix of CAS-capable systems that includes non-developmental aircraft that cost less to procure and operate than high-performance fighters. New operating concepts should also address how precision surface-to-surface fires could be integrated with airborne assets to provide more persistent close air support in contested and permissive areas.

## Capacity implications

America's combat air forces are far smaller than the force that was ready to respond to Operation Desert Storm in 1991. Additional upgrades to existing combat aircraft may help regain some capacity that has been lost to the budget axe. Given the age and diminished size of the force, however, it is highly unlikely that upgrades alone will maintain America's competitive advantage in the air. Moreover, continuing to pursue modernization programs at the expense of force size is an unwise choice. The Air Force has said that it needs to procure at least 100 new stealth bombers and modestly increase the size of its fighter force to 60 squadrons to meet future operational requirements. The Navy requires manned and unmanned systems with greater range and survivability to ensure its aircraft carriers remain relevant against the militaries of China and Russia, and the Marine Corps must replace its aging combat aircraft. DoD analyses of the great power conflict scenarios recommended in this report are likely to conclude the U.S. military now needs a combat air force that is much larger and has a mix of capabilities that is much different than is presently the case. Analyses alone, however, will not suffice to maintain America's comparative advantages in the air domain. It will also require years of increased resources sufficient to reverse the harm caused by years of budget cuts.

In summary, decisions to prematurely terminate major modernization programs, including the procurement of stealthy B-2s and F-22s, have resulted in a force mix that is now mostly incapable of operating in contested airspace. DoD has also allowed an imbalance between its short- and long-range combat air forces to develop over the last 25-years. Increasing the number of long-range, penetrating ISR and large-payload strike aircraft in the force could help offset the growing threat of air and missile attacks on U.S. airbases in the Pacific and Europe. A future mix of next-generation unmanned and manned aircraft capable of teaming to perform multiple operations could help maintain DoD's overmatch in the air. Combat aircraft for air superiority and strike will need larger payloads, greater range and persistence, and

improved survivability to operate against challenging target sets located in contested areas. Future CAS systems could include armed unmanned aircraft systems (UAS) and even swarms of collaborative, autonomous weapons that loiter in the battlespace, detect targets, and coordinate their attacks with other systems.

## Shaping Future Naval Forces

**Revised force posture.** Today, the U.S. naval fleet generally uses a "one-size-fits-all" approach to force deployment, with naval posture in important regions such as the Middle East or Western Pacific centered on large traditional U.S. naval formations such as carrier strike groups (CSG) and amphibious readiness groups (ARG). If deployed forward near enemy territory, these formations could be suppressed by prompt, high-volume fires from Russian or Chinese A2/AD complexes because, even if they avoid catastrophic damage, aircraft carriers (CVN) and amphibious assault ships (LHA/LHD) would be constantly maneuvering and unable to sustain flight operations. Naval forces cannot, however, simply remain outside waters contested by A2/AD networks. Chinese and Russian regional objectives, such as the Senkaku Islands or the Baltic states, are close enough to their borders to allow an invasion or other act of aggression to succeed unless sufficient U.S. and allied forces are in a position to quickly respond.

Instead of mainly operating in CSGs and ARGs, naval forces should be separated into forward-postured Deterrence Forces of submarines, surface combatants, and unmanned vehicles that rely on missiles for defensive and offensive fires; CSGs and ARGs should be postured in a Maneuver Force outside littoral areas such as the East and South China Seas or Mediterranean. This separation of naval forces would enable surface warships to shift to more efficient self defense, rather than area defense, against air threats. This division of forces would also exploit the missile-based offensive fires that would be needed to promptly counter aggression. Given the threat of A2/AD networks in a conflict, Deterrence Forces would be expected to rapidly expend their missiles and withdraw. These first actions would be essential to slowing an enemy advance. Maneuver Forces of CSGs and ARGs would be able to swing between theaters to reinforce or replace Deterrence Forces in a conflict. When CSGs and ARGs arrive, the A2/AD threat could be reduced, or at least would be better understood, enabling more sustained naval air operations. Perhaps more importantly, this revised force posture would better enable naval forces to contribute to conventional deterrence by countering gray zone confrontations at the time and place they occur. The Navy's current posture requires these forces to deploy from outside the theater to intervene, which would delay a crucial response and could be highly escalatory.

**Distributed operations.** Naval forces, particularly those postured forward in Deterrence Forces, would need to operate in distributed formations to improve their offensive capacity and survivability. Surface combatants and submarines operating independently from CSGs and ARGs would be able to reallocate some vertical launch system (VLS) magazine capacity to offensive, instead of defensive, weapons. Distributed naval forces would enable better

targeting coverage across the theater for offensive weapons, and, in the early phases of a conflict, they could execute rapid, widely dispersed, attacks before the enemy is able to suppress or eliminate them. Distributed surface formations would also improve the defenses of naval forces by increasing the number of potential targets that enemies would have to attack, improving the ability of decoys to mimic actual U.S. forces, and requiring more time to be defeated in detail.

**Air and missile defense.** U.S. naval air defense concepts and capabilities should focus on increasing the enemy's required salvo size or cost to undertake an offensive operation rather than on completely defeating small numbers of enemy weapons. Surface combatants should shift the focus of their air defenses to medium-range (10–30 nm) threat engagements, which would enable the use of smaller interceptors that can be carried in larger numbers, as well as line-of-sight defenses such as EW systems and directed energy weapons that have deep magazines (but are limited in range by the horizon). Surface combatants operating separately from CSGs and ARGs could rely to a much greater degree on high-capacity, short-range air defenses, increasing the salvo size needed to defeat them.

**EMS (electromagnetic spectrum) warfare.** Because naval forces will have to operate close to an aggressor, even improved missile defenses may not be enough to protect them from large or sophisticated missile salvos. The U.S. fleet will need to improve its position in the salvo competition by fielding capabilities to further degrade an enemy's ability to find and target U.S. ships and mobile forces ashore and by preparing to use decoys and other countermeasures to increase the number of weapons an enemy must use for its attacks. These operating concepts and capabilities are a significant part of the Navy's concept for Electromagnetic Maneuver Warfare (EMW).

**Undersea warfare.** U.S. naval forces will need to adopt new concepts and capabilities for offensive and defensive anti-submarine warfare (ASW), undersea warfare, and mine warfare. Due to the long ranges of enemy anti-air and anti-ship weapons above the water, U.S. offensive ASW operations in an enemy's home waters should rely on unmanned sensors and rapid attacks by penetrating aircraft or missiles. Because Chinese and Russian submarines are becoming quieter and carry anti-ship cruise missiles (ASCM) with increased range and lethality, defensive ASW to protect U.S. forces will need to focus on suppressing enemy submarines and preventing them from getting into launch positions rather than on trying to destroy them.

Offensively, given the relatively limited payloads of submarines and unmanned undersea vehicles (UUV), it would be better to use them for operations where salvos of smaller weapons or vehicles would be sufficient. For example, undersea platforms could launch small jammers or decoy missiles to enhance the survivability of penetrating aircraft or strike weapons launched from other platforms. Undersea platforms could also exploit the limited capacity and immaturity of torpedo defenses by conducting torpedo attacks against ships or infrastructure. Future forces conducting offensive mining, a low priority for the Navy since the end of the Cold War, could use larger unmanned vehicles to enhance their covertness. The Navy should also shift

toward using small, multi-mission autonomous undersea vehicles that can precisely position themselves, recognize targets, and then move to engage them.

**Addressing gray zone confrontations.** Russia and China are incrementally gaining territory and regional influence through slow-motion, low-intensity aggression against their neighbors. Russia supports proxy and paramilitary separatist forces in eastern Ukraine and protest movements in Latvia that seek autonomy and allegiance with Russia. China continues to build islands in the South China Sea and prevent Japanese access to the Senkaku Islands using civilian fishing vessels and coast guard ships. The small scale and low level of violence in these efforts are designed to avoid providing a pretext for U.S. intervention. Given threats stemming from China's and Russia's sophisticated A2/AD networks, U.S. responses to their gray zone aggression may require the deployment of large, heavily-defended formations of forces or operations to first suppress enemy sensors and long-range weapons. Either approach could be perceived as highly escalatory given the limited nature of the original confrontation. The Navy could better counter gray zone aggression by fielding more small combatants that enable proportional responses to confrontations and by enhancing its EMW capabilities to degrade an enemy's ability to threaten naval forces without having to roll-back Russian or Chinese A2/AD capabilities.

### Capacity implications

Capacity requirements for naval forces are generally driven by naval posture rather than surge requirements for major conflicts. This results from the need to regularly rotate deployed ships and crews back to port for maintenance and training during peacetime or protracted confrontations. During a major contingency, however, rotations would be curtailed to maintain all naval forces available unless ships need to be repaired. The separation of naval forces into forward-deployed Deterrence Forces and Maneuver Forces positioned outside littoral areas also suggests the Navy should forward-station most or all of its Deterrence Force surface combatants and submarines. Forward-stationed ships maintain a higher operational tempo than those based in the Continental United States, and fewer would be needed to sustain the same deployed posture, reducing overall force structure requirements.

## Shaping Future Land Forces

Over the past 15 years of continuous conflict, U.S. Army, Marine Corps, and Special Operations Forces (SOF) land forces adapted to conduct irregular warfare and counterterrorism operations against adversaries who could not impede the deployment of U.S. forces or challenge U.S. dominance in the air, maritime, space, and cyber domains. Although DoD made significant investments in capabilities to support these operations, most of these capabilities are unsuitable for operations in contested environments. As a consequence, the ability

of U.S. land forces to perform their primary missions[18] against high-end adversaries such as China and Russia has decreased dramatically. Preparing land forces for conflicts with great power aggressors should begin with developing operating concepts that flesh-out the Army–Marine Corps *Multi-Domain Battle* white paper.[19] These concepts, such as those suggested below, should then drive changes to the future capabilities, capacity, and overseas posture of America's land forces.

**Contesting gray zone actions.** Unconventional warfare and foreign internal defense are key land force missions. Operating concepts and capabilities for these missions need updating with the goal of countering gray zone activities that seek to undermine U.S. allies and friends while remaining below the threshold of actions that could instigate a major U.S. military response.

**Future maneuver operations.** Land force maneuver is necessary to counter adversary ground maneuver, SOF, airborne, and amphibious operations; protect friendly ground lines of communication (LOC); and defend critical infrastructure and bases. Future highly mobile U.S. maneuver units could act as rapid reaction forces to counter localized successes of a great power aggressor. U.S. ground combat vehicles will require lethality overmatch and active protection systems to enable maneuver against enemy combat vehicles and precision strike systems. Aerial maneuver supporting U.S. land force operations will require counterair defense systems, particularly against man-portable air defense systems (MANPADS) and other short-range air defense (SHORAD) threats. Future U.S. ground and vertical maneuver capabilities could be robotic or teamed man-machine systems.

**Long-range precision strike capabilities.** Army precision and area long-range fires (cannons, missiles, rockets, and hypersonic weapons), cyber capabilities, and EW forces are critical to striking land targets; providing counterfires to disrupt, neutralize, or destroy hostile fire systems; and suppressing air defenses. An integrated network of ground-based long-range fires, offensive cyber operations, and EW systems would help restore the ability of U.S. land forces to attack adversary installations, maritime forces, C2 (command and control) nodes, and ground formations in contested battlespaces. New kinetic and non-kinetic capabilities are needed to ensure U.S. forces are able to exploit the EMS and deny an enemy's ability to maneuver in the EMS. Achieving information dominance will be essential to U.S. operations in peace and war in all domains, including space and cyberspace. Future ground-based non-kinetic capabilities should be capable of disrupting and degrading space systems, particularly those that provide precision positioning, navigation, and timing (PNT) and targeting information to A2/AD capabilities.

18 The Army's primary functions are listed in "Functions of the Department of Defense and Its Major Components," DoD Directive 5100.01, December 21, 2010, pp. 29–30.

19 See U.S. Army–Marine Corps, *Multi-Domain Battle: Combined Arms for the 21st Century*, white paper (Fort Eustis, VA: U.S. Army Training and Doctrine Command [TRADOC], February 24, 2017), p. 4, available at http://www.tradoc.army.mil/MultiDomainBattle/docs/MDB_WhitePaper.pdf.

**Dual-capable systems to offset threats and enhance deterrence.** Some future U.S. ground fire systems should be dual-capable, which means they should be capable of delivering both conventional and low-yield nuclear weapons. Dual-capable systems could add rungs to the U.S. escalatory ladder, enhance deterrence in critical regions, and reduce reliance on nonstrategic nuclear weapons delivered by aircraft that may not be able to penetrate high-threat areas. For instance, posturing dual-capable weapon systems in Poland could help offset Russian nuclear-capable Iskander missiles located on its periphery and greatly complicate the problems Russia must solve to seize the Baltic states.

**Land-based air and missile defense operations.** Future land forces should be principally responsible for providing the U.S. contribution to coalition mid- and long-range theater air and missile defenses. Future land-based mobile and relocatable air defenses could help create screens behind which large, non-stealthy military aircraft could operate. They could also help protect U.S. ISR and strike aircraft from air threats that are within range. Future land-based systems could include directed energy defenses that give them virtually bottomless magazines, as well as low-cost guided projectiles and surface-to-air interceptors; both could help create cost-exchange ratios favorable to the United States. Importantly, ground-based systems should be highly mobile or stationed at hardened and camouflaged fixed sites that have pre-stocked magazines in order to improve their survivability and sustainability.

**Ground-based joint C2 and reconnaissance, surveillance, and target acquisition (RSTA).** Army ground-based long-range radars, elevated communications and sensor systems, communications gateways, and big data management systems are required to provide fusion centers for RSTA and help synchronize coalition kinetic and non-kinetic attacks across the battlespace. In addition to being dispersed and hardened, these capabilities should be prepositioned in areas that are key to deter great power aggressors.

### Capacity implications

The most brilliant operating concepts and revolutionary technologies will be ineffective if they are not postured abroad in sufficient numbers to provide a credible deterrent and thwart aggression if deterrence fails. Today, the Army is neither sized nor organized to execute the concepts outlined above. This is a matter of the type and mix of forces that it possesses as well as an end strength issue. The Army has significant shortfalls in specific types of formations, including air and missile defenses, long-range fires, EW, and cyber. Furthermore, given that many next-generation capabilities such as directed energy weapons needed by the force are still in development, their fielding will likely require land forces to create new operating concepts, types of formations, and modifications to existing units. The Army should reassess its Active-Reserve Component force mix and mobilization plans, since many of its units needed to execute these new operating concepts will have to be forward deployed in sufficient numbers to provide a credible deterrent. Finally, the types of Army maneuver and combat aviation forces needed for long-term operations and major contingencies against great power aggressors may be greater than currently anticipated by DoD.

## Shaping Future Naval Expeditionary Forces

The growing number of strategic competitors with A2/AD capabilities have created a host of new challenges for U.S. power-projection operations. Contending with A2/AD threats will require the United States to field forces that are highly mobile, can operate in a distributed posture, and are less reliant on fixed infrastructure. Naval expeditionary forces, the bulk of which reside in the Navy's amphibious fleet and the Marine Corps, must continue to have many of these attributes in order to meet the demands of forcible entry missions. In combat against a near-peer competitor, for example, Marines could take advantage of their light footprint and organic sealift and airlift to operate inside A2/AD envelopes where larger and less mobile forces would be at greater risk of being located and attacked. In order to maximize their utility in conflicts against advanced adversaries, naval expeditionary forces should adopt new—or in some cases reembrace old—operating concepts.

**Creating advance bases for power-projection forces.** In the first half of the 20th century, the Marine Corps developed new methods for offensive and defensive advance base operations. Future naval expeditionary forces could establish and sustain advance bases that can support interim logistics staging operations, distributed expeditionary airbase operations in contested areas, and sensor networks in littoral areas that are capable of detecting enemy attacks.

**Reinforcing allies.** At the outset of a great power conflict, threats to major seaports in the battlespace may be so great that the U.S. military will choose to rely on its amphibious shipping to deploy middle-weight expeditionary reinforcements rather than move heavier ground forces using Navy Maritime Sealift Command (MSC) vessels. Employing naval expeditionary forces as reinforcements could reduce the number of U.S. forces that must go through a lengthy reception and staging process and reduce their exposure to attacks. Naval expeditionary forces can also be moved ashore at more locations compared to other elements of the force that are dependent on large, complex logistics facilities.

**Support to naval blockade operations.** Naval expeditionary forces should be prepared to support blockade operations. Marine light infantry and Navy small boats and amphibious ships could supplement surface combatants tasked with stopping vessels at maritime chokepoints. Delegating the responsibility for ship boardings to naval expeditionary forces and their amphibious ships would free other surface combatants to focus on their primary warfighting duties.

**Sea and air denial operations.** Naval expeditionary forces could help deny an opponent's freedom of action in the air and at sea by deploying surface-to-air missiles (SAM) and ground-launched anti-ship missiles to littoral areas. Missile fires distributed at appropriate locations, such as throughout an archipelago or along a coastline, could use geography to create chokepoints for an enemy's air and naval surface forces. U.S. missile units could take advantage of their low signatures, distributed dispositions, and mobility to present an opponent with a highly survivable threat-in-being. Dispersed missile launchers could cause an opponent to

either allocate additional resources to suppress them or alter their aircraft and surface ship ingress and egress routes to avoid attack.[20] Either response would impose a form of virtual attrition on hostile forces by reducing available resources for offensive operations.

### Capacity implications

Expeditionary naval forces will need to acquire new capabilities or use existing capabilities in new ways in order to execute operating concepts described above. These include developing and procuring ground-based anti-ship missiles and advanced SAMs; optimizing surface connectors for ocean travel rather than trying to build vehicles that can swim for long distances and fight on land; developing and procuring logistics over-the-shore systems capable of operating in high sea states; expanding the capabilities of Expeditionary Fast Transport (EPF) ships; and increasing the armament of amphibious ships by equipping them with VLS.

The sizes of the Navy's amphibious fleet and the Marine Corps' forces are tied to overseas presence and warfighting requirements levied on naval expeditionary forces. At a minimum, the Marine Corps must be large enough to ensure that its forces do not exceed the Service's deployment-to-dwell time ratio policies.[21] The overall requirement for amphibious shipping currently stands at 38 vessels to provide lift to the assault echelons (AE) of two Marine expeditionary brigades (MEB).[22] The Navy's Fiscal Year 2017 shipbuilding plan fails to reach this level over most of the next 30 years, despite the fact that two AEs of lift is a one-third decrease in this requirement since end of the Cold War. Moreover, the requirement for two AEs of lift does not take into consideration that analyses of how new concepts for distributed operations and other operations that amphibious ships may be required to support in the future could increase the need for amphibious shipping fleet capacity.

## Report Organization

Similar to CSBA's 2013 FPC assessment, this report begins by summarizing trends in force planning that have influenced the size and shape of the U.S. military. It then proposes an alternative planning approach that could encourage the adoption of new operating concepts and technologies that could create a better balance between DoD's National Defense Strategy and its capabilities.

Chapter 1, "Reinforcing the Status Quo," builds on CSBA's 2013 report to summarize major planning trends that have discouraged changes to operating concepts and new investments in capabilities that are needed to maintain the U.S. military's overmatch against emerging

20 Even U.S. surface-to-air missiles with a low Pk against enemy weapon systems could cause an enemy to "honor the threat" and take actions to suppress or avoid them.

21 In peacetime and for long-duration operations, DoD aspires to maintain a 1:3 deployment ratio for Active Component personnel in which they will remain home for three times as long as they are deployed.

22 Maren Leed, *Amphibious Shipping Shortfalls: Risks and Opportunities to Bridge the Gap* (Washington, DC: Center for Strategic and International Studies, 2014), p. 3.

threats. Chapter 2, "Considerations for DoD's Next Force Planning Construct," recommends priorities for a new FPC and a planning approach that first defines an appropriate mix of military capabilities for future operational challenges before assessing force capacity requirements. Chapters 3 through 6 describe operating concepts that should help shape future air, sea/undersea, land, and naval expeditionary forces for conflicts in contested environments. Embedding these concepts in DoD's FPC scenarios would give defense planners a better foundation for assessing different mixes of capabilities and forces to meet *future* security challenges rather than wars of the past.

CHAPTER 1

# Post-Cold War Force Planning: Reinforcing the Status Quo

Force planning priorities created in the aftermath of the Cold War have had an enduring impact on the size and shape of the U.S. military. Major defense strategic reviews completed by every administration since the early 1990s added new mission requirements to the Pentagon's FPCs. They also added or modified policies such as requirements for accessing the military's Reserve Component and force rotation goals for long-duration operations that affected DoD's capability and capacity requirements. Despite these changes, many assumptions that underpinned DoD's post-Cold War FPCs remained remarkably static and rooted in operating concepts designed to prevail in conflicts roughly analogous to Operation Desert Storm. These assumptions helped justify existing force structures and programs rather than encourage changes to concepts, capabilities, and organizations that are now needed to address great power aggression. DoD's post-Cold War FPCs were also designed to support defense budget cuts rather than provide a basis for determining an appropriate level of resources needed to support the National Defense Strategy. The combination of static operating concepts and capability decisions driven more by resource constraints than emerging threats has left DoD unprepared for the emerging era of great power competition.

## Overview of Previous Force Planning Constructs

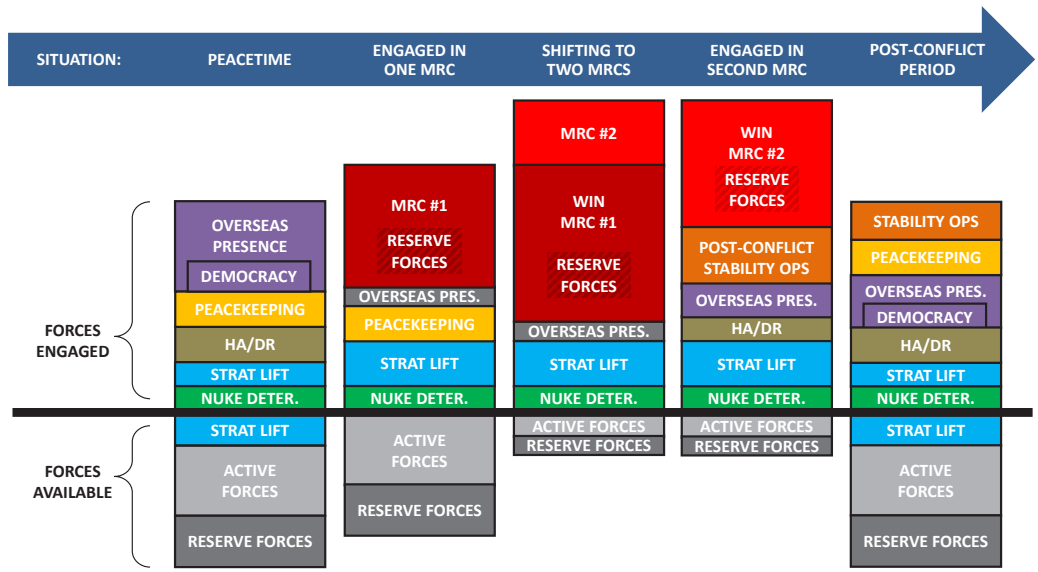
### The Base Force and the Bottom-Up Review

In 1989, Chairman of the Joint Chiefs of Staff General Colin Powell recommended DoD shift from preparing for global conflict with the Soviet Union to organizing, training, and equipping forces to defeat conventional invasions launched by regional aggressors such as North Korea and Iraq. Powell's recommendations were the product of a review initiated in 1988 by the Joint Staff to develop a "Base Force" that would be capable of responding to regional

crises in the post-Cold War era.[23] Concurrently, the Joint Staff developed a new National Military Strategy that recommended DoD create "smaller permanent forces, together with periodic deployments [that would] demonstrate the U.S. commitment to protect its interests overseas."[24] The shift away from a *forward defense* posture that was sized to defeat Soviet aggression toward smaller regional postures to maintain *forward presence* would help enable force structure cuts "in response to anticipated reductions in defense spending."[25] In August 1990, President Bush publicly announced that he had accepted many of the Base Force recommendations, including its proposed 25 percent cut to DoD's active military forces.[26] This led then-Congressman Les Aspin to declare the Base Force as "defense by subtraction."[27]

Aspin's claim was ironic, considering that he was soon to preside as Secretary of Defense over a "Bottom-Up Review" (BUR) of DoD's strategy, plans, and programs that generally embraced the Base Force's major tenets. The 1993 BUR adopted a building block FPC (see Figure 1) that required the military services to maintain sufficient forces and capabilities to support two Desert Storm-like MRCs.

## FIGURE 1: 1993 BUR BUILDING BLOCK FORCE PLANNING APPROACH




23 Base Force recommendations were also intended to provide guidelines for the "reduction of our Armed Forces without breaking them or reducing their quality." Lorna A. Jaffe, *The Development of the Base Force 1989–1992* (Washington, DC: Office of the Chairman of the Joint Chiefs of Staff, July 1993), foreword.

24 Ibid., p. 3.

25 Ibid., pp. 3–4.

26 President George H. W. Bush, remarks at the Aspen Institute Symposium in Aspen, CO, August 2, 1990. President Bush declared that the nation's "security needs can be met by an active force 25 percent smaller than today." Kathleen H. Hicks and Samuel J. Brannen, "Force Planning in the 2010 QDR," *Joint Forces Quarterly* 59, 4th Quarter, October 2010, p. 138.

27 Hicks and Brannen, "Force Planning in the 2010 QDR," p. 138.

The overarching CONOPS for these MRCs assumed that U.S. forces would be able to deploy to a theater, rapidly halt a conventional invasion of an allied or partner state, build up a decisive force, and then launch a combined arms offensive to expel the invader and achieve other objectives.[28] Although the BUR considered forces and capabilities that may be needed to support future smaller-scale contingencies and peacekeeping operations, these were deemed second-tier priorities that could be supported by a force structure that was sized to fight and win two MRCs nearly simultaneously.[29] Later defense reviews determined this assumption was incorrect. U.S. forces are not expected to rotate to support short-duration "surge" deployments to major conflicts similar to Operation Desert Storm. For peacetime and for long-duration operations, however, DoD aspires to maintain a 1:3 deployment ratio for Active Component personnel, which means they should be stationed at their home bases for three times as long as they are deployed. In essence, this rotation ratio means that a total of four units may be needed in order to continuously deploy one unit away from home station. As a result, the number of forces needed to support multiple, long-term SSCs could exceed those needed to support one or even two MRC surges.

## The 1997 Quadrennial Defense Review

Compared to the BUR, the 1997 Quadrennial Defense Review (QDR) was far from a fresh look at the Pentagon's strategy, force structure, modernization plans, and overseas posture as envisioned by Congress.[30] Instead, DoD's leadership used the QDR to sustain the BUR's force planning construct and create a rationale for capping annual defense spending at approximately $250 billion in compliance with the Clinton administration's guidance.[31] Accordingly, the 1997 QDR Report reaffirmed the need to size U.S. forces to "deter and defeat large-scale, cross-border aggression in two distant theaters" in overlapping time frames. It also proposed cutting additional military personnel and funding for some modernization programs, including the B-2 bomber and Seawolf attack submarine.[32]

Decisions to terminate B-2 and Seawolf production early highlight the impact of DoD's shift toward a warfighting CONOPS that assumed the United States would have sufficient time and unencumbered theater access to deploy a large force close to an aggressor before launching

28 Scenarios the BUR "focused on most closely . . . envisioned aggression by a remilitarized Iraq against Kuwait and Saudi Arabia, and by North Korea against the Republic of Korea." OSD, *Report on the Bottom-Up Review* (Washington, DC: DoD, 1993), p. 14.

29 The BUR's building block force planning construct did allow for specialized forces that would be needed for missions such as sustaining the nation's nuclear posture.

30 National Defense Authorization Act (NDAA) for Fiscal Year 1997, H.R. 3230, 104th Congress, 2nd Session, 1996, p. 2624.

31 For a summary of factors that influenced the review, see Eric V. Larson, David T. Orletsky, and Kristin Leuschner, *Defense Planning in a Decade of Change* (Santa Monica, CA: RAND Corporation, 2001), pp. 83–118. According to the authors, "As had been the case with the BUR, the strategy and force options available to the authors of the QDR were thus to be greatly constrained by the resources that were assumed to be available." Ibid., p. 87.

32 DoD, *Report of the Quadrennial Defense Review* (Washington, DC: DoD, May 1997), Section 3, pp. 36 and 44–48, hereafter referred to as the *1997 QDR Report*.

a counteroffensive. Given these assumptions, a smaller force of B-2s and attack submarines were deemed sufficient to support initial operations until short-range land- and sea-based fighters could arrive in a theater and begin operations from bases and waters close to an enemy's borders. The CONOPS also assumed that U.S. non-stealthy aircraft supported by strikes from standoff weapon launchers could quickly suppress enemy air defenses, reducing the need for stealth systems.

Of note, the 1997 QDR FPC did recognize the need to consider additional force structure requirements created by multiple, simultaneous SSCs in peacetime. This was an acknowledgment of the strains that long-duration SSCs, such as operations to enforce no-fly zones over Iraq after Desert Storm, could place on the U.S. military.[33]

### 2001 and 2006 QDR force planning constructs

At the beginning of the President George W. Bush administration, DoD expanded the range of planning scenarios it used to assess force structure and capability requirements. Most notably, the 2001 QDR added homeland defense to DoD's FPC and a requirement to forward-station deterrence forces in four critical regions.[34] The latter initiative was intended to create overseas force postures that would be better capable of "defeating an adversary's military and political objectives with only modest reinforcement."[35] It was also an acknowledgement that emerging A2/AD threats had the potential to delay the arrival of U.S. reinforcements responding to some regional crises. To free resources needed to increase funding for next-generation, transformational military technologies, the 2001 FPC was revised to require a "decisive defeat," which could include regime change and occupation, for only one of two MRCs. The 2001 QDR also shifted DoD's force planning process toward a capabilities-based approach that would assess capabilities and capacity needed for major mission areas, rather than focus almost exclusively on planning for set-piece warfighting scenarios against specific aggressors.

The 2006 QDR created a so-called refined wartime construct that further broadened the kinds of conflict scenarios DoD should prepare for. This FPC maintained the post-Cold War requirement to prepare for two major regional contingencies, but it specified that one of those contingencies could be a large-scale irregular warfare campaign similar to operations then underway in Iraq and Afghanistan.[36] The QDR also prioritized the need to assess steady-state

33 For a description of Operations Northern and Southern Watch and how the Air Force adapted to them, see John A. Tirpak, "Legacy of the Air Blockades," *Air Force Magazine*, February 2003, pp. 46–52.

34 OSD, *Quadrennial Defense Review Report* (Washington, DC: DoD, September 30, 2001), p. iv, hereafter referred to as the *2001 QDR Report*. The four critical regions were Europe, Northeast Asia, East Asia, and Southwest Asia/the Middle East.

35 "A reorientation of the posture must take account of new challenges, particularly anti-access and area-denial threats. . . One of the goals of reorienting the global posture is to render forward forces capable of swiftly defeating an adversary's military and political objectives with only modest reinforcement." *2001 QDR Report,* pp. 25–26.

36 "In the post-September 11 world, irregular warfare has emerged as the dominant form of warfare confronting the United States, its allies and its partners." OSD, *Quadrennial Defense Review Report* (Washington, DC: DoD, February 6, 2006), p. 36, hereafter referred to as the *2006 QDR Report*.

demand for forces, recognizing the toll on the U.S. military's readiness created by the need to support multiple concurrent long-duration overseas contingency operations.[37]

## 2010 and 2014 QDR force planning constructs

The 2010 QDR rejected capability-based planning in favor of a scenario-based planning approach and an FPC that placed greater emphasis on sizing the force. The QDR's force sizing/shaping construct was split into combinations of scenarios that were to be used to assess requirements in the near term (5 to 7 years) and long term (7 to 20 years).[38] Scenario combinations listed in the 2010 QDR's official report (see Table 1) "provide insight into the potential number and size of overlapping operations for which U.S. military forces must plan to prepare."[39] Despite these changes, the 2010 QDR FPC validated many of the previous administration's priorities, including the need to assess requirements for homeland defense, counterinsurgency, stability, and counterterrorism operations as well as countering weapons of mass destruction (WMD).[40]

### TABLE 1: KEY SCENARIO COMBINATIONS ASSESSED DURING THE 2010 QDR

| |
|---|
| A major stabilization operation, deterring and defeating a highly capable regional aggressor, and extending support to civil authorities in response to a catastrophic event in the United States. |
| Deterring and defeating two regional aggressors while maintaining a heightened alert posture for U.S. forces in and around the United States. |
| A major stabilization operation, a long-duration deterrence operation in a separate theater, a medium-sized counter-insurgency mission, and extended support to civil authorities in the United States. |

Shortly before he left office in 2011, Secretary of Defense Gates initiated the Comprehensive Strategic Review. His successor, Leon Panetta, led the review, which further revised the Pentagon's FPC. A report on the review's decisions revealed that U.S. forces would henceforth "be capable of denying the objectives of—or imposing unacceptable costs on—an opportunistic aggressor in a second region" while conducting a large-scale operation in the first region.[41] This closely resembled the "win in one conflict and hold in a second" FPC alternative that was hotly debated during the 1993 BUR. The 2011 review also concluded that "U.S. forces will no longer be sized to conduct large-scale, prolonged stability operations," reflecting the Obama administration's shift away from operations in Iraq and Afghanistan in favor of creating more

37 *2006 QDR Report*, pp. 3–4.

38 Hicks and Brannen, "Force Planning in the 2010 QDR," p. 140.

39 OSD, *Quadrennial Defense Review Report* (Washington, DC: DoD, February 2010), pp. 42–43, hereafter referred to as the *2010 QDR Report*.

40 Ibid., p. 42.

41 DoD, *Sustaining U.S. Global Leadership: Priorities For 21st Century Defense* (Washington, DC: DoD, January 2012), p. 4.

robust deterrent postures in the Asia-Pacific region and Middle East, areas that posed "the greatest challenges for the future."[42]

The 2014 QDR requires little explanation, since it was a review in name rather than substance. Instead of leading a strategic review, the Office of the Secretary of Defense essentially wrote a report to Congress that validated DoD's existing plans and program priorities.[43]

Table 2 summarizes key elements of force planning constructs adopted by DoD since the end of the Cold War.

### TABLE 2. KEY ELEMENTS OF DOD'S POST-COLD WAR FORCE PLANNING CONSTRUCTS

| | 1993 BUR | 1997 QDR | 2001 QDR | 2006 QDR | 2010 QDR | 2012 Strategic Review |
|---|---|---|---|---|---|---|
| Force Planning Construct | 2 MRCs, Building Block Construct | Sustain the Bottom-Up Review | "1–4–2–1" | Refined Wartime Planning Construct | No Name | No Name |
| Major Elements | Defeat 2 regional threats nearly simultaneously | Defeat large-scale, cross-border aggression in 2 theaters in overlapping timeframes<br>+<br>Smaller-scale contingencies | Homeland defense<br>+<br>Forward defense in 4 priority theaters<br>+<br>2 swift defeats (win 1 decisively) | Homeland defense<br>+<br>2 conventional contingencies<br>**or**<br>1 conventional<br>+<br>1 irregular warfare contingencies | Homeland consequence management events<br>+<br>2 large-scale land campaigns<br>**or**<br>1 large air/naval campaign<br>+<br>a campaign in a 2nd theater<br>**or**<br>1 large land campaign<br>+<br>a long-term irregular warfare campaign | Homeland defense, provide support to civil authorities<br>+<br>1 full combined arms campaign across all domains<br>+<br>Deny objectives or impose unacceptable costs on a 2nd opportunistic aggressor |
| Key Points or Changes | ❒ Size for 2 MRCs<br>❒ Most other contingencies are lesser included cases | ❒ Size for 2 major theater wars plus steady-state SSCs<br>❒ Swing some forces to 2nd major conflict | ❒ Emphasize forward defense<br>❒ Accept risk in a 2nd major theater conflict | ❒ Shift capabilities to address 4 focus areas<br>❒ Long-duration irregular warfare<br>❒ Address steady-state & surge demand for forces | ❒ Size as well as shape<br>❒ Multiple scenario cases for the near- and far-term<br>❒ Address surge & steady-state demand for forces, including for long-duration irregular warfare | ❒ Do not size the force for large and protracted stability operations<br>❒ Rebalance to the Asia-Pacific region |

42 Ibid., p. 6; and Secretary of Defense Leon E. Panetta, "Statement on Defense Strategic Guidance," speech given at the Pentagon, Washington, DC, January 5, 2012.

43 According to Paul Davis, "The 2014 Quadrennial Defense Review (QDR) did not have sufficient analytic grounding for its announced strategy and programs." Paul K. Davis, *Capabilities for Joint Analysis in the Department of Defense: Rethinking Support for Strategic Analysis* (Santa Monica, CA: RAND Corporation, 2016). p. 2.

## Force Planning Trends That Discouraged Change

The remainder of this chapter addresses key force planning trends since the end of the Cold War that discouraged changes to DoD's operating concepts and investments in new capabilities needed to modernize the joint force.

### Budget-driven, not budget-informed planning

As described above, the size and mix of forces recommended by DoD's periodic strategic reviews were driven more by pressures on its budget than by assessments of alternative defense strategies, emerging threats, and technological opportunities to reshape the U.S. military. Budget-driven force cuts recommended by the Base Force Review and BUR were reasonable in light of the end of the Cold War. However, most strategic reviews conducted during subsequent administrations were designed to create a rationale for additional cuts that shrank the force while operational demands in the Middle East and deterrence requirements in the Pacific and Europe remained high. As a result, the material condition and readiness of the force deteriorated. This is often characterized as a "hollowing" of the force.

More recently, DoD's Comprehensive Strategic Review developed force planning priorities to meet reduced defense spending mandated by the 2011 Budget Control Act (BCA), which reduced planned defense spending. The stated objective for the review was to assess how DoD could reduce its spending by $487 billion over 10 years (Fiscal Years 2012 through 2021) as required by the BCA while avoiding a hollow force that lacked "proper training, maintenance and equipment—and manpower."[44] As described in the 2012 Defense Strategic Guidance approved by Panetta, the review modified DoD's FPC to reduce force structure requirements in part by changing the objective for the second of two major regional conflicts from a "defeat" to "denying the objectives of—or imposing unacceptable costs on—an opportunistic aggressor."[45] This shift from an objective of "defeat" to "deny and impose costs" in a second war was driven in large part by budget considerations.[46] In light of the U.S. military's continuing decline in readiness, aging weapon systems, and persistent personnel shortfalls, the budget-driven 2012 Comprehensive Strategic Review failed to meet its primary objective.

44 For example, DoD announced its intent to retire six cruisers and two amphibious ships early, retire 65 C-130 cargo aircraft, eliminate six Air Force fighter squadrons, and reduce Army and Marine Corps end strength by 72,000 and 10,000 personnel, respectively. DoD, *Defense Budget Priorities and Choices* (Washington, DC: DoD, January 2012). Secretary of Defense Robert M. Gates, "Defense Spending," speech presented at the American Enterprise Institute, Washington, DC, May 24, 2011. The 2011 Budget Control Act (2011 BCA) cut the base defense budget—not OCO funding—by a total of approximately $487 billion over a ten-year period.

45 "Even when U.S. forces are committed to a large-scale operation in one region, they will be capable of denying the objectives of—or imposing unacceptable costs on—an opportunistic aggressor in a second region." DoD, *Sustaining U.S. Global Leadership*, p. 4. This is a change from the scenario combination for "deterring and defeating two regional aggressors" assessed during the 2010 QDR. *2010 QDR Report*, pp. 42–43.

46 "In 2012, the Obama administration . . . proposed a strategy of 'defeat and deny.' This called for the U.S. military to be able to win one regional war while preventing an aggressor in a second region from achieving its war aims. This force sizing construct was driven by the defense spending caps in the Budget Control Act." McCain, Restoring American Power, pp. 5–6.

The hollowing of the force was accelerated by a second round of automatic budget cuts required by the BCA in 2012, which reduced the defense budget by another 10 percent (about $500 billion) over ten years.

### DoD strategic reviews prioritized sizing the force over changing its mix of capabilities

Most strategic reviews led by DoD over the last 25 years prioritized sizing the U.S. military at the macro level over rebalancing its mix of capabilities to address emerging threats. The 1993 BUR continued to downsize the force for the post-Cold War era, while the 1997 QDR—unofficially known inside the Pentagon as the "Bottom-Up Review light"—sustained the BUR's priorities and proposed additional cuts to meet defense spending caps. Leaders of the 2010 and 2014 QDRs sought to create FPCs that emphasized force sizing and proposed force structures that were aligned with anticipated budgets.

The 2001 and 2006 QDRs were partial exceptions to the rule. The 2001 QDR prioritized transforming DoD's capabilities mix to address emerging challenges such as the rise of China and A2/AD threats. It also recommended DoD adopt a capabilities-based force planning approach that focused "more on how an adversary might fight than who the adversary might be and where a war might occur."[47] If it had been implemented, this approach would have required defense planners to assess how "remote sensing, long-range precision strike, transformed maneuver and expeditionary forces and systems," and other advanced capabilities could help counter A2/AD threats.[48] Progress toward creating a force mix aligned with the 2001 QDR's priorities was largely short-circuited, however, by the need to allocate additional resources to operations in Afghanistan and Iraq and against al Qaeda across the globe.

In lieu of prescribing the size of the future force, the 2006 QDR's FPC was designed to rebalance DoD's mix of capabilities to better address four critical focus areas: defeating terrorist networks, shaping the choices of countries at strategic crossroads, defending the homeland, and preventing enemies from acquiring or using WMD.[49] The 2006 review also assumed that although the size of the force was about right, its mix of capabilities was ill-suited to challenges represented by the four focus areas.[50] Similar to the 2001 QDR, however, the real-world

47 *2001 QDR Report*, p. 14.

48 Ibid., p. 14.

49 *2006 QDR Report*, pp. 3, 19.

50 Accordingly, the 2006 QDR determined that DoD should increase its SOF and ISR capacity; improve its ability to locate, tag, and track WMD; and begin to develop next-generation capabilities such as a new penetrating bomber and an aircraft carrier-based UCAS for surveillance and strike into contested areas. For details on the QDR's recommendations, see *2006 QDR Report*, pp. 41–61.

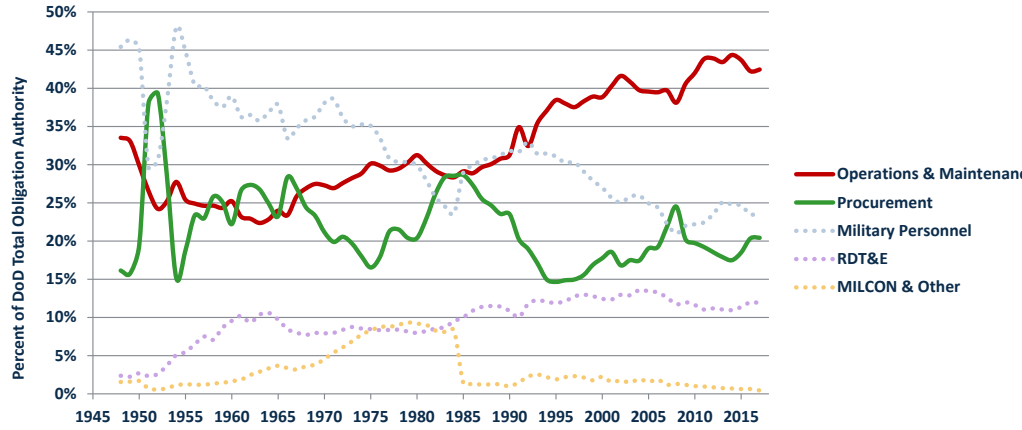
demand for forces and capabilities needed for overseas contingency operations (OCO) superseded most its proposals to increase investments in next-generation capabilities.[51]

### Many force planning priorities were reactive and focused on near-term requirements

Most of the changes made to the Pentagon's FPCs since the end of the Cold War that were not budget-driven were designed to address operational demands for forces and capabilities. The 1997 QDR added SSCs to DoD's FPC, acknowledging that multiple, long-duration SSCs such as Operations Northern and Southern Watch could create significant force structure demands.[52] The 2001 QDR added homeland defense as a major mission area; the 2006 QDR added a requirement to plan for large-scale, long-duration irregular warfare; and the 2010 QDR was a "wartime QDR" that placed "…current conflicts at the top of our [DoD's] budgeting, policy, and program priorities."[53]

These priorities are reflected in changes over time to total obligation authority (TOA) for DoD's various major resource categories, as illustrated by Figure 2. DoD's annual funding for operations and maintenance (red line) has grown to historic highs since the end of the Cold War, while the green line shows that procurement funding to recapitalize and modernize the U.S. military reached a record low in the 1990s that has since remained relatively flat.

**FIGURE 2: FISCAL YEARS 1948–2017 DOD TOA INCLUDING OCO FUNDING[54]**




51 These included capabilities for "persistent surveillance and long-range strike, stealth, operational maneuver and sustainment of air, sea and ground forces at strategic distances, and air dominance and undersea warfare." *2006 QDR Report*, p. 31.

52 "The Department has long known that many segments of the force have been, and probably will be, used at a very high operating tempo (OPTEMPO) in peacetime. However, the analysis showed that this phenomenon was not limited to traditional 'low density/high demand' (LD/HD) units that have been identified over the past few years. Many 'regular' forces were also in very high demand . . ." *1997 QDR Report*, Section 4.

53 *2010 QDR Report,* preface, p. i (Secretary of Defense Robert M. Gates, *2010 QDR Report* cover letter, February 1, 2010).

54 OUSD (Comptroller), *National Defense Budget Estimates for FY 2018*, FY 2018 Green Book (Washington, DC: DoD, June 2017), available at http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2018/FY18_Green_Book.pdf.

Moreover, many capabilities procured for overseas contingency operations since 2001, such as non-stealthy drones and Mine-Resistant Ambush Protected vehicles (represented by the 2006–2007 spike in procurement funding in Figure 2), are not suitable for operations against the militaries of Russia and China. In particular, most of the Army's new investments were focused on capabilities needed to support irregular warfare and counterinsurgency operations.

### A planning scenario development process that encourages the status quo

DoD leaders have expressed their frustration over the excessive amount of time needed to develop and field high-impact, next-generation capabilities and operating concepts that will offset emerging threats. It is worth considering how the force planning process that DoD has used to develop its requirements may have contributed to this problem.[55]

Each of DoD's QDRs increased the number and combinations of steady-state and surge illustrative planning scenarios used to determine force structure requirements.[56] These scenarios are developed by planners in the Office of the Secretary of Defense and the Joint Staff in cooperation with the Services and other defense components. Development of a scenario typically begins with OSD issuing guidance on the objectives and overarching strategic concepts for military operations. The Joint Staff then develops more specific CONOPS to achieve scenario objectives and creates data for forces and capabilities needed for operations. The joint scenario development process seeks consensus from the Services, which are often inclined to shape their inputs on CONOPS and force requirements to defend their existing program and budget priorities. This has the effect of perpetuating the use of current operating concepts in scenarios that are intended to be used to assess requirements for future capabilities and forces. Furthermore, DoD instituted a major change to its analytical process early in the Obama administration that placed greater emphasis on assessing requirements to support "*…combatant commander plans* [emphasis added] instead of scenarios as starting points for review of midterm programs." Because combatant commander plans primarily address potential contingency operations in the next two years, this emphasis can promote the use of current operating concepts in future planning scenarios.[57]

Although DoD has increased the complexity and diversity of its force planning construct over time, its planning processes have failed to encourage the development of changes needed to

55 DoD called this process its "Analytic Agenda" until 2010, at which time it was renamed "Support for Strategic Analysis" (SSA).

56 In addition to the types and numbers of planning scenarios, other key FPC variables that can change force size and capability requirements include scenario size, intensity, and duration; scenario frequency and/or overlap; and force rotation policies for various phases of contingencies.

57 Davis, *Capabilities for Joint Analysis in the Department of Defense*, p. x.

prevent the U.S. military's competitive edge from eroding.[58] In hindsight, it seems obvious that processes that prioritized balancing the budget and meeting near-term operational needs discouraged innovations that could have reshaped the joint force to meet the future security challenges espoused in DoD's own planning documents. In combination, these factors encouraged the Services to defend status quo operating concepts, force structures, and programs.

58 According to Deputy Secretary of Defense Robert Work, DoD sees its "overwhelming operational and technical dominance starting to erode and the trend lines concern us." Cheryl Pellerin, "Defense Innovation Maintains Military Overmatch Against Adversaries," *DoD News*, May 3, 2017, available at https://www.defense.gov/News/Article/Article/1172099/defense-innovation-maintains-military-overmatch-against-adversaries.

CHAPTER 2

# Planning for Key Changes in the Operating Environment

The beginning of a new administration is an opportunity for DoD to adopt planning policies and practices that encourage innovation and the creation of a force that is shaped and sized for future challenges rather than wars of the past. Chapter 2 recommends initiatives that could help achieve these objectives. The chapter begins by summarizing warfighting strategies adopted by China and Russia that seek to avoid large-scale wars of attrition with the United States. These strategies should be addressed by planning scenarios that are part of DoD's next FPC. Chapter 2 also recommends DoD create overseas force postures that could help offset A2/AD complexes that threaten its ability to respond to regional crises quickly. Returning to postures capable of *forward defense* could improve the U.S. military's ability to counter great power gray zone actions; prevent crises from escalating to conflicts; and, should deterrence fail, punish or defeat aggressors. The chapter concludes by describing a capabilities-focused planning approach that could encourage the development of innovative operating concepts and new technologies needed to maintain our military's edge against great power competitors.

## Planning for Informationized Warfare and New Generation Warfare

DoD's next force planning construct should include scenarios that account for the new warfighting strategies of the militaries of China and Russia.

China's People's Liberation Army (PLA) has adopted "Informationized Warfare" as the core of its warfighting strategy, which has been described as "warfare where there is widespread use of informationized weapons and equipment and networked information systems, employing suitable tactics, in joint operations in the land, sea, air, outer space, and electromagnetic domains, as well as the cognitive arena."[59] The PLA believes that information technologies

59 Cheng, "Information Dominance," p. 3.

have affected the conduct of warfare as they have commerce, communications, and other functions of a modern society. As a result, future wars "will be contests in the ability to exploit information."[60] Unlike large-scale, industrial age warfare, which seeks to induce an enemy's collapse by attriting its means to fight, the primary target of Informationized Warfare is the decision-making of an enemy's leadership.[61] The PLA believes that achieving information dominance should be its main operational line of effort in a conflict, not a supporting effort, and it is reshaping its doctrine, organizations, and capabilities to achieve this dominance. For instance, the PLA has created a Strategic Support Force from "operational units formerly under the PLA's General Departments that were responsible for space, cyber, electronic, and psychological warfare."[62] China's Informationized Warfare strategy uses kinetic and non-kinetic capabilities in all operational domains to shape an adversary's decision-making in peacetime and during war. Peacetime activities, such as operations to develop a better understanding of the strengths and weaknesses of enemies, psychological operations, and other actions to shape the perceptions of enemy leaders and the public, are particularly important to the success of Informationized Warfare.[63]

A similar form of warfare is also part of Russia's "New Generation Warfare" military strategy. Rather than an adjunct line of effort, authoritative Russian sources indicate that information warfare is fundamental to the success of all other military operations: "A new type of war has emerged, in which armed warfare has given up its decisive place in the achievement of the military and political objectives of war to another kind of warfare—information warfare."[64] In this form of conflict, Russia would conduct information-psychological warfare to influence an enemy's civilian population and military forces and information-technology warfare to degrade, disrupt, and destroy systems enemies use to "receive, collect, process and transmit information."[65] Prevailing over an enemy will require a belligerent to gain information superiority, which is viewed by Russian military experts as a necessary precondition for achieving

60 Dean Cheng, *Cyber Dragon* (Santa Barbara, CA: Praeger, 2017), p. 15.

61 Gaoming, "Public Opinion Warfare, Psychological Warfare, and Legal Warfare," as cited in Cheng, "Information Dominance."

62 Elsa Kania and John Costello, "China's Quest for Informatization Drives PLA Reforms," *The Diplomat,* March 4, 2017, available at http://thediplomat.com/2017/03/chinas-quest-for-informatization-drives-pla-reforms.

63 John Costello, "The Strategic Support Force: China's Information Warfare Service," *China Brief* 16, no. 3, February 8, 2016, available at www.jamestown.org/single/?tx_ttnews%5Btt_news%5D=45075&no_cache=1#.VxjQwfnR_rc. See also Joel Wuthrow and Phillip Saunders, *Chinese Military Reforms in the Age of Xi Jinping: Drivers, Challenges and Implications* (Washington, DC: National Defense University Press, March 2017).

64 Vladimir Kvachkov, Спецназ России [Russia's Special Purpose Forces] (online: *Voyennaya Literatura* [Military Literature], 2004), available at http://militera.lib.ru/science/kvachkov_vv/index.html; as quoted in Keir Giles, *Handbook of Russian Information Warfare* (Rome, Italy: NATO Defense College, December 2016), p. 3, available at http://www.ndc.nato.int/news/news.php?icode=995.

65 Kvachkov, *Russia's Special Purpose Forces*; as quoted in Giles, *Handbook of Russian Information Warfare*, p. 9.

all other warfighting objectives.[66] During the opening stages of a conflict, New Generation Warfare integrates offensive and defensive electronic warfare with kinetic strikes launched by aircraft and ground fires against enemy C3ISR targets.[67] Similar to China's Informationized Warfare, Russia's strategy includes operations in peacetime as well as in war.[68]

DoD's concept for information operations (IO) is narrower than Informationized Warfare. DoD defines IO as "the integrated employment, during military operations, of information-related capabilities in concert with other lines of operation to influence, disrupt, corrupt, or usurp the decision-making of adversaries and potential adversaries while protecting our own."[69] The U.S. military can conduct IO to influence an enemy's key decision-makers, mass audiences, and vulnerable populations to help achieve a commander's objectives.[70] IO can take place in all phases of an operation, including what DoD has called the shaping and deterring phases that may occur before major combat operations commence. In contrast to Informationized Warfare, which forms the central line of effort in modern Chinese and Russian warfare, U.S. military doctrine generally considers IO as *supporting* other lines of operation in a joint campaign plan.

Informationized Warfare and New Generation Warfare represent major breaks from attrition-based warfighting strategies. Preparing for operations against enemies whose central focus will be to gain and maintain information dominance will likely require changes to DoD's operating concepts, doctrine, capabilities, and even force structure. DoD should include major conflict scenarios for Informationized Warfare and New Generation Warfare its next FPC to provide a baseline to assess these changes,

## Planning for Gray Zone Aggression

DoD's next force planning construct should also include scenarios that account for the actions of China and Russia in the gray zone. U.S. defense analysts have described gray zone actions as part of an "intense political, economic, informational, and military competition more fervent

66 "No goal will be achieved in future wars unless one belligerent gains information superiority over the other." S.G. Chekinov and S.A. Bogdanov, "The Nature and Content of a New-Generation War," *Military Thought*, no. 4, 2013, p. 13, translation available at http://www.eastviewpress.com/Files/MT_FROM%20THE%20CURRENT%20ISSUE_No.4_2013.pdf. *Military Thought* is a Russian journal of military theory and strategy.

67 S. G. Chekinov and S. A. Bogdanov, "Прогнозирование характера и содержания войн будущего: проблемы и суждения [Forecasting the Nature and Content of Wars of the Future: Problems and Assessments]," *Military Thought*, no. 10, 2015, pp. 44–45; as quoted in Giles, *Handbook of Russian Information Warfare*, p. 69. "Future wars will be launched by electronic warfare (EW) forces, which will protect friendly forces, block foreign propaganda disinformation, and strike at enemy EW forces and assets, blending with strategic and aerospace operations, with the latter augmented by cruise missiles and reconnaissance assets (UAVs, robots) delivering strikes and fires." Ibid.

68 Vladimir Slipchenko, "Future War (A Prognostic Analysis)," January 1998; as cited in Giles, *Handbook of Russian Information Warfare*, p. 4. This is a lecture of Slipchenko's, a professor at the Russian Academy of Military Sciences.

69 DoD, *DOD Dictionary of Military and Associated Terms* (Washington, DC: DoD, August 2017), p. 115, available at http://www.dtic.mil/doctrine/dod_dictionary.

70 DoD, *Information Operations* (Washington, DC: DoD, 2014), pp. I-3–I-8.

in nature than normal steady-state diplomacy, yet short of conventional war."[71] Although this description characterizes gray zone actions as part of long-term *competitions*, Chinese and Russian strategists describe them as ways to achieve their nation's objectives in long-term *conflicts* that are already in progress. More specifically, China's and Russia's new military strategies incorporate peacetime non-military diplomatic, information, and economic actions with low-intensity gray zone military operations and high-end military capabilities to gain influence and territory without having to escalate to a major conflict.

China's gray zone operations in the South and East China Seas are tangible evidence of its campaign to gradually expand its influence, weaken confidence in the United States as a regional security guarantor, and eventually replace the United States as the predominant world power. Similarly, Russia's gray zone actions in Eastern Europe support its strategy to regain influence over former Soviet and Warsaw Pact states, discredit NATO, and expand its influence in the Middle East and other regions it considers critical to its status as a great power.

### FIGURE 3: CHINESE GRAY ZONE AGGRESSION AGAINST VIETNAM IN THE SOUTH CHINA SEA


Chinese vessels appear to ram a Vietnamese fishery control vessel while another Chinese ship fires a water cannon in a disputed area of the South China Sea on June 23, 2014. Photo released by Vietnam's coast guard.

71 Votel, Cleveland, Connett, and Irwin, "Unconventional Warfare in the Gray Zone," p. 102. A U.S. Special Operations Command white paper has described gray zone actions as "competitive interactions among and within state and non-state actors that fall between the traditional war and peace duality. They are characterized by ambiguity about the nature of the conflict, opacity of the parties involved, or uncertainty about the relevant policy and legal frameworks." Philip Kapusta, *The Gray Zone*, United States Special Operations Command (USSOCOM) white paper (MacDill AFB, FL: USSOCOM, September 9, 2015), p. 2, available at https://info.publicintelligence.net/USSOCOM-GrayZones.pdf.

It is important to note that gray zone conflicts are not new.[72] What is new, however, is China's and Russia's ability to use modern non-lethal and lethal weapons in operations that fall short of a level that could instigate a major military response by the United States. These capabilities include EW systems that can detect and geolocate the emissions of opposing military forces and long-range weapons that can precisely strike located targets with little or no warning and minimal collateral damage. Russia has conducted cyberattacks on military and civilian networks as part of their gray zone actions and equipped paramilitary and unbadged military "little green men" with systems to communicate with distant fire support units. Small, transportable drones, guided weapons, and shoulder-launched SAMs have increased the lethality of Russian-supported proxy forces. China is weaponizing disputed islands in the South China Sea, artificial and otherwise, threatening freedom of navigation in the region. China also uses nontraditional forces, including its coast guard and a portion of its fishing fleet that has been called the People's Armed Forces Maritime Militia, to harass foreign ships in the South China Sea.[73]

DoD should also assess how A2/AD challenges will affect its plans and capabilities to deter or counter future acts of gray zone aggression. Over the past 25 years, the U.S. military has been able to intervene against small-scale aggression with little risk of being attacked by an enemy's long-range precision strike forces. In the future, U.S. forces responding to gray zone actions may need to operate in areas that are covered by the A2/AD envelopes of China or Russia. China's efforts to weaponize islands in the South China Sea and Russia's creation of A2/AD complexes in the Black Sea and Baltic Sea regions exemplify this dynamic. Depending on the nature of the crisis, these threats could create an unacceptable level of risk for U.S. forces deploying to assist an ally or partner state. A conventional response to these threats would be to deploy large military formations equipped with robust defenses and possibly offensive systems capable of degrading the adversary's sensor and weapon networks should it become necessary. This could be perceived as highly escalatory by a great power opponent. It could also be considered by U.S. leaders and the international community as a disproportionate response to gray zone actions. As a result, the United States could be dissuaded from coming to the assistance of a beleaugered ally, which would allow China or Russia to continue or even intensify their gray zone actions.

In summary, U.S. planning scenarios should include responses to non-military and low-intensity military actions that are undertaken by China and Russia to achieve their revisionist objectives as main lines of effort, not ancillary activities. DoD's planning has tended to treat peacetime competition and conflict as two separate situations, but for America's great power competitors, these activities are on the same continuum and designed to pursue a common end. Incorporating scenarios for confrontations short of all-out war in DoD's next FPC would

72 For example, see Votel, Cleveland, Connett, and Irwin, "Unconventional Warfare in the Gray Zone," p. 102.

73 Conor M. Kennedy and Andrew S. Erickson, *China's Third Sea Force, The People's Armed Forces Maritime Militia: Tethered to the PLA*, China Maritime Report No. 1 (Newport, RI: China Maritime Studies Institute, U.S. Naval War College, March 2017).

provide defense planners with a baseline to assess operating concepts and capabilities needed for U.S. warfighters to operate in the gray zone.

## Shift Toward Operating Concepts and Theater Postures That Help Offset A2/AD Challenges

Operating concepts that formed the foundation for many of DoD's post-Cold War FPC scenarios were based on an overarching strategy of compellence that required U.S. forces to respond rapidly to an invasion of an allied state, build up a decisive force in theater, expel invading forces from friendly territory, and overthrow the adversary's regime if necessary. These concepts assumed there would be few challenges to theater access and the U.S. military's freedom of action in the global commons—including in the electromagnetic spectrum. They also assumed there would be enough time—perhaps months in some cases—to build-up sufficient forces in a theater to achieve a decisive defeat over a conventional enemy force.

DoD leaders are beginning to acknowledge that operating concepts and assumptions adopted by the Pentagon in the aftermath of Desert Storm provide an inadequate template for its future force planning. Russia, Iran, and other adversaries learned from Desert Storm that affording the United States and its coalition partners the time and space needed to assemble large forces on their borders is a recipe for defeat. As described by other CSBA reports, this is part of their rationale for developing A2/AD complexes that could slow U.S. and allied intervention and allow their militaries to achieve a *fait accompli*.[74] Their investments in advanced integrated air defense systems (IADS), guided missiles, anti-satellite weapons, EW systems, and other asymmetric capabilities are designed to exploit the U.S. military's known vulnerabilities. Many of these vulnerabilities are related to the fact that U.S. power-projection forces must play an away game, and therefore depend on extended LOCs, long-range communications and ISR networks, and bases that may be located within range of air and missile threats.

Chapters 3 through 6 address candidate operating concepts such as shifting toward conducting long-range strike operations from bases located in lower threat areas, taking advantage of the more access-insensitive undersea domain, and conducting distributed operations inside contested areas that could enhance the U.S. military's ability to project power. Including these and other concepts in DoD's FPC scenarios could improve the U.S. military's ability to assure America's allies and friends, engage in long-term competitions with China and Russia, deter conflict, and prevent coercive actions from succeeding. Positioning the right mix of capabilities and some additional forces in Europe and the Pacific could help offset A2/AD threats and reduce the U.S. military's crisis response times. The next section addresses posture changes that could help achieve these objectives.

74 For example, see Jan Van Tol with Mark Gunzinger, Andy Krepinevich and Jim Thomas, *AirSea Battle: A Point-of-Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010); and Mark Gunzinger with Chris Dougherty, *Outside-In Operating from Range to Defeat Iran's Anti-Access and Area-Denial Threats* (Washington, DC: Center for Strategic and Budgetary Assessments, 2011).

### Create regional force postures to counter A2/AD challenges

Following the end of the Cold War, DoD created an overseas posture that mostly consisted of forces that rotated to key regions instead of large, permanently stationed forces with sufficient capacity to blunt major conventional invasions. Although the 2001 QDR concluded that DoD should create more robust postures in four critical regions to better prevent crises from escalating to conflicts, this strategic initiative was short-circuited by the need for forces and resources to support the wars in Iraq and Afghanistan as well as operations against al Qaeda across the globe.

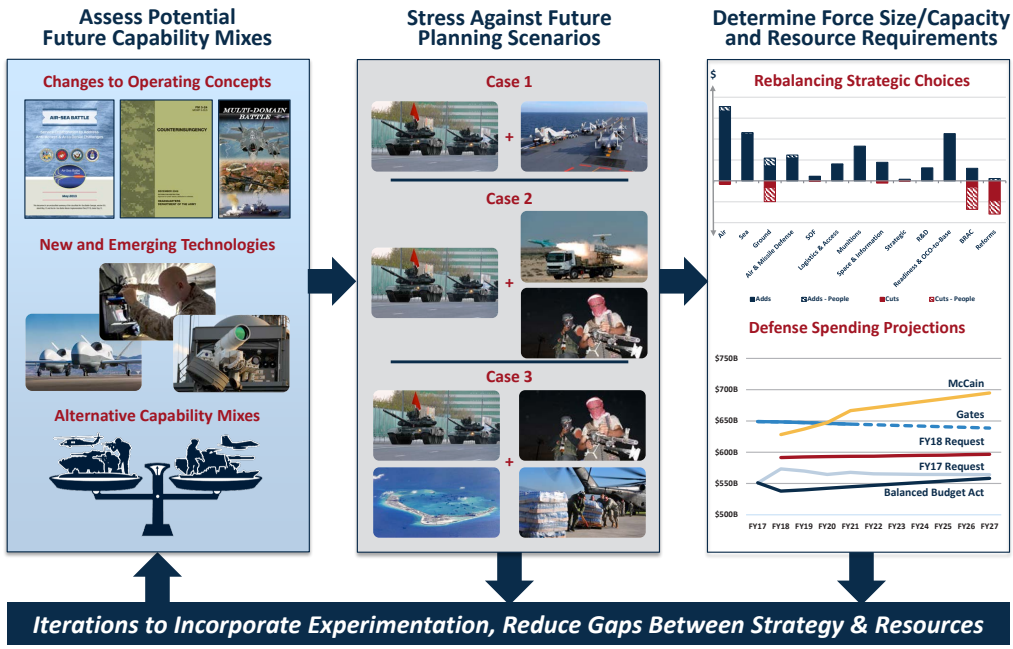
As DoD creates its next FPC, it should assess posture changes that could better deter great power competitors and act as immediate response forces to counter aggression that occurs with little or no warning. These postures should be very different than postures that were designed to fight wars of attrition against the Warsaw Pact. Rather than the large, concentrated formations reminiscent of the forces that DoD maintained overseas during the Cold War, future postures should prioritize forces capable of distributed operations, conducting long-range, land-based fires, coastal anti-ship missile batteries, and high-capacity air and missile defenses that could help harden the U.S. military against Chinese and Russian A2/AD threats. These postures should be complimented by long-range ISR and strike forces that can operate from lower threats areas located outside A2/AD threat envelopes. The following chapters expand on posture initiatives to defend forward in Europe and the Pacific.

Since the number and type of U.S. forces permanently stationed and rotationally postured overseas can have a significant impact on DoD's requirements, it is important to assess potential posture changes as part of DoD's force planning. For instance, stationing additional air defense units or ships in key regions might decrease the need to periodically rotate some forces to those regions. This would have the effect of reducing some of DoD's capacity requirements.

## Adopting a Capabilities-Centric Force Planning Approach

CSBA's 2013 FPC report recommended DoD shift the emphasis of its planning away from defining "how much" force structure is needed toward first determining the "how" (new operating concepts) and "what" (capability mixes) may be required to meet future security challenges. This did not occur, which is unsurprising given budget uncertainties created by the 2011 Budget Control Act and the lack of a strategic vision to inform development of the future joint force. As DoD creates a new defense strategy and force planning construct, it should assess how a capabilities-centric force planning approach similar to the one illustrated by Figure 4 could encourage defense innovation and change.

## FIGURE 4: AN ILLUSTRATIVE PLANNING PROCESS FOCUSED ON OPERATING CONCEPTS AND CAPABILITIES




Photos: U.S. Navy, U.S. Marine Corps, Government, and Creative Commons sources.

The first step for planners (represented by the blue box) would be to assess concepts and technologies that have the potential to create more enduring competitive advantages in key operational competitions. Competitions such as the hiders versus finders and salvo competitions are driven by predominant operating concepts and technologies.[75] Current phases of military competitions typically consist of moves and countermoves that can lead to reactive, incremental capability enhancements that drive spirals of increasing costs for diminishing returns. The U.S. military might gain a more enduring advantage by shifting to the next phase of competitions rather than continuing these tit-for-tat cycles. This usually requires adopting new operating concepts and fielding a different mix of capabilities needed to implement them.[76] A number of competitions are now entering new phases due to the proliferation of advanced military technologies, improvements in computing power, and access to commercial innovations.

75 For a description of the hiders versus finders competition, see Michael G. Vickers and Robert C. Martinage, *The Revolution in War* (Washington, DC: Center for Strategic and Budgetary Assessments, 2004), pp. 109–114. As in any military competition, the advantages of technological innovations such as aircraft low observability usually instigate the development of offsetting capabilities, such as integrated active and passive sensors to detect low-observable aircraft emissions.

76 For examples of military competition and the potential to gain advantages by shifting to a new phase of a competition, see the ground-breaking report by John Stillion and Bryan Clark, *What It Takes To Win: Succeeding In 21st Century Battle Network Competitions* (Washington, DC: Center for Strategic and Budgetary Assessments, 2015).

As illustrated by the middle (gray) box in Figure 4, planners should then assess candidate operating concepts and capability mixes against key scenario cases. Tabletop exercises, wargames, and experimentation using illustrative conflict scenarios could provide first-order assessments that inform follow-on analyses of specific requirements.

The third step in this process would be to determine force capacity requirements including end strength needs. DoD could conduct more traditional analyses to determine capacities to support its new FPC at low-to-moderate levels of risk. These analyses should address requirements for contingencies that may be of long duration, not just forces that temporarily surge to major combat operations (see Figure 5).

## FIGURE 5: ILLUSTRATING FORCE REQUIREMENTS FOR A NOTIONAL SCENARIO CASE

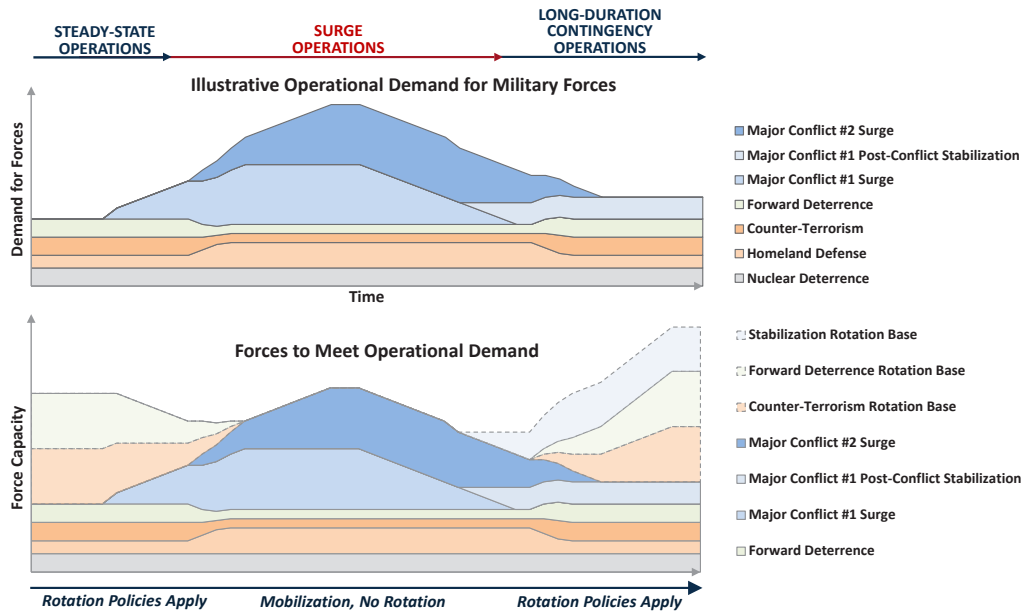



Figure 5 illustrates operational demands of a notional scenario case that includes long-duration operations and surges for two major conflicts (top chart) with resulting force capacity requirements (bottom chart). Capacity requirements in the bottom chart incorporate rotational forces needed to sustain forces deployed to non-surge, long-duration operations pre- and post-conflict. In peacetime, DoD seeks to deploy a given unit 25 to 33 percent of the time, resulting in a requirement for three to four units to maintain one deployed. During surges to major wars, no force rotations are assumed. In the aftermath of a major conflict, units are expected to sustain a 50 percent deployed tempo, resulting in a requirement for at least two units to keep one deployed. As Figure 5 shows, long-duration non-surge operations could drive force capacity requirements that *exceed* warfighting surge demands when force rotations to sustain operations over time are factored in. In other words, future long-duration contingencies of various sizes in multiple theaters may create demand for forces and capabilities that exceed the two-war surge requirements as envisioned by DoD's post-Cold

War FPCs. This is a reversal from the 1993 Bottom-Up Review's assumption that a force that is fully resourced for two surge MRCs would also be capable of supporting SSCs and other long-term operations.

Finally, the difference between capacity needs and resources available (including budgets) could result in shortfalls that affect future operations. As shown by the feedback arrows at the bottom of Figure 5, planners could assess changes to operating concepts and alternative force mixes that could mitigate excessive risk. Alternatively, risk created by these shortfalls could form the basis for requests to Congress for additional resources.

In summary, DoD should include various combinations of the following pacing scenarios in its next FPC:

- Multiple operations of long-duration that require force rotations;
- Actions to deter or counter gray zone aggression by China and Russia;
- Large-scale Informationized Warfare conflicts with China;
- Large-scale New Generation Warfare conflicts with Russia against one or more former Soviet states, including the highly vulnerable Baltic states; and
- Catastrophic homeland defense event.

These scenario combinations would provide DoD's components with a baseline for assessing new operating concepts, capability mixes, and force capacities needed in the era of great power competition. These should then be stress-tested against other contingencies such as operations against rogue state aggressors in the Persian Gulf and Northeast Asia and long-term counter-terror operations globally.

The remaining chapters in this report address operating concepts that DoD should consider as it develops its next defense strategy and FPC. Although many of these concepts are cross-domain in nature, it is important to understand that the Services assess many of their capability and capacity requirements nearly independently. This stovepipe approach can create excessive overlap in capabilities that are procured by multiple Services, as well as issues with integrating joint force operations. Therefore, DoD should develop new concepts that include cross-domain operations, and then assess how they would reshape its future air, sea and undersea, land, and expeditionary naval capabilities holistically. For the sake of brevity, the chapters focus on selected concepts and capabilities to establish more enduring advantages for U.S. forces, rather than all mission areas and capability portfolios.

CHAPTER 3

# Shaping Future Combat Air Forces

Globally responsive combat air forces have been a pillar of American military superiority since the end of World War II. In the 21st century, Air Force, Navy, and Marine Corps multi-mission air forces are supporting counterterrorism operations, providing close air support to friendly forces in multiple theaters, and helping to ensure the air sovereignty of U.S. allies and partners. A small force of bombers remains America's primary means of conducting conventional attacks over long ranges, and nuclear weapons-capable B-52s and B-2s constitute one leg of the U.S. strategic triad. Over the last 16 years, multiple UAS variants have joined the force and are now routinely flying surveillance, strike, logistics, and other missions in support of overseas contingency operations.

## A Combat Force That is Smaller, Older, and Mostly Unable to Operate in Contested Areas

America's combat air forces are now far smaller than the forces that were available to fight Operation Desert Storm in 1991. Decisions to prematurely terminate major aircraft modernization programs, including the procurement of stealthy B-2s and F-22s, has resulted in a force mix that is aging, lacks sufficient range, and is mostly incapable of operating in contested airspace.

For instance, the U.S. bomber force has been cut from 411 aircraft at the end of the Cold War to 158 today, of which only 96 are maintained as Primary Mission Aircraft Inventory (PMAI) aircraft.[77] Early termination of the B-2 program in the late 1990s marked the beginning of a multi-decade break in DoD's procurement of long-range, penetrating strike aircraft. Although

77 PMAI aircraft are "assigned to a unit for performance of its wartime mission." U.S. Air Force, "Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination," Air Force Instruction 16-402, May 30, 2013, p. 33.

the Pentagon continued to develop stealth technologies, it deferred funding a next-generation penetrating bomber in favor of developing a new fighter aircraft and upgrading its existing fighter force. It also continued to rely on relatively short-range, small payload fighters as the predominant means to deliver weapons in theater conflicts. This was partly based on the assumption that fighters and their refueling tankers would be able to operate with near-impunity from airbases located close to an enemy's territory. As a result, the Air Force's bomber force is now the smallest that it has ever operated, has an unprecedented average age of a little over 42 years, and includes only 20 B-2 aircraft—less than 13 percent of the bomber force—that are capable of penetrating enemy defenses.

Similarly, the Air Force's combat-coded fighter inventory is now 59 percent smaller than its 1991 force, and retirements over the next few years could leave it with 1,160 combat-coded fighters.[78] This force, most of which consists of non-stealthy F-15s and F-16s originally designed in the 1970s, has an average age of about 27 years. In comparison, the force between 1978 and 1997 had an average age of 11 years. About 56 percent of the Service's air superiority fighters are F-15C/Ds. Both aircraft are outclassed by new stealth fighters that Russia and China are developing. Although the U.S. F-22A is the world's most capable air superiority fighter, the desire for a peace dividend in the 1990s and subsequent need to fund operations in Iraq and Afghanistan drove decisions to reduce and then cap its procurement at 187 aircraft, which is about a quarter of the original requirement. Only 123 F-22s are now fully capable of combat operations. Similarly, the Marine Corps continues to operate its venerable AV-8B jump jet, which is the second oldest fighter in the U.S. inventory after the A-10, and the Navy has yet to field a single operational stealth fighter in its carrier airwings.

In comparison, Russia has about 770 fighters and 1,300 fixed-wing attack aircraft, and China operates an even larger force of 1,000 fighters and 1,300 fixed-wing attack aircraft. Although many of their operational fighters are inferior to U.S. F-15s, F-16s, and F/A-18E/Fs, both Russia and China are developing stealth aircraft that will outperform U.S. 4th generation, non-stealthy fighters. Furthermore, Russia and China are improving their combat air forces by giving them upgrades such as the capability to launch long-range, advanced air-to-air missiles, and fielding "4-plus" generation fighters like the Su-35 before their 5th generation designs are mature.

As with other elements of the joint force, DoD now faces the task of rebuilding its combat air forces. As it does so, it should assess operating concepts that address emerging threats and future conflict scenarios, rather than air warfare in the permissive operating environments of the past. The following sections propose a number of candidate operating concepts that could change the mix of capabilities in America's air forces. For the sake of brevity, these concepts focus on key combat missions instead of the full range of airpower operations, which includes special operations, strategic and tactical airlift, humanitarian assistance, and support

78 The Air Force's 2017 fighter force consists of 55 squadron "equivalents" of 24 combat-coded aircraft each, compared to 134 fighter squadron equivalents in 1991.

to civilian authorities. As DoD develops its next force planning construct, it should also define pacing threats that could help planners to better differentiate how major elements of it forces should be shaped and sized. This differentiation could help reduce excessive overlap in capabilities and capacity across the joint force. For planning purposes, the near-term pacing threat for U.S. fixed-wing combat air forces should be future conflicts with China in the Western Pacific. China should also be the pacing threat for U.S. naval forces, although U.S. naval concepts and capabilities will need to address Russia's strengths in undersea and electromagnetic warfare. The near-term pacing threat for U.S. land forces should be Russia, while China should be the high-end pacing threat in the mid-term.

## Maximizing Precision Strike Salvos

The U.S. military's ability to conduct large-scale precision strike campaigns has been unmatched by the enemies it has fought since the Cold War. This advantage is eroding as the proliferation of precision guidance systems and other modern weapons technologies enables adversaries to field their own inventories of precision-guided munitions (PGM) capable of reaching U.S. airbases and aircraft carriers over long ranges. Previous CSBA reports have assessed the implications of salvo competitions between militaries that both have the ability to launch precision strikes and to counter opponent strikes.[79] Today, all of DoD's main operating bases in Europe and the Pacific are within range of ballistic missiles, long-range cruise missiles, and other weapons that can be launched by Russia or China respectively. In future salvo competitions, relying almost exclusively on operating combat aircraft from areas that are at highest risk of large-scale salvo attacks could greatly reduce the tempo of U.S. airstrikes.

### Shift toward striking from range

There are alternative operating concepts that could help maintain America's strike advantage in a mature precision strike regime. For instance, U.S. power-projection forces could increase their salvo sizes by operating from airbases and locations at sea **that are** out of range of most of an enemy's air and missile threats. Staging U.S. air operations from more distant locations could decrease the density of an enemy's attacks and increase the cost of its strikes by forcing it to use larger, more expensive, longer-range weapons. Lower density enemy salvos would also reduce the U.S. air and missile defense capacity needed to defeat them. Shifting toward striking from range would play to a comparative advantage of the U.S. military, which has a fleet of bombers with unrefueled ranges of more than 4,000 nm and the capacity to carry up to 80 PGMs[80] each per sortie. U.S. long-range strike and ISR forces are more fuel efficient than

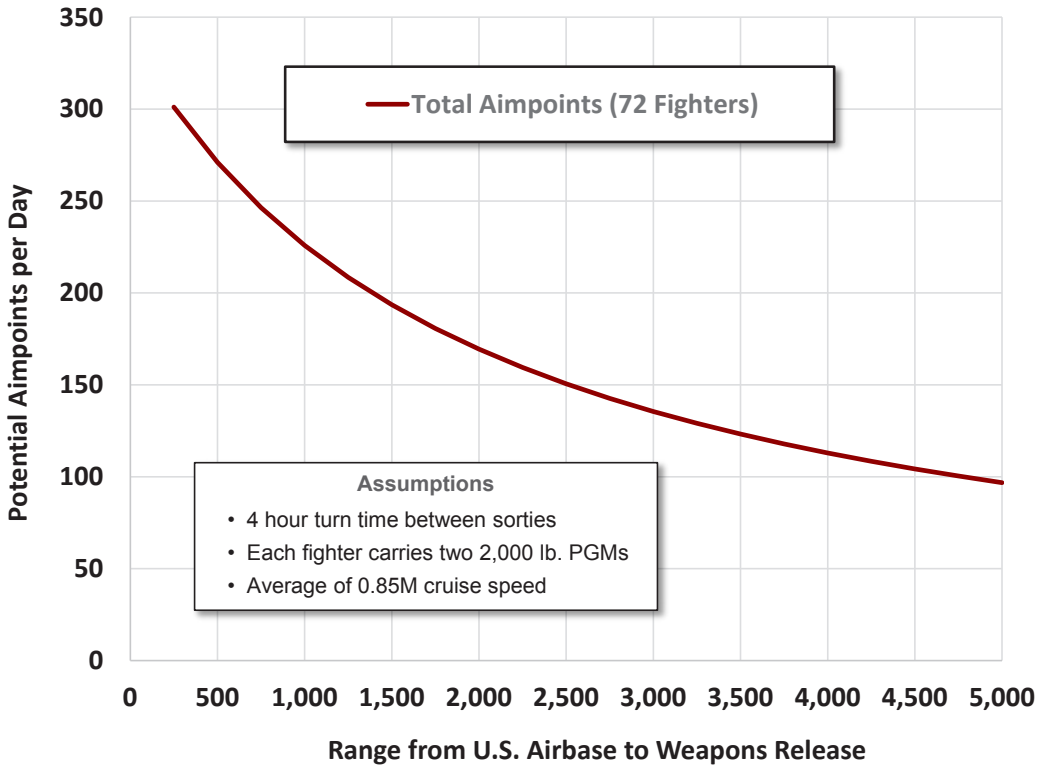
79 See, for instance, Gunzinger and Clark, *Sustaining America's Precision Strike Advantage*; and Mark Gunzinger and Bryan Clark, *Winning the Salvo Competition: Rebalancing America's Air and Missile Defenses* (Washington, DC: Center for Strategic and Budgetary Assessments, 2016).

80 This depends on the size and weight of the PGMs.

forces operated by China and Russia, and they are supported by the world's largest and most capable aerial refueling fleet.[81]

It is important to understand that increased mission ranges could also reduce the number of PGMs (salvo size) a given U.S. force could deliver on targets per day. As illustrated by the solid line in Figure 6, potential aimpoints that 72 fighters could attack in 24 hours decrease as the distance between their airbases and weapons launch points increases. Figure 6 assumes the example fighters carry two 2,000-pound conventional PGMs in their internal weapon bays. Although the number of potential aimpoints per day would increase if the fighters carried larger payloads of small PGMs such as the 250-pound class Small Diameter Bomb II, the principle would remain the same: range has a major impact on the number of aimpoints a given number of aircraft can attack on a daily basis.

### FIGURE 6: IMPACT OF RANGE ON THE POTENTIAL NUMBER OF AIMPOINTS ATTACKED PER DAY

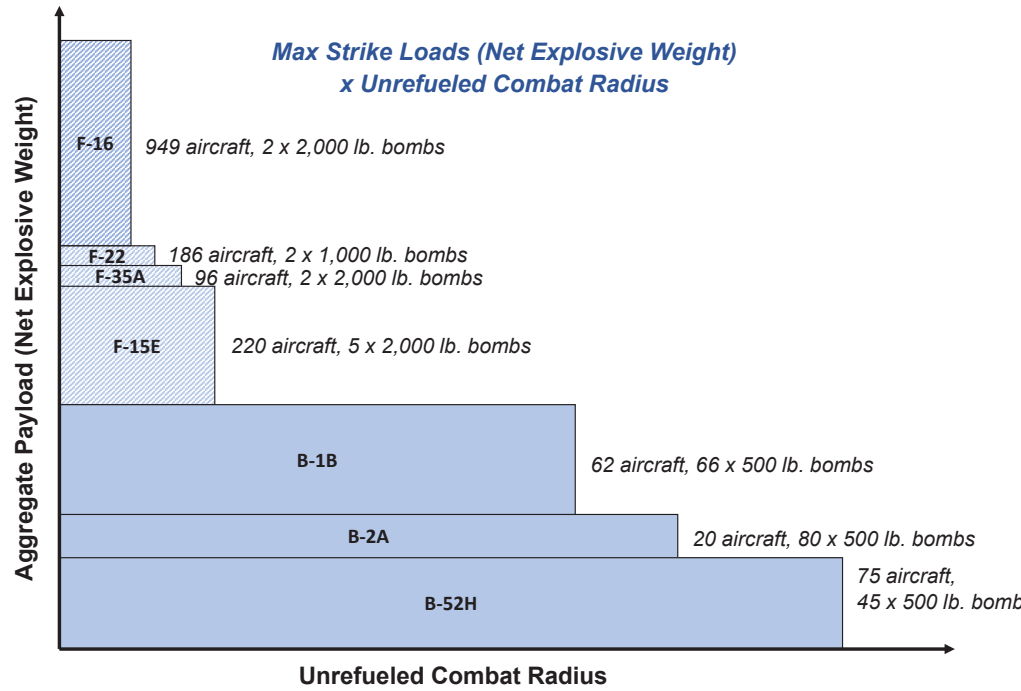



This suggests it would be inefficient to use fighter aircraft with about one-fifth the unrefueled range and one-tenth the payload of a typical bomber to conduct strikes over long ranges.

81 For additional details on this advantage, see Gunzinger and Clark, *Sustaining America's Precision Strike Advantage*, pp. 47–48.

There are also limits to human performance that become extremely relevant for aircrews that must fly long-range sorties. In other words, the relationships between range, mission duration, sortie rate, payload size, and threat environment make a compelling case for using bombers staged from more distant and secure airfields for the bulk of airstrikes in salvo competitions. Moreover, reduced sortie rates caused by operating from longer ranges could be partially offset by preferentially using large-payload bombers instead of fighters for strike operations. This is illustrated by Figure 7, which compares the total payload potential or weapons "throw weight" of the U.S. Air Force's bomber and fighter forces.

### FIGURE 7: ILLUSTRATIVE COMPARISON OF THE WEAPONS THROW WEIGHT AT RANGE OF U.S. AIR FORCE BOMBERS AND FIGHTERS




This would be a reversal from the 1993 BUR and 1997 QDR assumption that U.S. fighter forces could provide a preponderance of high volume airstrikes needed in major conventional conflicts. It could also reverse the priority that DoD has placed on the sizes of its fighter and bomber forces since the end of the Cold War. Shifting toward conducting airstrikes from range could require a larger bomber force than exists today. It would, however, be more feasible to move fighters rather than logistics-intensive bombers in shell-game fashion around a distributed network of temporary and permanent airfields located inside contested areas. Instead of routinely conducting strike operations, U.S. fighters could operate from networks of distributed bases inside contested areas to conduct counterair missions as discussed in the next section.

Other concepts that could change the mix of combat air force capabilities needed for salvo competitions are addressed in greater detail by a previous CSBA report.[82] For instance, improved stealth and electromagnetic warfare capabilities are needed to degrade the effectiveness of increasingly capable enemy defenses. Developing more air-to-ground weapons with ranges from 40 to 400 nm would also increase the flexibility and survivability of U.S. strike aircraft that must penetrate and persist in contested areas.[83] As the report concludes, launching airstrikes from even longer ranges would require combat aircraft to carry payloads of larger PGMs. This would have the effect of reducing the salvo size of U.S. airstrikes.

## Air Superiority

Over the last 25 years, adversaries have developed operating concepts and capabilities designed to prevent the air forces of the United States from dominating the air domain. U.S. joint doctrine acknowledges this reality, observing that air superiority is "that degree of control of the air by one force that permits the conduct of its operations at a given time and place without prohibitive interference from air and missile threats," rather than unchallenged command of the air.[84] Similarly, the Air Force's *Air Superiority 2030 Flight Plan* states that U.S. forces should not assume they will have absolute command of the air, since "in highly contested environments, such a conception may be unrealistic and unnecessary. Air superiority is only needed for the time and over the geographic area required to enable joint operations."[85]

The overarching objective of the *Air Superiority 2030 Flight Plan* is to identify "capability options to enable joint force Air Superiority in the highly contested environment of 2030 and beyond."[86] This 2030-plus focus may be an unfortunate choice, given that IADS covering areas in the Western Pacific and along NATO's eastern front may now be able to deny access to all but the stealthiest of aircraft. It is true that U.S. fighters still hold advantages in the context of individual engagements with most enemy aircraft. However, the sophistication, number, and coverage of integrated air defenses on the ground, at sea, and in the air can change this dynamic to the point that enemies may not need to use a large number of fighters to deny air superiority to U.S. forces. Moreover, adversaries are now able to attack airbases that are critical to U.S. power projection. As RAND analysts have concluded, China's current ability to

82 Ibid., pp. 29–40.

83 For an assessment of the need for additional medium-range standoff weapons, see ibid., pp.36–37.

84 DoD, *Countering Air and Missile Threats*, Joint Publication 3-01 (Washington, DC: DoD, April 21, 2017), p. I-4. As defined by DoD, air superiority encompasses offensive counterair (OCA) and defensive counterair (DCA) mission areas. OCA includes attack operations, the suppression of enemy air defenses (SEAD), fighter escort, and fighter sweeps, while DCA consists of active and passive air and missile defense operations.

85 U.S. Air Force, *Air Superiority 2030 Flight Plan*, p. 1.

86 Ibid., p. 2.

"threaten air bases, challenge U.S. air superiority, and attack U.S. aircraft carriers is of particular concern."[87]

This suggests that gaining the degree of air superiority needed to execute joint and combined operations is more than a matter of fielding a new aircraft capable of outmaneuvering and outrunning enemy fighters. In a previous CSBA report, Dr. John Stillion assessed the growing importance of networks of counterair platforms that have all-aspect RF (radiofrequency) and IR (infrared) signature control, long-range sensors and air-to-air weapons, and low probability of intercept/low probability of detection (LPI/LPD) connectivity.[88] Staging air forces from "small, resilient bases, using dispersal, warning, active and passive defenses, rapid repair capabilities, and streamlined logistics" in order to increase their survivability is also critical to future air superiority operations.[89] Gaining the degree of air superiority needed to enable future operations will require new operating concepts that address these broader considerations.

### Preferentially use fighters to counter air threats

Concepts for operating in contested areas should consider how fighter aircraft could be preferentially used to defend theater bases and friendly forces on the ground, at sea, and in the air from enemy air and missile attacks. Teams of manned fighters and UCAS could fly combat air patrols to support U.S. bombers and intercept enemy strike aircraft before they launch their weapons. Given progress toward developing directed energy weapons, miniaturized air-to-air guided projectiles, and multi-functional EW systems, future non-traditional aircraft[90] such as bombers and carrier-based UCAS could have significant capabilities to counter air-to-air and surface-to-air threats.

### Manned-unmanned teaming/loyal wingman operations

Stillion's air superiority report assessed how teams of manned and unmanned aircraft could have a major impact on air-to-air exchange ratios. The report suggests a future network of UCAS "optimized to perform as sensor platforms with modest aerial weapon payloads" could be teamed with bombers or other large aircraft with long-range sensor suites and large payloads of long-range air-to-air weapons to conduct air superiority missions.[91] As illus-

87 Eric Heginbotham et al., *The U.S.–China Scorecard* (Santa Monica, CA: RAND Corporation, 2015).

88 Stillion, *Trends in Air-to-Air Combat*.

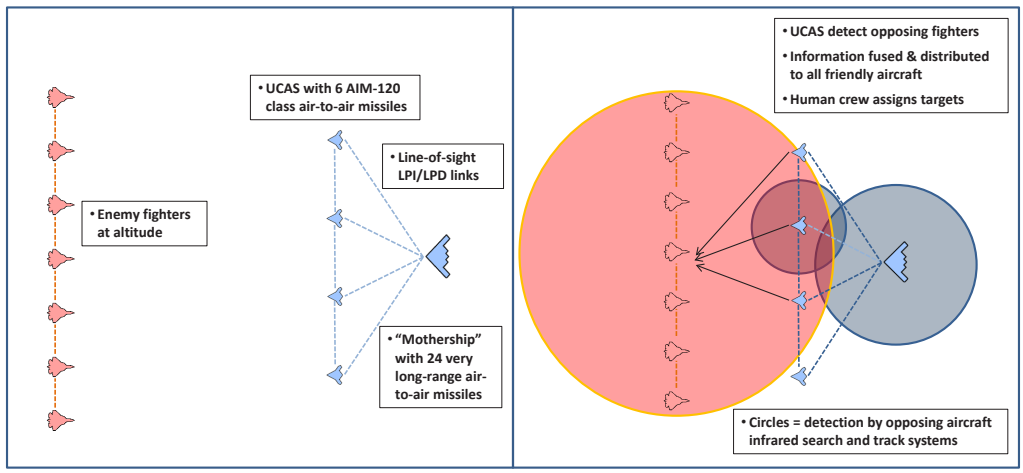
89 U.S. Air Force, *Air Force Future Operating Concept: A View of the Air Force in 2035* (Washington, DC: U.S. Air Force, September 2015), herein referred to as *AFFOC 2035*.

90 These aircraft are non-traditional in the sense that bombers and other non-fighter aircraft usually lack organic capabilities, other than EW systems and passive means to reduce their potential to be detected by enemy sensors, to effectively counter air-to-air and surface-to air threats. It should be noted that multiple variants of U.S. bombers have been armed with very short-range gun systems. The B-52H, which lost its radar-guided tailguns in the 1990s, was the last bomber to be so equipped.

91 Stillion, *Trends in Air-to-Air Combat*, pp. 43 and 47–48.

trated by Figure 8, large aircraft could team with UCAS wingmen to expand their combined sensor and weapons coverage over large areas. Future manned/unmanned networks could also employ passive sensors to detect targets and then cue attacks against enemy aircraft from other UCAS or a mothership carrying long-range air-to-air weapons. DoD's loyal wingman program is assessing the promise of manned-unmanned teaming.[92]

### FIGURE 8: MANNED-UNMANNED TEAMING/LOYAL WINGMAN CONCEPTS




## Conducting beyond visual range air-to-air engagements

There is an ongoing debate over the future need for traditional fighter designs that are very maneuverable and can fly at high speeds versus aircraft that trade some speed and maneuverability for greater mission endurance and larger payloads. Stillion's air superiority assessment concluded that the value of maneuvering and relying on high speeds to engage or avoid enemy aircraft is decreasing relative to aircraft that can use long-range sensors and weapons and have lower signatures and other attributes needed for successful beyond visual range (BVR) air-to-air intercepts.[93] This is borne out by trends in air-to-air engagements; since the Vietnam conflict, about 75 percent of aerial victories were achieved by fighters using BVR tactics and systems.

Stillion's findings suggest there is a need for air superiority operating concepts that integrate manned and unmanned platforms with low all-aspect signatures, long-range passive and active sensors, long-range air-to-air weapons, and LPI/LPD communications networks. There

92 David Axe, "2018: The Year U.S. Fighter Pilots Could Get Drone Wingman," *War Is Boring*, April 12, 2016, available at https://medium.com/war-is-boring/2018-the-year-u-s-fighter-pilots-could-get-drone-wingmen-8dcd884e66ba. See also Graham Warwick, "Lockheed's Skunk Works Demos Autonomy For Unmanned Loyal Wingman," *Aerospace Daily & Defense Report*, April 11, 2017, available at http://aviationweek.com/defense/lockheed-s-skunk-works-demos-autonomy-unmanned-loyal-wingman. Figure 8 is adapted from Stillion, *Trends in Air-to-Air Combat*.

93 Stillion, *Trends in Air-to-Air Combat*, p. 42.

are indications the Air Force is considering alternatives for a Penetrating Counterair Aircraft (PCA) that is a "sensor platform with lots of weapons and long range" capable of performing "air escort, fighter sweep, suppression of enemy air defenses, and defensive counter-air" missions.[94] Long range would increase a PCA's ability to persist in contested areas and operate from locations that are at lower risk of missile attacks, while its sensors could provide target information to other penetrating and non-penetrating platforms.[95] Since Airborne Warning and Control System (AWACS) aircraft can identify targets over very long ranges and position fighters for BVR kills, assessing how they could be integrated into a future air superiority system-of-systems capable of operating in contested airspace should be a key step in defining requirements for their replacements.[96] Given the increasing ability of Chinese and Russian air forces to intercept large, non-stealthy platforms like the Air Force's current AWACS, migrating this mission to more survivable manned and possibly unmanned platforms should be a high priority.

### Using standoff "arsenal planes" with large payloads of long-range air-to-air weapons

Although concepts for using arsenal planes for strikes and counterair missions have been discussed for years, until recently there has been little evidence that DoD was serious about pursuing this concept. The *Air Superiority 2030 Flight Plan* briefly mentions a standoff arsenal plane-like capability the Air Force is developing in partnership with DoD's Strategic Capabilities Office that would utilize "long-range mission effects chains."[97] Appropriately, DoD has not released details about this effort. However, combining large-payload but non-penetrating aircraft with penetrating UAS or fighters that provide the arsenal planes with target cues could help achieve the degree of localized air superiority needed for future joint operations.[98] Given the ranges of modern IADS, this would require non-penetrating arsenal planes to carry very-long-range air-to-air weapons in order to remain at standoff distances that significantly reduce the risk of attack. This concept will require significant analysis of the effectiveness and cost to equip arsenal planes with countermeasures and long-range weapons they would need in conflicts with China and Russia.

94 John A. Tirpak, "Defining the Next Air Superiority Platform," *Air Force Magazine,* July 2017, available at http://www.airforcemag.com/Features/Pages/2017/July%202017/Defining-the-Next-Air-Superiority-Platform.aspx. This article cites a presentation given by Air Force Brigadier General Alex Grynkewich, Deputy Director for Global Operations, the Joint Staff.

95 Ibid.

96 According to the Air Force, the replacement for its current AWACS—the Advanced Battle Management System (ABMS)—will require new operating concept ideas for its employment. U.S. Air Force, *Air Superiority 2030 Flight Plan*, p. 7.

97 Ibid., p. 6.

98 Depending on the scenario, it may also be possible for ground and sea-based systems to provide arsenal planes with target cues.

## Global "Swing" Forces to Deter and Deny

Given force capacity shortfalls that will likely exist for some time even under the most optimistic defense budget projections, DoD should place a high priority on forces that have the flexibility to rapidly swing between different theaters and contingency operations. Swinging forces between theaters to deter or respond to regional crises is not a new concept for DoD. Doing so in response to great power aggression, however, will likely require the development of new operating concepts and a mix of forces capable of gaining access in A2/AD threat environments. For instance, a future joint swing force could consist of long-range, penetrating aircraft for ISR and strike; aircraft carriers with multi-mission stealth UCAVs; and embarked elements of a Marine air-ground task force capable of joint theater entry operations. These operating concepts and capability requirements could have a significant impact on the design of the future joint force.

## Airbase Air and Missile Defense Operations

Despite enormous resources invested in DoD's ballistic missile defense architecture, it lacks the capability and capacity to defeat salvos of weapons that include large numbers of cruise missiles, air-delivered PGMs, armed UAS, and other threats. As a consequence, U.S. theater airbases are nearly undefended against these large salvos that can be launched by China and Russia.[99] This situation may not improve in the near future, since there appears to be very little substantive progress toward developing operating concepts and fielding higher capacity air and missile defenses that could give U.S. forces "a unique advantage at the operational level of war."[100]

Without adequate salvo defenses, U.S. air forces may have to choose between operating from theater bases that are at high risk of salvo attacks or staging from remote locations that exceed the range of most of an enemy's strike weapons. Alternatively, new operating concepts and capabilities could significantly improve the U.S. military's ability to defend airfields located further within contested areas. As illustrated by Figure 6, operating air forces from defended bases located closer to the battlespace could increase their operating tempo and ability to generate offensive and defensive sorties. The following candidate concepts could provide starting points for assessing airbase defense requirements in a mature precision strike regime.[101]

99 For specific examples, see Dave Ochmanek, *Overcoming Anti-Access and Area Denial (A2AD) Threats*, PAF-1P-406 report (Santa Monica, CA: RAND Corporation, Project Air Force, June 9, 2017).

100 "The competitor who can demonstrate the ability to defeat the guided munitions salvo competition is going to have a unique advantage at the operational level of war." Deputy Secretary of Defense Bob Work, speech delivered at the U.S. Army War College Strategy Conference, Carlisle, PA, April 8, 2015, available at https://www.defense.gov/News/Speeches/SpeechView/Article/606661/army-war-college-strategy-conference/.

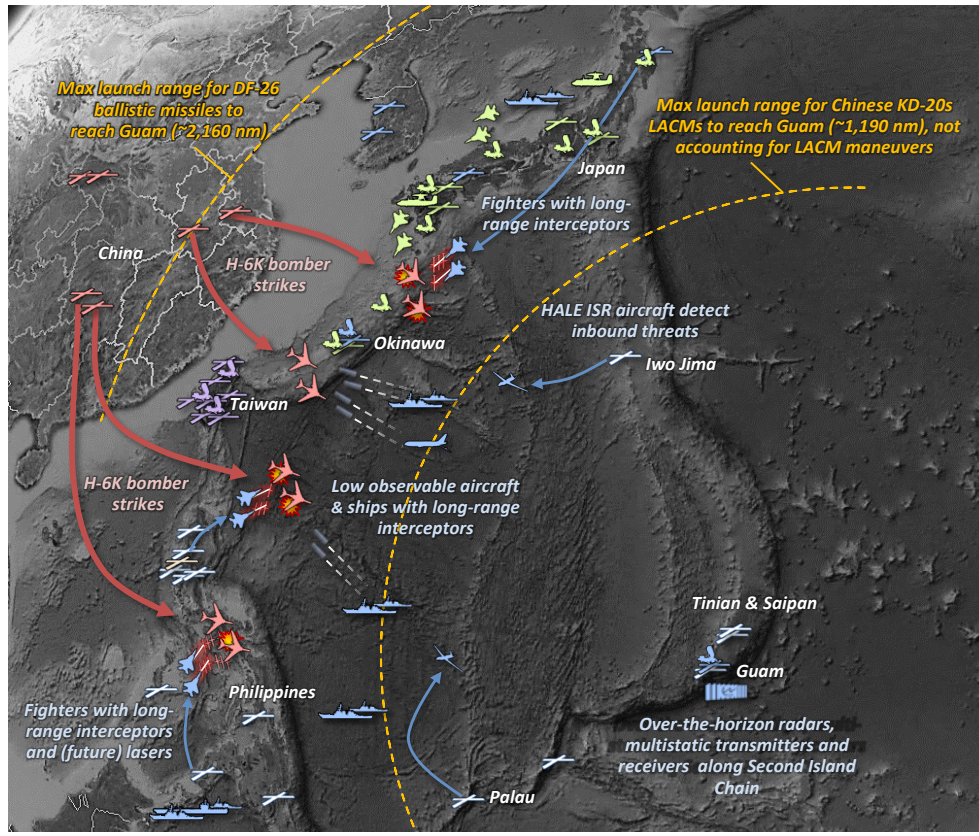
101 Gunzinger and Clark, *Winning the Salvo Competition*.

### Left-of-launch salvo defense counterair operations

"Left-of-launch" is a term used to describe kinetic and non-kinetic (e.g., cyber and electronic warfare) operations to suppress enemy air and missile attacks before they are launched. Preparing for offensive left-of-launch operations such as attacking enemy missile TELs, military airfields, and weapons resupply nodes should be a high priority for the Air Force, since no other Service can deploy sufficient capacity to execute them on a large scale. These operations will require penetrating ISR and strike systems with sufficient range, persistence, and all-aspect broadband low observability needed to attack this target set in contested areas.

Future left-of-launch operations could also include using fighters and ground fires to intercept enemy strike aircraft in the air before they reach their weapons launch points (see Figure 9). The threat of these intercepts could compel an enemy to sortie additional fighters and electronic attack aircraft to protect its strike packages, further driving up the cost of its salvos. These counterair operations could be complemented by surface ships capable of launching long-range surface-to-air missiles against enemy ISR and strike platforms.

FIGURE 9: INTERCEPTING ENEMY AIRSTRIKES BEFORE WEAPONS LAUNCH



### Operating air forces from dispersed postures

Today, U.S. air forces in the Pacific are concentrated at a small number of MOBs. Although this concentrated posture creates efficiencies in peacetime, it would present Chinese air and missile forces with lucrative targets in the early stages of a major conflict. Operating air forces from dispersed postures inside contested areas could reduce an enemy's ability to concentrate its salvos on a small number of targets. Dispersal combined with frequently repositioning air forces to different operating locations in Europe and the Pacific would also increase strains on an opponent's ISR networks and possibly create opportunities for U.S. counter-C3ISR operations.

Given the vast expanse of the Pacific theater, however, operating combat air forces from a widely dispersed posture would be extremely challenging absent significant upgrades to the U.S. military's logistics networks. In Europe, there is far more infrastructure and hundreds of airfields and potential temporary operating locations that could be utilized by U.S. and allied conventional takeoff and landing (CTOL) and short takeoff and vertical landing (STOVL) combat aircraft. Assessing operating concepts, prepositioning options, logistics infrastructure and other requirements for distributed operations in both theaters should be a high priority for DoD.

### Counter-C3ISR operations

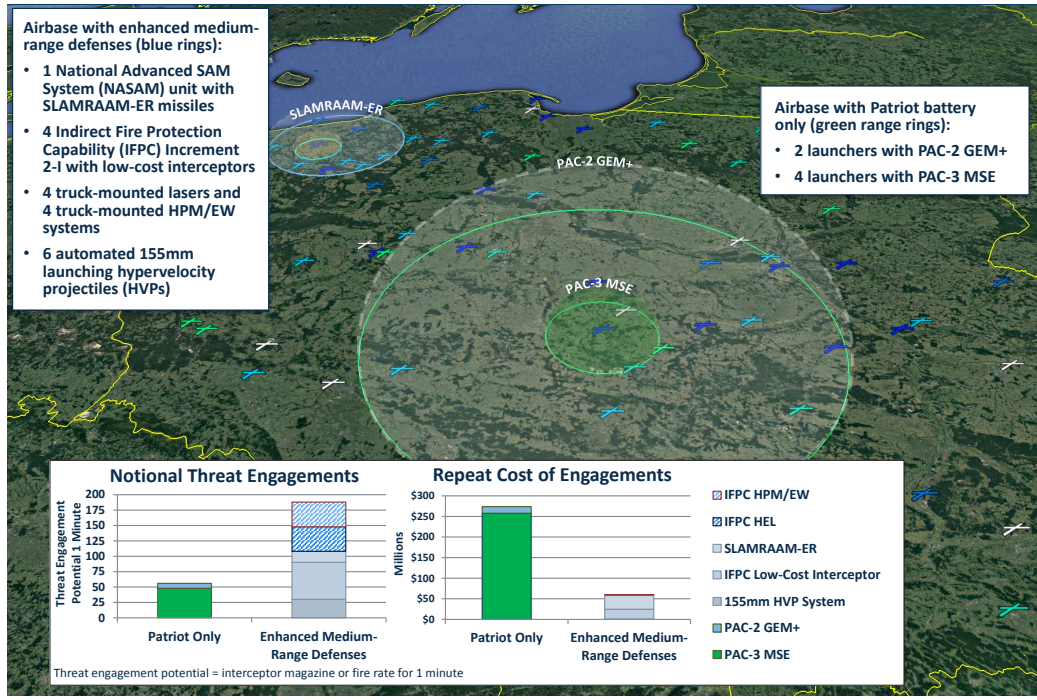
Counter-C3ISR operations to degrade an enemy's ability to gain an accurate picture of the battlespace could greatly increase the resources they would need to attack U.S. bases with precision. Active counter-C3ISR measures include nodal attacks on enemy information networks and electronic warfare operations to locally degrade the sensors that enemy forces rely on to attack targets. Other non-kinetic operations could degrade or corrupt PNT information from terrestrial and space-based systems such as Russia's Global Navigation Satellite System (GLONASS) and China's BeiDou constellation. Denying PNT to an enemy could increase its reliance on PGMs that are equipped with terminal guidance sensors. This may create additional opportunities to use EW, directed energy weapons, and other measures to cause enemy PGMs to miss their intended targets or divert them to false targets.

Passive counter-C3ISR measures could also help future U.S. power-projection forces to degrade an enemy's ability to use EW systems to locate and cue attacks against airbase emitters. Some U.S. airbase emitters such as radars and communications systems could be mobilized to reduce the risk they will be accurately located and tracked. Networked multistatic passive sensors coupled with distributed communications systems would further reduce the signature of an airbase in the electromagnetic spectrum. Future passive sensing systems could take advantage of emitters of opportunity such as commercial radio, television, and cell tower transmitters to locate air and missile threats. Ground-based and airborne infrared sensors linked by LPI/LPD communications could extend the range and accuracy of airbase threat detection and targeting networks.

## Short- and medium-range air and missile defense operations

A previous CSBA report assessed how a combination of active and passive operations could greatly increase the number of sorties and weapons (salvo sizes) an enemy would need to use to successfully attack defended targets.[102] While it would be impractical to field airbase defenses that are capable of intercepting *all* threats in large salvos, even a moderate increase in capacity combined with other active and passive defense measures might dissuade an enemy from launching attacks that it perceives to be too difficult or too costly. Future airbase defenses could include medium-range ground-based defense systems such as rapid-firing guided projectiles launched by mobile guns, low-cost surface-to-air interceptors, and directed energy systems. In addition to defenses operated by land forces, future airmen could be equipped with mobile high-power lasers and high-power microwave (HPM) systems capable of engaging multiple threats in a salvo. As illustrated by Figure 10, high-capacity airbase defenses could help harden them against salvos and possibly achieve better cost exchange ratios relative to defenses that only consist of more expensive surface-to-air interceptors.[103]

### FIGURE 10: COMPARING THE CAPACITY OF TWO NOTIONAL AIRBASE DEFENSES AND THE COST PER ENEMY SALVO ENGAGED




102 For more information on potential future medium-range air and missile defenses, see ibid.

103 Figure 10 assumes identical salvos are launched at both airbases. The bar chart on the left shows the potential number of air and missile threats each base defense laydown could engage in a one-minute period.

## Close Air Support Operations

The close air support mission has been the focus of a great deal of controversy over the last few years, instigated in part by the proposed retirement of the Air Force's aging A-10C fighter. Similar to other major mission areas, the larger issue is how and with what the joint force should conduct CAS in the future, not the pending retirement of one specific weapon system.

### CAS in permissive environments

The Air Force is considering increasing its capacity to conduct direct attack CAS in permissive environments by procuring non-developmental, low-cost OA-X (Observation/Attack-X) aircraft.[104] The Service has studied how smaller, less expensive aircraft could support counter-terrorism operations at a cost of $2,000–$3,000 per flying hour, a significant reduction from the $20,000-plus cost per flying hour for more sophisticated fighters. Equipped with sensor balls similar to what is on the MQ-9, these aircraft could conduct CAS, armed reconnaissance, non-traditional ISR, and peace enforcement missions in low threat areas.

As PGMs, onboard targeting pods, and other precision strike technologies have matured, upgraded bombers and other non-traditional platforms such as UAS have been tasked for CAS missions. DoD should assess how operating concepts for CAS in permissive environments could take advantage of multiple precision-enabled aircraft to provide friendly ground forces with close-in fire support. Manned systems could be teamed with a host of different UAS, including small tactical UAS operated by ground units, to provide persistent CAS.

104 "OA-X is the low-cost, off-the-shelf light attack solution the Air Force is bruiting to relieve the spiraling operating costs of conducting low-intensity operations with multirole fighters, working within existing fiscal constraints to free resources to invest in the high-end fight." Mike Benitez, "OA-X: More Than Just Light Attack," *War on the Rocks*, August 16, 2016, available at https://warontherocks.com/2016/08/oa-x-more-than-just-light-attack/.

FIGURE 11: SNIPER ADVANCED TARGETING POD ON A B-1B BOMBER


A Sniper Advanced Targeting Pod hangs from the underbelly of a B-1 Lancer. U.S. Air Force photo by Staff Sgt. Darnell Cannady.

### CAS in contested environments

Advances in PNT, unmanned autonomous technologies, sensors, and higher capacity data links could change how U.S. forces conduct CAS in contested environments. A future network of systems could use armed, semi-autonomous penetrating UAS equipped with advanced laser datalinks to perform CAS and provide precision target cueing for other manned/unmanned aircraft and standoff weapon launchers. This network could include small UAS that are launched by aircraft, ground units, and possibly UUVs that provide ISR support and data-links for CAS operations. Future small UAS, which could be expendable or recoverable, could locate, tag, and track targets in contested areas using RFID (radiofrequency identification) tags, perfluorocarbon tracers, nanocrystal quantum dots, and other technologies. The ability to quickly fuse data from multiple, dispersed air and ground forces will be key to integrating networked CAS operations in contested areas.

### Integrated air-ground precision fires operations

DoD should develop operating concepts to provide surface-to-surface precision "fires on demand" to ground forces in permissive and contested environments. These concepts should address how precision fires could be integrated with airborne CAS assets, especially in high-threat areas where sufficient U.S. combat aircraft may not be able to penetrate until opposing air defenses are degraded. UAS and small Unmanned Aircraft Systems (sUAS) of various

classes and capabilities, some of which are directly controlled by the ground units they are supporting, could provide target identification and cueing information for close-in surface-to-surface and air-to-surface precision fires. Integrating multi-domain CAS operations will likely require new organizational relationships and structures—such as a multi-domain operations center—to coordinate fires. Chapter 5 addresses this in greater detail.

## Sustaining the Air-Breathing Leg of the U.S. Nuclear Triad

DoD's next force planning construct would be incomplete without considering the factors that could influence the shape and size of its future nuclear deterrent posture. This section briefly addresses the need to modernize the Air Force's AGM-86B Air-Launched Cruise Missile (ALCM), which is now the only air-launched, standoff nuclear weapon in DoD's strategic triad. A future CSBA report will address the need to modernize other elements of the U.S. strategic triad.[105]

Near the end of the Cold War, the United States maintained an inventory of more than 12,000 nuclear warheads on 1,875 strategic vehicles.[106] Since 1990, multiple U.S. administrations seeking to "reduce the role that nuclear weapons in our national security strategy"[107] chose to delay or cancel programs to modernize the U.S. strategic triad.

This modernization pause gave America's competitors an opportunity to field new nuclear weapon systems or pursue an initial nuclear weapons capability. China has increased the stature of its PLA Rocket Force (PLARF), giving it a Service-like status and the resources to upgrade and grow the size of its nuclear and conventional missiles.[108] Russia is modernizing all three legs of its strategic triad; has fielded a new long-range, air-launched cruise missile;[109] and is developing a new stealth bomber. Russia also maintains a force of approximately "2,000 operationally-available non-strategic nuclear warheads, which can be delivered by air defense, coastal defense, maritime strike, land attack, anti-surface warfare, and anti-submarine warfare weapons."[110] It has also breached the Intermediate-Range Nuclear Forces (INF) Treaty, which

105 The U.S. strategic triad now consists of Minuteman-III ICBMs, gravity bombs and air-launched cruise missiles that can be carried by bombers, and 14 Ohio-class SSBNs that can each carry up to 24 Trident II D5 submarine-launched ballistic missiles (SLBM).

106 The Soviet Union fielded just over 11,000 warheads on 2,332 strategic nuclear delivery vehicles. The United States and Russia are now on track to reduce their inventories to 1,550 warheads and 800 total launchers by early 2018 in compliance with New START.

107 Remarks by President Barack Obama, Hradcany Square, Prague, Czech Republic, April 5, 2009, available at https://obamawhitehouse.archives.gov/the-press-office/remarks-president-barack-obama-prague-delivered.

108 The PLARF was formerly the PLA Second Artillery Force.

109 Defense Intelligence Agency (DIA), *Russia Military Power: Building A Military to Support Great Power Aspirations* (Washington, DC: DIA, 2017), p. 25; and "Kh-101/Kh-102," *GlobalSecurity.org*, January 1, 2017, available at http://www.globalsecurity.org/wmd/world/russia/kh-101.htm.

110 Evan Braden Montgomery, *Extended Deterrence in the Second Nuclear Age: Geopolitics, Proliferation, and the Future of U.S. Security Commitments* (Washington, DC: Center for Strategic and Budgetary Assessments, 2016), p. 21.

bans the development and testing of ground-launched cruise missiles with ranges between 500 and 5,500 kilometers. North Korea has developed a small inventory of nuclear warheads and is aggressively pursuing ballistic missile and reentry vehicle technologies that would be needed to deliver them over intercontinental ranges. Although the U.S. Government has said that Iran is complying with the Joint Comprehensive Plan of Action, which went into effect in October 2015, it continues to develop and test ballistic missiles and unmanned systems that "present a danger to U.S. forces and partners across the Middle East and beyond" and may be capable of carrying nuclear weapons in the future.[111]

Despite these developments, serious debate persists over the need to modernize the U.S. strategic triad. Although the Commander of the U.S. Strategic Command General John Hyten has acknowledged that all three legs of the triad urgently require modernization,[112] others in and out of government have voiced concerns about program costs and the potential that some new triad systems may be destabilizing. A recent target of these claims is the Long-Range Standoff weapon (LRSO) program, which will develop a cruise missile to replace the Air Force's geriatric ALCM.

Like other weapons designed in the 1970s, the ALCM lacks the capability to survive in contested air environments and is facing serious reliability and availability challenges.[113] In fact, concerns with the ALCM's survivability against IADS caused the Air Force to initiate an effort to develop a replacement cruise missile shortly after the ALCM was declared operational in the early 1980s. The resulting Advanced Cruise Missile (ACM) had stealth coatings, forward-swept wings, and other design features that improved its ability to penetrate defended areas.

111 General Paul Selva, Vice Chairman of the Joint Chiefs of Staff, "Military Assessment of Nuclear Weapons Requirements," statement before the 115th Congress, House Armed Services Committee, March 8, 2017, p. 4, available at http://docs.house.gov/meetings/AS/AS00/20170308/105640/HHRG-115-AS00-Wstate-SelvaUSAFP-20170308.pdf.

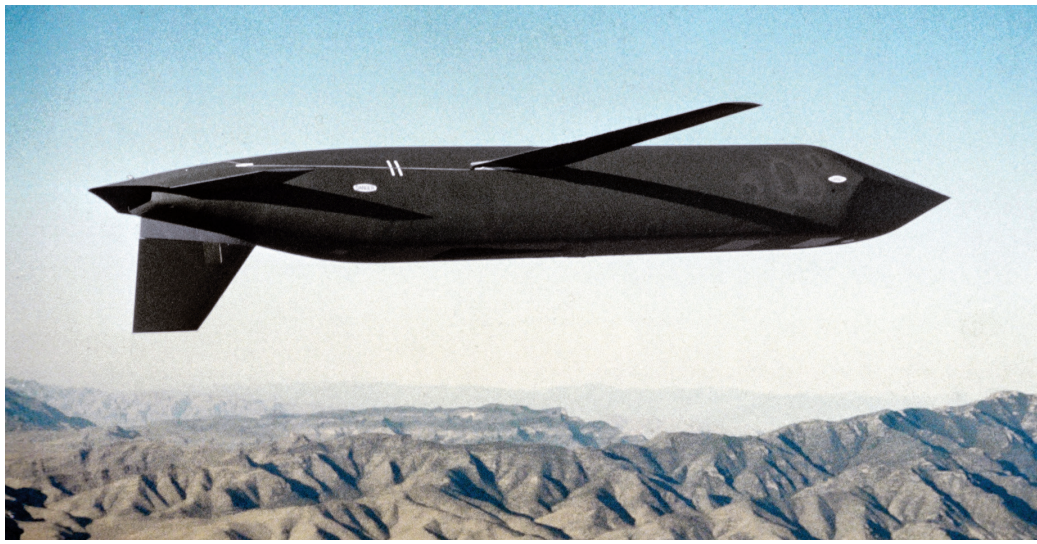
112 Bill Gertz, "STRATCOM Worried by Slow Pace of U.S. Nuclear Modernization," *Washington Free Beacon,* July 31, 2017, available at http://freebeacon.com/national-security/stratcom-worried-slow-pace-u-s-nuclear-modernization/.

113 First fielded in 1982, the ALCM was designed to have a 10-year service life.

### FIGURE 12: AGM-86B ALCM


U.S. Air Force Photo.

### FIGURE 13: AGM-129 ACM



U.S. Air Force Photo.

Due to the end of the Cold War, new arms control agreements, and other reasons, DoD decided to terminate ACM production short of its original inventory objective and not replace

its ALCMs.[114] The last ACM was retired from active service in 2012. Nearly 35 years after the ALCM first joined the active force, DoD is initiating a program to develop the LRSO, which will be capable of "penetrating and surviving complex advanced integrated air defense systems and GPS-denied environments from significant standoff ranges."[115]

Unlike ALCMs, which can only be carried by B-52s, LRSOs will be carried by B-2s and future B-21 bombers. Without the LRSO, the U.S. bomber force will lose its ability to launch nuclear strikes from standoff ranges. This would require U.S. bombers to penetrate very close to defended targets to deliver their nuclear gravity bombs. It would also further erode America's strategic deterrence posture and ability to meet its extended deterrence commitments. A similar dynamic exists for the Air Force's Minuteman-III intercontinental ballistic missile (ICBM), which is facing significant obsolescence and sustainment challenges. A future CSBA report will provide a more comprehensive assessment of the need to replace the Minuteman-III as well as the ALCM and their associated infrastructure.

## Capability and Sizing Implications

### Examples of future precision strike capabilities

**Long-range, penetrating ISR and strike combat aircraft.** For global precision strike, future air forces should include manned and unmanned all-aspect, low observable platforms capable of penetrating and persisting in contested areas. A network of manned and unmanned ISR and strike systems should include stealth bombers and longer-range, multi-mission UCAS that can operate from aircraft carriers and theater airbases located in areas that are at lower risk of air and missile attacks.

**Active and passive measures to increase aircraft survivability and maximize salvo size.** Decoys, jammers, and other EW systems that are dispensable or carried by penetrators could increase the survivability of U.S. salvos. Future EW systems should be networked and increasingly able to autonomously assess the EMS across a wide frequency range, detect threats, determine appropriate countermeasures, and create effects against threats that are not in their threat libraries.[116]

114 "AGM-129A Advanced Cruise Missile," Fact Sheet, U.S. Air Force, May 24, 2010. See also Bill Orndorff, "Last Cruise Missiles Crushed at Hill AFB," *Hilltop Times*, April 19, 2012, available at http://www.hilltoptimes.com/content/last-cruise-missiles-crushed-hill-afb.

115 Office of the Under Secretary of Defense (OUSD)(Comptroller), Chief Financial Officer (CFO), *Department of Defense Fiscal Year 2018 Budget Request: Program Acquisition Cost by Weapon System* (Washington, DC: DoD, May 2017), p. 5-17, available at http://comptroller.defense.gov/Portals/45/Documents/defbudget/fy2018/fy2018_Weapons.pdf.

116 For additional insights on attributes for future EMS warfare systems, see Bryan Clark and Mark Gunzinger, *Winning the Airwaves: Regaining America's Dominance in The Electromagnetic Spectrum* (Washington, DC: Center for Strategic and Budgetary Assessments, 2016).

**Medium-range standoff PGMs.** Flexibility of airstrikes in contested areas can be increased by developing additional air-to-ground weapons with ranges from 40 to 400 nm. These weapons would create more options for penetrating strike aircraft to avoid lethal air defenses while balancing their salvo sizes with weapon costs.

**Networked communications to support strikes in contested areas.** Air operations in contested areas will require LPI/LPD communications and secure data links to create networks of ISR, strike, electronic warfare, and airborne BMC3I (Battle Management, Command, Control, Communications, and Intelligence) systems. Networks should support communications between 5th and 4th generation aircraft and direct coordination with sea-based assets and ground fires units. The ability to be integrated into a network of sensors and shooters should be a baseline requirement for all future combat aircraft.

### Examples of future air superiority capabilities

**Capacity to carry long-range sensors and weapons.** A future system-of-systems for air superiority should include stealth aircraft with sufficient space, weight, power, and cooling capacity for longer-range IR and RF sensors and air-to-air weapons for BVR threat engagements. Aircraft with these attributes would also have greater flexibility to accept modifications as new technologies mature, including hypersonic air-to-air missiles and directed energy systems.

**All-aspect signatures suitable for operations in contested areas.** Future air superiority manned and unmanned aircraft should have all-aspect low observability in the RF and IR regimes of the EMS. Although subsonic tailless aircraft are inherently less maneuverable than more conventional wing-body-tail designs, they may have the greater ability to counter threats at BVR ranges before they can be counter-detected and attacked.

**Manned-unmanned system-of-systems.** A future air superiority system-of-systems could include networked manned and unmanned combat aircraft that can cooperatively detect, track, and engage threats. UAS with active and passive sensors and possibly small weapons loads could support "loyal wingman" operations, increasing the range, area coverage, and endurance of a networked air superiority force.

**Non-traditional platforms that can contribute to air superiority.** Directed energy, miniaturized air-to-air guided projectiles, and other weapon systems could give bombers and unmanned systems the ability to counter surface-to-air and air-to-air threats.

### Salvo defense capabilities

**Capabilities for left-of-launch operations.** Penetrating and persistent ISR and strike systems are needed to conduct salvo suppression operations against enemy airfields, missile TELs, and weapons logistics nodes. Future fighters equipped with long-range sensors and long-range air-to-air weapons could intercept cruise missile-carrying bombers and other

strike aircraft before they launch their weapons. Future high-altitude, long-endurance (HALE) UAS equipped with long-range sensors and directed energy weapons could target and attack ballistic missiles in their boost phase of flight.

**Capabilities for counter-C3ISR operations.** Future U.S. air forces should include airbase defenses capable of counter-C3ISR operations that reduce the size and effectiveness of enemy strike salvos. Active and passive counter-C3ISR capabilities should include multi-spectral camouflage, shelters (actual and decoys), decoys with signatures in the EMS sufficient to divert enemy weapons from actual targets, and electronic warfare systems to degrade enemy ISR systems and weapon sensors.

**High-capacity airbase air and missile defenses.** DoD should field new capabilities that promise to greatly increase the capacity of its airbase defenses against salvo threats. Candidate defenses include directed energy weapons; medium-range, low-cost surface-to-air missiles; and inexpensive rapid-firing projectiles that can guide or be command guided to intercept maneuvering threats after launch. Airbase defense operations should be a multi-Service responsibility. In particular, the Air Force should no longer assume that another Service will eventually field airbase defenses with sufficient capacity against salvo threats.

### Close air support

**Networked system-of-systems for CAS.** DoD should assess operating concepts for CAS in permissive and contested areas that address how multiple precision-enabled aircraft could provide friendly ground forces with close-in fire support. In addition to manned aircraft capable of delivering weapons with a very high degree of accuracy, a network of systems for CAS could include precision-enabled armed UAS and even swarms of collaborative, autonomous weapons that have the ability to loiter in the battlespace, detect potential targets, and communicate with other manned and unmanned systems to coordinate attacks.

**A future "high-low" force mix for CAS.** Although new technologies introduced into the force have changed how the U.S. military performs CAS, F-16, F-15E, F/A-18E/F, and other combat aircraft units are suffering from reduced readiness and increased maintenance costs, driven in part by operational tempos. An OA-X could free more sophisticated, multi-mission combat aircraft for other operations; help relieve strain on the force;[117] and possibly reduce the cost of providing persistent CAS in low-threat environments.

**New capabilities for CAS.** Given technological advances, it is likely that old concepts and capabilities for CAS will give way to new systems that can provide highly accurate fires in support of ground forces. In the future, multi-mission combat aircraft could be supplemented

117 An Air Combat Command analysis posited that replacing one and a half deployed high-performance fighter squadrons with OA-X aircraft could reduce operating costs by $300 million every year due to its reduced fuel costs. OA-X could also be an option for building the capacity of U.S. partners. Air Combat Command, *OA-X Enabling Concept* (Langley AFB, VA: Air Combat Command, December 23, 2008), p. 4, available via *Aviation Week* at http://aviationweek.com/site-files/aviationweek.com/files/uploads/2017/03/14/ACC%20OA-X%20Enabling%20Concept%28Distro%20A%29.pdf.

by surface-to-surface fires provided by mobile launchers and tube-launched guided projectiles, possibly including hypervelocity projectiles. UAS of various classes, some of which may be controlled by ground forces, could supplement other ISR systems supporting CAS.

### Some capacity implications

Determining specific capacity implications of the operating concepts proposed in this chapter will require more comprehensive analyses. This will be the topic of a future CSBA report. Nonetheless, Chapter 4 is incomplete without mention of several major force sizing considerations.

With few exceptions,[118] most elements of the U.S. military have absorbed multiple cuts since the end of the Cold War. Although upgrades to existing weapons systems have recaptured some capacity lost to budget cuts, continuing to prioritize upgrades over replacing aging weapon systems is unlikely to maintain the U.S. military's overmatch against China and Russia. Moreover, cutting additional forces to free resources for modernization programs may not be the best choice given growing capacity shortfalls in combat air forces. It would be unwise to consider cuts *within* the combat air forces portfolio before assessing potential tradeoffs across portfolios and operating domains.

Unfortunately, the Air Force may be considering additional cuts to its combat air forces. According to the Service's Air Combat Command, anticipated budget levels will not maintain the size and readiness of its current combat air forces, much less its planned modernization programs.[119] As a consequence, it may retire earlier model F-16s, F-15Cs, and the A-10 in order to free resources for other priorities.[120] This seems to fly in the face of reason, considering the Air Force has said that its fighter force is already too small to support existing requirements, and at least 60 fighter squadron equivalents will be needed in the future.[121] Moreover, the Air Force developed its requirement for 60 fighter squadrons based on scenarios and assumptions from the previous administration's defense strategy and force planning construct. A shift toward planning for conflict in the era of great power competition could require the Air Force to conduct additional analyses of its future combat air force requirements.

118 Funding for SOF and forces operating unmanned systems has remained relatively immune to defense budget cuts.

119 John A. Tirpak, "ACC Too Big and Too Small," interview with General Mike Holmes, Commander of the Air Combat Command, *Air Force Magazine*, July 12, 2017, available at http://www.airforcemag.com/Features/Pages/2017/July%202017/ACC-Too-Big-and-Too-Small.aspx.

120 Ibid.

121 The approximately 150 additional fighters needed to field a force of 60 fighter squadrons may not be affordable given budgets that are capped by the 2011 Budget Control Act. Lt. Gen. Jerry "JD" Harris Jr., USAF Deputy Chief of Staff (Strategic, Plans, Prorgrams and Requirements); Lt. Gen. Arnold W. Bunch, Jr. USAF Military Deputy, Office of the Assistant Secretary Of the Air Force (Acquisition); and Lt. Gen. Mark C. Nowland, USAF Deputy Chief of Staff (Operations), "Air Force, Force Structure and Modernization Programs," presentation to the Senate Armed Services Committee Subcommittee on Airland Forces, March 29, 2017, p. 8, available at https://www.armed-services.senate.gov/imo/media/doc/Harris-Bunch-Nowland_03-29-17.pdf.

Similar factors may affect the future size of DoD's bomber force. The Air Force's 158 total active inventory of B-1s, B-52s, and B-2s is "insufficient to meet Defense Planning Guidance and nuclear guidance while sustaining current operational demands and maintaining sufficient training and readiness capacity."[122] This does not include 100 new B-21 stealth bombers that will begin to join the force in the mid-2020s. Apparently, the Air Force is considering retiring all of its 76 B-1 bombers as the B-21 comes online, then retiring its B-2 stealth bombers as the B-21 is certified for nuclear deterrence missions. The result could be a total force of 100 B-21s and 75 B-52Hs to meet the nation's long-range strike needs.

This is puzzling, considering the shortage in long-range strike capabilities that exists today and the likely increase in demand for bombers given growing threats to U.S. airbases. Additionally, DoD's stated requirement for 100 B-21 bombers is worth revisiting, considering that the analyses—if any—supporting this acquisition target would have occurred six or seven years ago. These assessments were likely based on FPC scenarios and assumptions that did not consider Russia's resurgence, gray zone challenges, and changes to operating concepts such as those proposed in this report. In summary, potential tradeoffs within the combat air forces portfolio (and likely other capability portfolios) serve to emphasize one of this report's major findings: *budget considerations continue to have a greater impact on DoD's future force planning decisions than do new operating concepts and technologies that are needed to address emerging threats.*

122 Lt Gen Arnold W. Bunch, Jr. USAF Military Deputy, Office of the Assistant Secretary of the Air Force (Acquisition); Lt Gen Jerry D. Harris, USAF Deputy Chief of Staff (Strategic Plans and Requirements); and Maj Gen Scott A. Vander Hamm, USAF Assistant Deputy Chief of Staff (Operations), "Hearing on Air Force Bomber/Tanker/Airlift Acquisition Programs—HASC Seapower And Projection Forces," presentation to the House Armed Services Committee Subcommittee on Seapower and Projection Forces, May 25, 2017, p. 4, available at http://docs.house.gov/meetings/AS/AS28/20170525/106013/HHRG-115-AS28-Wstate-BunchA-20170525.pdf. B-52s may remain in the force until 2060 or beyond to provide capacity for standoff strikes.

CHAPTER 4

# Shaping Future Sea & Undersea Forces

Because they can be postured and sustained in international waters near areas of potential conflict, U.S. naval forces would be on the front line of America's efforts to deter aggression and manage crises—if they can survive long enough to deny or delay an enemy's initial advances and promptly attack targets to punish it for an act of aggression. Perhaps more importantly, naval forces can provide a persistent and proportional means to counter gray zone aggression that is less escalatory than deploying air or land forces from outside the theater. Forward forces also improve reassurance of allies, who may not be encouraged by a posture that keeps U.S. forces outside the range of enemy A2/AD complexes. The concepts and capabilities described below are designed to improve the ability of the U.S. fleet to defend itself and conduct offensive operations in forward areas contested by adversary A2/AD systems.

For planning purposes, the pacing threat for U.S. naval forces should be China. The PLA Navy (PLAN) is a growing, highly capable force that can compete with the U.S. Navy in each naval mission area. The Russian Federation Navy (RFN) is smaller, older, and less capable than the U.S. Navy, but U.S. concepts and capabilities will need to address Russia's strengths in undersea and electromagnetic warfare. Recognizing their vulnerability to U.S. intervention, Russia and China are both complementing their naval forces with long-range sensors and weapons ashore to threaten or delay the arrival of U.S. naval and air forces in their region. To retain their ability to deny and punish aggression, U.S. naval forces will need new operating concepts and capabilities to defend themselves against these threats while remaining able to attack enemy forces.

Unlike the competition for global hegemony that marked the Cold War, the likely near-term military objectives of countries such as Russia or China are relatively modest and close to their own territory. To support rapid attacks against nearby targets and reduce the need for large and capable air or naval forces, potential U.S. adversaries' offensive and defensive capabilities rely on long-range precision-guided weapons. To delay or deny actions like a Russian invasion

of Baltic NATO allies, Chinese assaults on the Senkaku Islands, or Iranian mining of the Strait of Hormuz, U.S. forces will need to respond quickly, defend against high-volume missile attacks, and quickly deliver offensive strikes to delay or defeat the aggression.

The concepts below could enable U.S. and allied naval forces to survive long enough in a highly contested region near an aggressor and its objectives to conduct attacks in the initial phases of a conflict.[123] Enabling these operating concepts will require some new ships, aircraft, weapons, and unmanned systems. More importantly, these approaches should drive force planning by changing the force packaging, posture, and overall capacity of naval forces.

## Revised Force Posture

Today, the U.S. naval fleet generally uses a "one-size-fits-all" approach to force deployment, with naval posture in important regions such as the Middle East or Western Pacific centered on large traditional U.S. naval formations such as carrier strike groups and amphibious ready groups. If deployed forward near enemy territory, these formations could be suppressed by prompt, high-volume fires from Russian or Chinese A2/AD complexes because, even if they avoid catastrophic damage, aircraft carriers and amphibious assault ships would be constantly maneuvering and unable to sustain flight operations. Naval forces cannot, however, simply remain outside waters contested by A2/AD networks. Military objectives such as the Senkaku Islands for China or the Baltic states for Russia are close enough to be rapidly overrun unless U.S. and allied forces are in a position to interdict acts of aggression as soon as they commence.

Instead of mainly operating in CSGs and ARGs, naval forces should be separated into forward-positioned Deterrence Forces comprising submarines, surface combatants, and unmanned vehicles that rely on missiles for defensive and offensive fires and a Maneuver Force comprising CSGs and ARGs postured outside littoral areas such as the East and South China Seas or Mediterranean.[124] This separation of naval forces would enable surface warships to shift to more efficient self defense, rather than area defense, against air threats and exploit missile-based offensive fires that would be needed to promptly counter aggression. Moreover, this revised force posture would better enable naval forces to contribute to conventional deterrence by countering gray zone confrontations at the time and place they occur, as opposed to deploying forces from outside the theater to intervene, which could be highly escalatory.

Given the threat of A2/AD networks in a conflict, Deterrence Forces would be expected to rapidly expend their missiles and withdraw. Those first actions, however, would be essential to slowing an enemy offensive. Maneuver Forces of CSGs and ARGs would be able to swing

123 These concepts and resulting force packages are described in more detail in Bryan Clark et al., *Restoring American Seapower: A New Fleet Architecture for the United States Navy* (Washington, DC: Center for Strategic and Budgetary Assessments, 2017).

124 The establishment of deterrence forces and maneuver forces is described further in Bryan Clark et al., *Restoring American Seapower,* pp. 46–48.

between theaters to reinforce or replace Deterrence Forces after they withdraw. When CSGs and ARGs arrive, they would likely need to conduct strike operations from more than 1,000 nm away to remain outside the range of most A2/AD weapons and sustain air operations.

## Distributed Operations

Naval forces, particularly those in forward-postured Deterrence Forces, would need to operate in distributed formations to improve their offensive capacity and survivability. As noted above, surface combatants operating independently from CSGs and ARGs would be able to reallocate some vertical launch system magazine capacity to offensive, instead of defensive, weapons. They could also shift to shorter-range and higher-capacity air defense systems as described below to increase the salvo size needed for Chinese or Russian A2/AD networks to successfully attack them. Distributing surface warship formations using higher-capacity defenses would further increase the time and number of weapons needed to defeat them in detail. An enemy could simply launch more weapons to overwhelm a ship's defenses, but, as described below, the required salvo could reach into the hundreds of weapons. Although the cost of this large weapon salvo would still be less than the cost of the ship being attacked, expending more than a hundred missiles against a single ship would quickly reduce an enemy's weapons inventory, increase the complexity of it strike operations, and diminish its capacity to engage other targets. This may dissuade an enemy from attempting to eliminate U.S. naval forces early in the conflict, enabling those U.S. ships to conduct attacks before withdrawing.

This new approach to naval formations is similar to the U.S. Navy's emerging concept of Distributed Lethality.[125] By disaggregating sensors and shooters, Distributed Lethality enables new approaches to find and attack the enemy. For example, a surface combatant or unmanned surface vehicle (USV) postured forward can find targets with shorter-range passive acoustic or RF sensors and relay targeting information via an unmanned aerial vehicle (UAV) to shooters over the horizon using an LPI/LPD datalink. Alternatively, distributed surface forces could use active sensors such as radar on a small number of ships or unmanned vehicles to find targets while most surface combatants in the formation keep their radars off to avoid detection by enemy passive sensors. Rapidly engaging enemy ships or forces ashore based on fleeting targeting information, however, will require long-range weapons that can reach across an operating theater.

125 See Thomas Rowden, Peter Gumataotao, and Peter Fanta, "Distributed Lethality," *Proceedings,* January 2015, available at http://www.usni.org/magazines/proceedings/2015-01/distributed-lethality; and Thomas Rowden, "Sea Control First," *Proceedings,* January 2017, available at https://www.usni.org/magazines/proceedings/2017-01/commentary-sea-control-first.

## Air and Missile Defense

A previous CSBA report described the emerging salvo competition between precision strike weapons and precision defenses.[126] In this competition, attackers attempt to employ salvos that are either large or survivable enough to circumvent their opponent's defenses. Defenders attempt to mount defenses with enough capacity or lethality to defeat attacks or make strike salvos too large or expensive for the attacker to be willing to engage the defended target.[127]

To reassure allies and deter or respond to aggression, U.S. naval forces will need to operate relatively close to potential aggressors and the targets of their aggression, which will place them in range of a large variety and number of strike weapons. It is probably not reasonable to expect that ships or forward bases could completely defeat all enemy strike salvos under these conditions. Instead, U.S. naval forces will need to employ new approaches for air defense to survive in highly contested environments long enough to slow or stop enemy aggression and withdraw until additional forces arrive or the threat is degraded.

As described above, surface combatants disaggregated from CVNs and LHA/LHDs would be able to focus on self defense to a greater degree than when they are associated with CSGs and ARGs. This would enable surface combatants to carry and use medium-range (30 nm) and short-range (less than 10 nm) air defense systems in greater numbers than today's long-range SM-2 or SM-6 air defense interceptors. For example, four smaller, medium-range interceptors such as the Evolved Sea Sparrow Missile (ESSM) can be loaded in a VLS cell that can only hold one SM-2 or SM-6.

Shifting to a short-to-medium-range air defense concept would also enable surface ships to use energy-based air defenses such as lasers, high-power radiofrequency (HPRF) weapons, and other electronic warfare capabilities. These weapons operate in a straight line and would only have a range of about 10 nm against a sea-skimming anti-ship missile: farther if the target were at a higher altitude. Surface ships could also use guns for air defense at a range of 10–30 nm if they shoot hypervelocity projectiles (HVP), which can be precisely guided to a target and travel at speed above Mach 5.[128]

Figure 14 shows the impact of adopting a short-to-medium-range air defense concept for a single destroyer (DDG). By engaging incoming missiles at shorter ranges, U.S. naval forces can shift some engagements to higher-capacity guns, interceptors, and energy weapons. Today, these shorter-range weapons are only used as a last resort when longer-range air

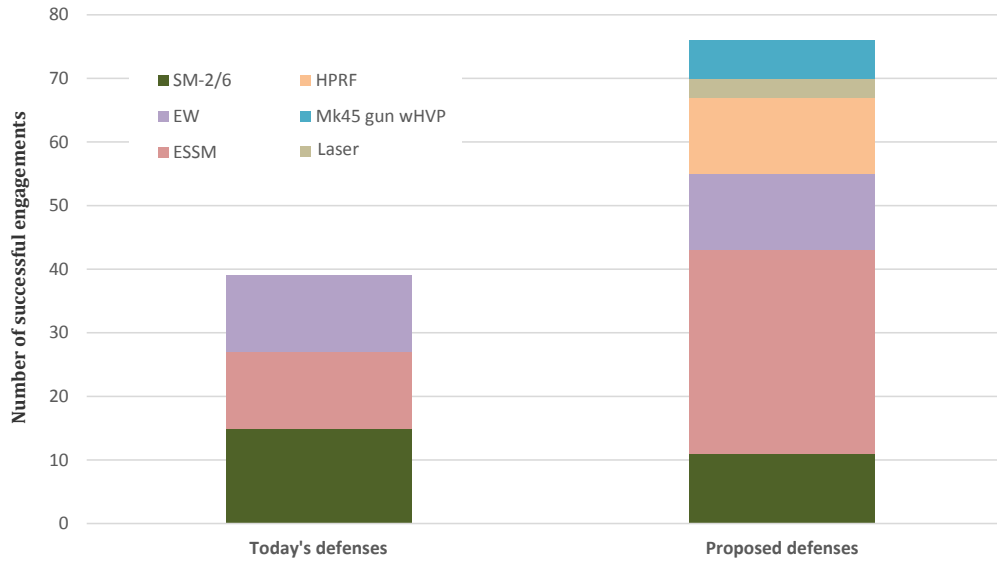
126 See Gunzinger and Clark, *Winning the Salvo Competition*, pp. 1–9.

127 See Deputy Secretary of Defense Robert Work, remarks at the CNAS Inaugural National Security Forum, Washington, DC, December 14, 2015, available at https://www.cnas.org/publications/transcript/remarks-by-defense-deputy-secretary-robert-work-at-the-cnas-inaugural-national-security-forum.

128 An HVP round from a 5-inch gun can travel about 50 nm in a ballistic path surface-to-surface. Against air threats, its range would likely be 10–20 nm, which would be the upward portion of its trajectory and the portion where it is traveling fastest. See "HVP Hyper Velocity Projectile," Datasheet, BAE Systems, Inc., 2016, available at http://www.baesystems.com/en-us/product/hyper-velocity-projectile-hvp.

defense systems have failed. This shift is necessary to address the growing salvo sizes enemies can mount and will be infeasible if surface combatants only deploy to protect CVNs and LHA/LHDs.[129]

### FIGURE 14: CURRENT AND PROPOSED DEFENSIVE CAPACITY OF A DDG




Surface combatants would continue using larger, longer-range interceptors like the SM-2 or SM-6 to defend another ship in many situations and to conduct offensive air operations against enemy aircraft. A medium-range interceptor such as ESSM would generally only be able to protect another vessel, such as in a CSG or ARG, when the air defense ship is less than 5 nm away, is positioned between the defended ships and the enemy, and threat ASCMs are subsonic. At longer ranges and against faster ASCMs, ESSMs may not be able to engage ASCM salvos before they reach a defended ship, or they may engage the threats so close to the ship that the resulting debris still causes damage.

U.S. CSGs could also use CVW (carrier air wing) aircraft to defeat ASCMs or, preferably, to attack enemy ships and aircraft before they can launch attacks. Given the range of modern ASCMs, this would require sustaining combat air patrols that are located 250 to 500 nm away

129 Figure 14 shows the number of possible engagements by a current Flight IIa DDG-51 equipped with an SLQ-32 EW system and a notional VLS cell loadout of 10 percent SM-3s, 20 percent SM-6s, 30 percent SM-2s, 25 percent Tomahawks, and 10 percent ESSMs compared to a proposed Flight IIa DDG-51 equipped with a 5-inch Mk-45 gun using hypervelocity projectiles; an SLQ-32 EW system; an HPRF weapon; a laser; and a notional VLS cell loadout of 10 percent SM-3s, 20 percent SM-6s, 15 percent SM-2s, 25 percent Tomahawks, and 25 percent ESSMs. The assumed single shot probability of kill (SSPk) for these weapons are 0.4 for guns, HPRF, EW, and lasers. SSPk for interceptors is assumed to be 0.7.

from the CVN. Since the F-35C and F/A-18E/F have an unrefueled combat radius of about 700 nm and 500 nm respectively, aerial refueling will be needed to sustain the air defense CAPs.[130]

## EMS Warfare

Because they will have to operate close to an aggressor, even improved missile defenses may not be enough to protect U.S. naval forces from the large or sophisticated missile salvos an enemy could bring to bear. The fleet will need to further improve its position in the salvo competition by degrading the enemy's ability to find and target U.S. ships, bases, and troops ashore while deploying decoys to delay enemy targeting or increase the number of weapons needed for a rapid attack. These operating concepts and capabilities are a significant part of the Navy's EMW concept and of the DoD's expanding application of EW to pursue EMS superiority.[131]

As noted in Chapter 2, Russian New Generation Warfare and Chinese Informationized Warfare tactics include controlling their own emissions to reduce the probability they will be detected by passive sensors; jamming an enemy's satellite communications; and physically or virtually attacking wired computer networks. These measures are intended to compel opponents to use active sensors such as radar and omnidirectional RF communications like Link-16, mobile phones, or VHF (very high frequency) radios, all which could be rapidly located by Russian and Chinese passive sensor networks.[132]

To prevent being easily detected and targeted, U.S. naval forces will need to increasingly employ passive sensors on manned ships, submarines, and aircraft, while shifting active sensors to unmanned vehicles. Manned/unmanned teams of platforms would use line-of-sight LPI/LPD datalinks to share sensor information and develop targeting solutions. These capabilities would enable multistatic sensor concepts with the unmanned vehicle as the illuminating platform, passive sensing techniques using multiple sensors at different aspects, and monostatic sensors like radar on an expendable unmanned vehicle.

Even these measures will not prevent U.S. ships and aircraft from having visual, IR, and radar signatures that will eventually be found by enemy active or passive sensors. Enemy sensor networks will likely have extensive and overlapping areas of coverage close to its territory or objectives. Especially concerning are passive airborne and space-based EO/IR

130 "F-35 Joint Strike Fighter (JSF) Lightning II: Specifications," *Global Security*, updated April 14, 2016, available at http://www.globalsecurity.org/military/systems/aircraft/f-35-specs.htm; and U.S. Navy, "F/A-18 *Hornet* Strike Fighter," *U.S. Navy Fact File*, May 26, 2009, available at http://www.navy.mil/navydata/fact_display.asp?cid=1100&tid=1200&ct=1.

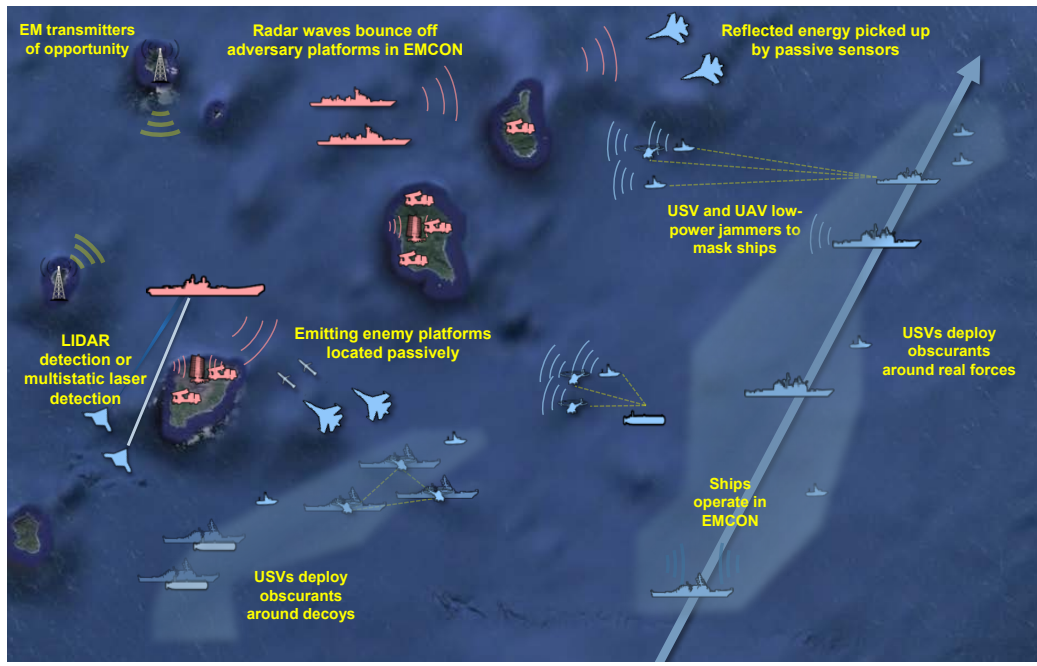
131 See Mark Coffman, "Advancing Electromagnetic Maneuver Warfare," Navy Warfare Development Command, *NEXT*, no. 2, Summer/Fall 2015, available at https://www.nwdc.navy.mil/NeXT%20Assets/current/NeXTw2016.aspx; and Sydney J. Freedberg Jr., "Work Elevates Electronic Warfare, Eye On Missile Defense," *Breaking Defense,* March 17, 2015, available at http://breakingdefense.com/2015/03/raid-breaker-work-elevates-electronic-warfare-eye-on-missile-defense/.

132 Joe McReynolds, *China's Evolving Military Strategy* (Washington, DC: Jamestown Foundation, 2016), pp. 228–236.

(electro-optical/infrared) sensors, which are improving and proliferating to support increased commercial demand for overhead imaging.

Although U.S. naval forces may not be able to remain undetected by a diverse and dense network of enemy sensors, they may be able to degrade enemy targeting and erode the enemy's advantage in the salvo competition by reducing the signatures of friendly forces while creating many false targets. Figure 15 depicts this approach, combined with the new passive and multistatic sensor techniques described above. The goal of these counter-C3ISR actions is to increase the number of potential aimpoints detected by an enemy and slow its targeting operations or compel it to use large numbers of weapons against all potential targets, not to completely hide U.S. and allied forces.

### FIGURE 15: FUTURE NAVAL EMS OPERATIONS




To obscure the location of real ships, aircraft, and shore systems, distributed naval forces could use a combination of radar jammers, laser dazzlers, visual and IR obscurants, and camouflage. Jammers and dazzlers could be used continuously by USVs to degrade the radar and EO/IR sensor imaging, respectively, of nearby ships. Obscurants like smoke and chaff are temporary and could be employed when passive sensors detect an increase of adversary sensing in the area. Camouflage could be used on ships, to a degree, to degrade EO/IR sensing, but it can be very effective on weapons systems ashore.

Because sensor countermeasures will not render U.S. forces invisible, they must be complemented with decoys that present adversaries with plausible alternative targets. Visual decoys exist for weapons systems and aircraft, but will likely be too expensive for ships. USVs could

act as ship decoys by emitting RF signals and IR signatures consistent with the ships or systems they are simulating. UUVs could create acoustic signatures to simulate submarines or surface ships to enemy passive or active sonars. Decoy signatures should be obscured in a similar manner as real targets to undermine an enemy's ability to quickly sort out the targeting picture.

The combination of sensor countermeasures and decoys will increase the number of potential targets enemies must address. In response, they will either have to take time to discriminate real targets from decoys or use more weapons to quickly attack all the possible targets. For example, to ensure a successful strike, an attacker would have to overcome the defensive capacity shown in Figure 14 for each real or decoy DDG to be attacked. This may dissuade an enemy from conducting the attack because the number of weapons required may exceed what it is willing to expend or impact other offensive operations planned for the same time. Conversely, delays an enemy may experience while attempting to fully analyze the targeting situation may prevent it from maintaining its desired pace of operations and provide an opening for U.S. forces to take the initiative.

Using countermeasures and decoys together also reduces the sophistication and cost needed for each. Decoys do not need to be perfect representations of the real systems they simulate because they and the real systems will be obscured by countermeasures. Similarly, countermeasures do not need to hide the systems under them perfectly because the goal is to increase the number of viable targets instead of completely hide U.S. and allied forces.

The kinds of aggression China and Russia are pursuing today in the South China Sea or Ukraine are designed to remain below the level of escalation that would result in an armed conflict.[133] These approaches, however, depend on threats of large-scale guided missile attacks to deter U.S. and allied intervention. Using current U.S. operating concepts and strike forces to attack these threats in Chinese or Russian territory would be highly escalatory. This could dissuade U.S. leaders and commanders from assisting victims of low-level aggression. Using EMW or a similar approach to EMS warfare, U.S. naval forces could assist an ally facing gray zone aggression and respond with more proportional options such as warning shots, shouldering, EW tools, or disabling HPRF weapons without having to attack the aggressor's long-range sensors or weapons.

133 Ely Ratner, "Course Correction," *Foreign Affairs,* July/August 2017, available at https://www.foreignaffairs.com/articles/2017-06-13/course-correction; and Andrea Macias, "A Detailed Look at How Russia Annexed Crimea," *Business Insider,* March 24, 2015, available at http://www.businessinsider.com/how-russia-took-crimea-2015-3.

## Undersea Warfare

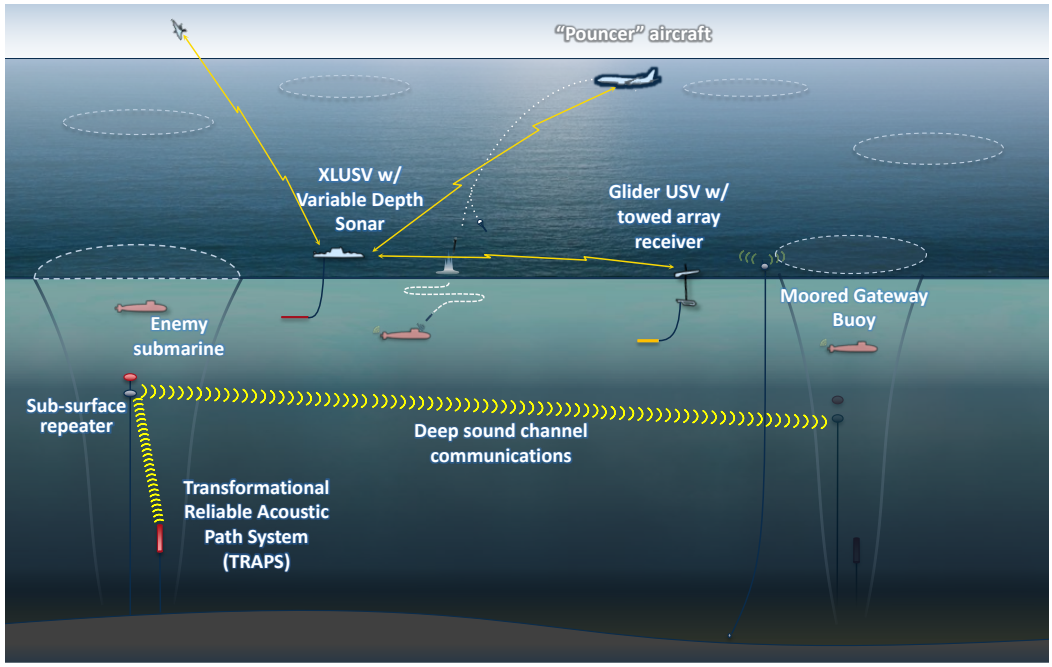
Submarine-launched ASCMs present a significant challenge for U.S. naval air and missile defense. A quiet submarine could get close to a targeted ship before an attack, giving air defense systems little time to react and likely only allowing one engagement at most before the ASCMs reach their target. Although engaging an ASCM platform before launch is always a goal of air defense, with submarines it may be an absolute necessity to prevent a successful attack. With improved submarine quieting and the threat of enemy long-range sensors and weapons from shore, U.S. naval forces will need to adopt new approaches to hunt enemy submarines before they leave their home waters and prevent them from approaching friendly naval formations.

### Offensive anti-submarine warfare

Offensive ASW is focused on destroying enemy submarines before they leave their home waters: north of the Greenland-Iceland-United Kingdom (G-I-UK) gap for Russia or the East and South China Seas for China. These areas are likely to be contested by enemy long-range air defenses and strike missiles in a conflict. Moreover, prosecuting submarine contacts often takes hours to days due to sonar's relatively short range and the difficulty of obtaining range information from passive sonar. The U.S. Navy now has three main types of platforms for conducting ASW: nuclear attack submarines (SSN), P-8A Poseidon maritime patrol aircraft or MH-60R helicopters, and DDGs or guided missile cruisers (CG). Of these, only SSNs can safely remain in highly contested areas near an adversary long enough to conduct offensive ASW operations.

U.S. plans are likely to need SSNs to launch missile strikes and anti-ship attacks to defeat enemy air defenses early in a conflict, making them unavailable for time-consuming offensive ASW close to enemy territory. Instead, U.S. naval forces will need to rely on unmanned sensors to find and target enemy submarines in contested areas. Unmanned sonar systems such as the bottom-moored Transformational Reliable Acoustic Path Sensor (TRAPS), passive and active sonar arrays towed by USVs, or the seabed-mounted Sound Surveillance System (SOSUS) could detect and target enemy submarines to enable short "pouncer" attacks by sea-based UAVs or land-based penetrating aircraft. In more permissive areas, ASW weapons could be launched by P-8As, MH-60Rs, or ship-launched standoff weapons. Figure 16 depicts this approach.

FIGURE 16: FUTURE OFFENSIVE ASW APPROACHES




Even rapid pouncer attacks, however, will not be feasible in areas very close to an adversary's shore-based SAMs, ASCMs, and defensive air patrols. Unmanned sensors could be placed in international waters along submarine transit paths and concentrated at chokepoints submarines will likely need to pass as they make their way to the open ocean. It is at these chokepoints that U.S. naval forces could focus their offensive ASW attacks to either destroy enemy submarines or contain them inside their local waters.

### Defensive ASW

Defensive ASW is focused on preventing submarines from getting in position to attack U.S. naval formations. Quiet submarines, as noted above, present a challenging threat because they can launch ASCMs from short range. At the other end of the spectrum, less stealthy submarines also pose a challenge due to the increasing range of ASCMs, which can be launched from well outside expected sonar detection ranges. If submarines cannot be destroyed or contained in their local waters, U.S. naval forces will need to field new methods to engage or deter submarines before they get in range or obtain targeting to conduct ASCM attacks.

During World War II, U.S. and other Allied forces defeated the Axis submarine threat by disrupting submarine operations rather than sinking large numbers of submarines.[134] The Navy will likely need to take a similar approach to prevent successful submarine attacks in future conflicts.

Some of the unmanned passive and active sensors described above for offensive ASW in contested waters could be applied to defensive ASW as well. In deep water, deployable passive sensors such as the TRAPS and towed arrays from USV gliders could be positioned along the planned course of friendly naval forces or at standoff range around planned operating areas. In shallower water, low-frequency active sonars on USVs like the Sea Hunter Medium-Displacement USV (MDUSV) could operate around naval formations.[135]

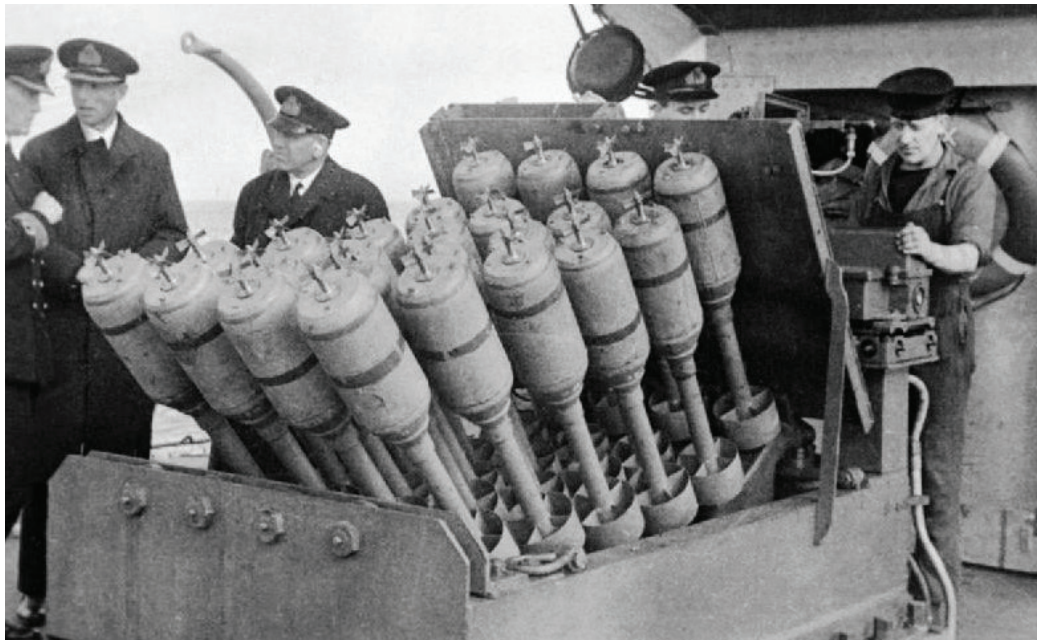
Once detected, pouncer aircraft or standoff missiles from ships could disrupt enemy submarine operations by dropping torpedoes or depth bombs near submarines, even if they do not hit their targets. Once attacked, even unsuccessfully, a submarine crew realizes it have been counter-detected and will often evade immediately. Submarines have little or no self-defense capability, are slow when compared to ships and aircraft, and lack sensors that can quickly determine the likelihood of a successful attack. They are not designed to stand and fight once detected. Instead the submarine will often break off an attack and attempt to regain its stealth.

Note, however, that this defensive ASW approach could use up many weapons, particularly if the enemy exploits it by deploying decoys to stimulate the desired ASW responses. Given the objective is to disrupt and dissuade, rather than destroy, enemy submarines, U.S. forces could therefore use small, inexpensive weapons for defensive ASW as Allied navies did in World War II with depth charges and Hedgehog rocket-propelled depth bombs.

134 The data and analysis behind this conclusion is described in Stillion and Clark, *What it Takes to Win,* pp. 14–17.

135 Passive sonar can achieve longer detection ranges in deeper water due to the refraction of sound waves in water that causes sound to carry farther in "channels" created by temperature layers. Active sonar performs better in shallow water where the sound can reflect between the bottom and the surface, which act essentially as a waveguide.

## FIGURE 17: HEDGEHOG ASW WEAPON



Royal Navy Photo.

## FIGURE 18: DEPTH CHARGES

Photo courtesy Kevin Rutherford under the Creative Commons License.

### Undersea strike and surface warfare

Offensively, the relatively small payloads of submarines and UUVs make them best used for operations in which they can carry smaller weapons or vehicles or where small salvos are sufficient. For example, undersea platforms could launch small jammer or decoy missiles to enhance the survivability of penetrating aircraft or strike weapons from another platform. Or they could focus on torpedo attacks against ships or infrastructure that exploit the small capacity and immaturity of torpedo defenses.

### Mine warfare

Mine clearing is a longstanding mission of the U.S. Navy, but new approaches could dramatically change how it is done. Today, mine countermeasures (MCM) operations are conducted by MCM ships that carry minehunting sonars, tow sweep gear, and deploy mine neutralization systems. The new Littoral Combat Ship (LCS), although troubled, is planned to move MCM operations to unmanned systems. Sweep gear and minehunting sonars would be towed by USVs; shallow-water minehunting lasers would be carried by UAVs; and mine neutralization systems could be deployed by USVs, UUVs, or UAVs.

**FIGURE 19: EXPEDITIONARY FAST TRANSPORT**

U.S. Navy photo by Thigpen Photography, inc, May 25 2016.

Unmanned MCM systems could enable the Navy to scale MCM operations independent of the number of MCM ships available. They could also permit naval forces to use a wider variety of ships for MCM operations, not only LCSs. The Navy should accelerate this effort and identify alternative ships with larger payload volumes that could be used for MCM, such as the Expeditionary Fast Transport.

Although the Navy is pursuing new mine clearing platforms and systems, its only offensive mining capability consists of aging Submarine-Launched Mobile Mines (SLMM) and air-dropped Quickstrike mine kits for Joint Direct Attack Munition (JDAM) bombs. Mining has not been an important mission for the U.S. Navy since the Cold War, when it envisioned using mines to bottle up the Soviet fleet in St. Petersburg, Tartus, and Sevastopol. Mines are less useful against American post-Cold War adversaries such as Iraq, Iran, or North Korea, whose strategies emphasize denying access to U.S. forces rather than gaining access to the open ocean.

The return of great power competition should make mining a more prominent element of U.S. deterrence. The navies and commercial shipping of China and Russia must pass through chokepoints such as the Japanese or Philippine archipelagos or the Gulf of Finland. They could be vulnerable to mining, which could be used to slow or stop aggression and cut off imports of needed commodities or income-generating exports. As with MCM, offensive mining will likely move increasingly to unmanned surface or undersea vehicles, which can deploy mines covertly in highly restricted waters. Moreover, mine deployment requires only a modest level of sensor capability and autonomy, making it a feasible mission for the emerging generation of larger USVs and UUVs. Penetrating strike aircraft could quickly deploy mines in large numbers from the air, particularly in highly contested areas where even a USV may not be survivable.

## Addressing Gray Zone Confrontations

Russia and China are incrementally gaining territory and influence in their regions through low-intensity aggression against their neighbors. Russia continues supporting proxy and paramilitary separatist forces in eastern Ukraine and protest movements in Latvia that seek to secure autonomous regions aligned with Russia. China continues building islands in the South China Sea and preventing Japanese access to the Senkaku Islands using civilian fishing vessels and coast guard ships. The small scale and low level of violence in these efforts are designed to avoid justifying U.S. intervention.[136]

The design and posture of U.S. naval forces and Chinese and Russian long-range strike capabilities help preclude the U.S. Navy coming to the aid of an ally facing gray zone aggression. U.S. commanders seeking to help Eastern European allies and partners fighting insurgencies are constrained by the reticence of NATO allies to allow operations against Russia from their territory. U.S. commanders may need to rely on naval forces and long-range strike aircraft from outside the theater for a unilateral option to intervene. In the Pacific, commanders have naval forces, but they are predominantly CSGs, ARGs, and large surface combatants. These highly capable ships and aircraft, designed for intense combat, are disproportionate to the task of countering civilian and paramilitary ships building

136 OSD, *Military and Security Developments Involving the People's Republic of China 2016*, Annual Report to Congress (Washington, DC: DoD, April 2016), p. 61; and Macias, "A Detailed Look at How Russia Annexed Crimea."

islands or blocking access to islands and reefs. Moreover, the importance of CSGs and ARGs would require the United States to immediately conduct escalatory attacks against Chinese sensors and missile sites ashore to protect naval forces if the gray zone confrontation turns to conflict.

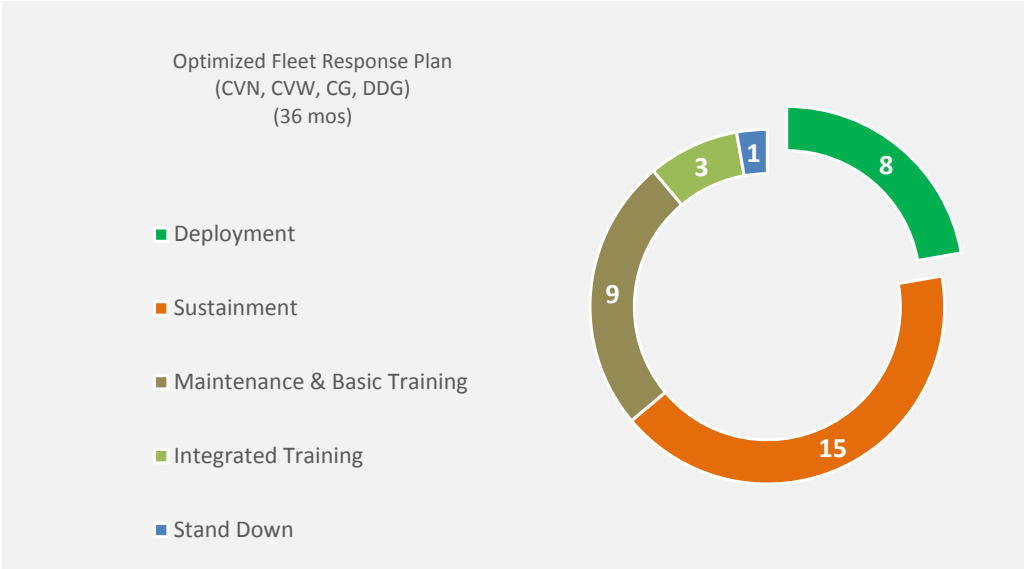
To better counter Russian gray zone operations in Eastern Europe, the United States may need to combine naval forces in the Northern Atlantic and Baltic with strike aircraft to conduct long-range strikes against Russian air defense sites and close air support of friendly troops. Against China in the Pacific, the U.S. Navy will need smaller surface combatants that would be more proportional to the adversary forces they face and would not require escalatory measures for defense in the event of conflict. Smaller ships, however, would still need to be able to defend themselves against short-notice Chinese missile attacks while conducting limited offensive operations against enemy ships and targets ashore.

## Posture and Sizing Implications

U.S. naval forces have an important role in conventional deterrence because they can remain close to an area of potential conflict, reassuring allies and countering small-scale aggression. When confrontation turns to conflict, however, naval forces have the mobility to withdraw while conducting attacks against the aggressor's forces. As the conflict progresses, naval forces would support joint and coalition military operations by protecting sea lanes, neutralizing enemy ships and overseas facilities, and defending forward U.S. bases and airfields. This approach will require a robust posture equipped to execute the concepts described above near potential adversaries and their objectives.

The rotational nature of naval forces results in day-to-day posture being the most stressing demand on naval force structure. During peacetime periods, the U.S. Navy's objective is to maintain a ship or aircraft squadron deployed for 20 to 25 percent of its operating cycle. For example, CSGs and surface combatants follow the Optimized Fleet Response Plan (OFRP) cycle of 7–8 months deployed out of a 36-month cycle, as shown in Figure 20. Submarines and patrol aircraft are deployed for about 6 months every 24 months, and amphibious warfare ships are deployed about 7 months in a 27-month cycle.

## FIGURE 20: OPTIMIZED FLEET RESPONSE PLAN




Sustaining a ship deployed overseas in peacetime using the OFRP cycle will therefore require five ships total. This is much more than during wartime, when ships and squadrons are expected to remain deployed until they are no longer needed or require repair. And although the number of ships needed in a major conflict would likely be higher than that needed in peacetime, it is unlikely to be 5 times more. During post-conflict stabilization operations, between one and five units would be needed to sustain one deployed because deployed ships and squadrons will periodically rotate home for maintenance, training, and crew rest.

To reduce the force structure needed to sustain a more robust posture and improve reassurance and proficiency, most Deterrence Forces should be based or stationed forward in ally and partner nations or U.S. territories overseas. These ships, aircraft, and crews—such as those in Japan, Guam, or Spain today—operate with a higher operational tempo and are closer to their area of operations. As a result, compared to the cycle depicted in Figure 20, the forward-based operating cycle keeps units deployed and operating about 50 percent of the time, instead of 22 percent. Thus, only three units are needed to keep one operating continuously if they are forward based.[137]

The peacetime posture needed from U.S. naval forces will likely grow as today's great power competitions intensify and China's and Russia's need to distract their large populations from internal economic, political, and demographic struggles increase. Regions that lacked a significant U.S. naval presence since the Cold War, such as the Northern Atlantic and Mediterranean, will become more important to contain Russian adventurism. Areas of current

137 For forward-based units, ships and aircraft will periodically need to rotate back to CONUS for overhauls, leading to a need for a third unit to keep one unit continuously operating.

emphasis like the South China Sea will probably require more ships and aircraft than today, particularly ones that will be more appropriate to counter gray zone aggression.

## Illustrative Capability Implications

The new operating concepts described above will require shifts in the Navy's investments in sensors, weapons, communications systems, and platforms. In a fiscal environment that will continue to be constrained, it is unlikely funding will be available to support new operating concepts while retaining all of the Navy's legacy capabilities.

### Distributed operations

**Rebalancing surface combatant mix.** The surface combatants in today's fleet and the Navy's required fleet are weighted toward large CGs and DDGs rather than small surface combatants such as guided missile frigates (FFG).[138] Although DDGs and CGs have greater capacity than FFGs or patrol craft, this mix constrains the number of ships the Navy can deploy and the fleet's ability to implement distributed operating concepts. A fleet architecture with more small surface combatants, such as the CSBA fleet architecture, could better enable distributed operations. Small surface combatants could leverage new air and missile defense capabilities, such as EW and directed energy, and multi-mission strike or surface warfare (SUW) weapons, enabling them to have similar capabilities as CGs or DDGs but with less capacity.

**Improved datalink technologies.** It is unlikely that distributed forces in contested areas will be able to depend on many of the satellite communications networks they use today. SAGs (surface action groups) and other formations will need to be able to share information using more secure line-of-sight datalinks such as the Navy's current Cooperative Engagement Capability (CEC) and Tactical Targeting Network Technology (TTNT), as well as the Air Force's Multifunction Advanced Datalink (MADL). The fleet will need to install a diversity of datalinks on ships, aircraft, and unmanned vehicles to enable a wide range of weapons, sensors, platforms, and command and control systems to share targeting and coordinate operations. This could also include software-defined radios that can increasingly act as translators between different datalink waveforms. The Navy's Digital Warfare Office is actively pursuing this level of network interoperability.[139]

**Multi-mission capable UCAV.** U.S. CSGs will need to conduct ISR and strike operations in highly contested areas from up to 2,000 nm away from hostile land-based anti-ship threats to support friendly surface combatants and submarines either withdrawing or intervening in

138 U.S. Navy, "Secretary of the Navy Announces Need for 355-ship Navy," *Navy News Service,* December 12, 2016, available at www.navy.mil/submit/display.asp?story_id=98160.

139 David Thornton, "CNO Warns About the 'changing character of competition'," *Federal News Radio,* June 15, 2017, available at https://federalnewsradio.com/defense-news/2017/06/cno-warns-about-changing-character-of-military-competition/.

the early phases of a conflict. This will require aircraft sortie durations of more than 10 hours, which exceeds the endurance normally allowed for a human pilot operating a single-seat aircraft.[140] Future CVWs will need a low observable UCAV with at least 500–700 nm unrefueled range to support these missions and to enable refueling aircraft to remain outside the range of enemy air defenses.[141]

### Air and missile defense

**Directed energy defenses.** Lasers and HPRF weapons, while not effective against all threats in all situations, could significantly increase the air defense capacity of naval forces. These systems, particularly, HPRF weapons, would fit within the space, weight, and power limitations of newer DDGs, most amphibious ships, and CVNs, and they could be incorporated into new FFGs.

**Unmanned aerial refueling aircraft.** CVWs will need aerial refueling capabilities to support long-range strike operations and distant, long-endurance CAPs. Although aerial refueling could be conducted by manned aircraft as they do today, unmanned aircraft that can remain on station longer and carry more fuel could support this mission more efficiently. To reduce the number of different airframes in the CVW, the Navy should consider developing a common airframe for its unmanned refueling aircraft and UCAV and design its future UCAV fully configured and equipped for operations in more highly contested areas.

### EMS warfare

**Unmanned RF and IR decoys.** Although visual ship decoys are likely to be too expensive and cumbersome to employ, USVs and UAVs could carry RF and IR emitters that emulate part or all of a manned ship or aircraft's EMS signatures. Because of power constraints, it is unlikely they could simulate high-power radars such as the SPY-1. These decoys could, however, simulate the signature of a ship that is not operating in perfect EMCON (radio silence or Emissions Control). These vehicles could be small enough to be deployed by the protected ships in distributed formations.

**Unmanned vehicle jammers and laser dazzlers.** RF jammers will be needed to obscure the signatures of naval forces against enemy radars, and laser dazzlers can degrade EO/IR sensors. In a contested environment monitored by many overlapping passive sensors, these active countermeasures could give away the actual location of U.S. naval forces and should instead be carried by unmanned vehicles.

140 Federal Aviation Administration, "Pilot Flight Time, Rest, and Fatigue," fact sheet, January 27, 2010, available at https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=6762.

141 Dave Majumdar, "Russia's Deadly S-5000 Air Defense System Ready for War at 660,000 Feet," *The National Interest*, May 3, 2016, available at http://nationalinterest.org/blog/russias-deadly-s-500-air-defense-system-ready-war-660000-16028.

**Cognitive and networked EW control systems.** In the complex EM (electromagnetic) environment that is likely to exist in highly contested regions, naval forces will need to manage their signatures carefully. Control systems will be needed to coordinate the operations of EW, communications, sensors, and directed energy systems. They will also need to manage EMS operations across distributed naval forces, which will require networked control capabilities like the Office of Naval Research's Netted Emulation of Multi-Element Signatures Against Integrated Sensors (NEMESIS) and Electromagnetic Maneuver and Control Capability (EMC2). Future EM control systems with cognitive capabilities, such as DARPA's Adaptive Radar Countermeasures (ARC) and Behavioral Learning for Adaptive Electronic Warfare (BLADE) programs, could evaluate the EM environment and develop and test courses of action (COA) to conduct EMW operations.[142]

### Undersea warfare

**New defensive ASW weapons.** For surface combatants to suppress enemy submarines, they will need longer-range ASW missiles and smaller ASW weapons to deploy from manned and unmanned pouncer aircraft. The warheads on these weapons do not have to be highly lethal, but they should be small enough to keep the cost of the weapons low and enable many of them to be carried on the launch platform.

**Unmanned pouncer aircraft.** Offensive and defensive ASW will depend on pouncer aircraft that can operate in contested areas and remain on station close enough to operating areas to rapidly engage potential targets. The DARPA Tactically Exploitable Reconnaissance Node (TERN) aircraft could provide this capability with a range of 600 nm and an on-station time of 12 hours.[143]

**Expanded applications for UUVs.** The Navy is pursuing a family of UUVs to conduct a wide range of missions.[144] The Navy could more aggressively pursue development of offensive capabilities for operations inside highly contested areas. For example, micro and small UUVs can act as mines and be deployed by large or extra-large UUVs. Small and medium UUVs can act as long-range weapons to enable undersea attacks and be deployed from surface ships or submarines to reach deep inside contested areas. And micro UUVs could act as acoustic decoys to increase the number of targets the enemy must analyze or engage.

142 Paul Tilghman, "Behavioral Learning for Adaptive Electronic Warfare (BLADE)," DARPA, available at http://www.darpa.mil/program/behavioral-learning-for-adaptive-electronic-warfare; and Paul Tilghman, "Adaptive Radar Countermeasures," DARPA, available at http://www.darpa.mil/program/adaptive-radar-countermeasures.

143 Daniel Wasserbly, "DARPA Eyes 2018 for TERN UAVs First Flight," *IHS Jane's Defence Weekly*, May 11, 2016, available at http://www.janes.com/article/60245/darpa-eyes-2018-for-tern-uav-s-first-flight; and David Axe, "Pentagon's Mad Scientists Want to Launch Killer Drones From Small Warships," *Wired,* March 4, 2013, available at https://www.wired.com/2013/03/darpa-drones-ships/.

144 Chief of Naval Operations (CNO), Undersea Warfare Directorate, *Autonomous Undersea Vehicle Requirement for 2025,* Report to Congress (Washington, DC: DoD, February 2016), available at https://news.usni.org/wp-content/uploads/2016/03/18Feb16-Report-to-Congress-Autonomous-Undersea-Vehicle-Requirement-for-2025.pdf.

### Addressing gray zone confrontations

**Smaller surface combatants.** In addition to rebalancing the surface fleet to support distributed operations, the Navy should field smaller surface combatants such as patrol vessels modeled on ships like the Danish *Visby*-class fast missile craft. They could provide more proportional responses to gray zone aggression than the Navy's current formations. And although these smaller ships are less expensive and have less capacity than FFGs or DDGs, they can have sophisticated offensive and defensive capabilities that enable them to survive and fight in contested areas. This reduces the need for escalatory attacks against enemy shore-based sensors and weapons to protect U.S. forces at sea.

CHAPTER 5

# Shaping Future Land Forces

Chapter 5 assesses potential operating concepts and capability priorities that should shape future U.S. Army, Marine Corps, and SOF land forces.

As summarized in Chapter 1, post-Cold War decisions on operating concepts and the size, shape, and overseas posture of the U.S. military were largely based on preparing for conventional conflicts to defeat regional adversaries in permissive environments. Although the period following the 2001 terrorist attacks on New York City and Washington, DC saw advances in concepts and capabilities needed for irregular warfare operations, the U.S. military's ability to defeat large, sophisticated state aggressors declined precipitously. This was understandable at the time, given that legacy operating concepts like AirLand Battle and Ship to Objective Maneuver did not address irregular warfare. Following the 2003 Coalition invasion of Iraq, the priority for U.S. land forces shifted to sustaining rotations to Iraq and Afghanistan and fighting terrorism globally. After the 2011 U.S. force withdrawal from Iraq and passage of the Budget Control Act, major cuts were made to the size of America's land forces. The Trump administration has declared its intention to reverse this trend.[145]

The result of multiple budget-driven cuts, the post-Cold War emphasis on preparing for regional threats, and a decade of irregular warfare is a generational gap in land force operating concepts and capabilities relevant to conflicts with great power aggressors. Complicating this challenge is the reality that Russia and China have directly or indirectly provided advanced weapons to Iran, North Korea, and Syria, as well as to non-state actors such as Hezbollah and Russian separatists. Although these lesser actors do not present the same challenges to U.S. freedom of action across all operating domains as the great power aggressors, their regular, irregular, and special operations forces can contest the ground domain. Moreover, U.S. land

145 The Army's end strength is anticipated to reach 476,000 in 2019 from a high of 771,000 Active Component soldiers in 1989. "The Army faces the triple effect of a reduced force combined with an aging combat fleet and a severe reduction of research and development spending." U.S. Army, *U.S. Army Future Force Development Strategy* (Washington, DC: U.S. Army, 2017), p. 6.

forces are required to support a wide range of other missions in multiple regions, as listed in Table 3.

### TABLE 3: EXAMPLES OF MILITARY OPERATIONS AND ACTIVITIES[146]

| | |
|---|---|
| Stability activities | Chemical, biological, radiological, and nuclear response |
| Defense support of civil authorities | Foreign internal defense |
| Foreign humanitarian assistance | Counterdrug operations |
| Recovery | Homeland defense |
| Noncombatant evacuation | Mass atrocity response |
| Peace operations | Security cooperation |
| Countering weapons of mass destruction | Military engagement |

U.S. land forces must, therefore, prepare to deter and, if necessary, engage in conflicts with high-end and mid-level adversaries while simultaneously retaining the capability and capacity to conduct irregular warfare. For planning purposes, the near-term pacing threat for U.S. land forces should be Russia, while China should be the high-end pacing threat in the mid-term. It is likely that both will present significant security challenges to the United States and its allies and friends in these timeframes. SOF should prepare to conduct foreign internal defense, information operations, and unconventional warfare against Chinese and Russian forces.[147] This chapter largely focuses on concepts and capabilities for conventional U.S. land forces, particularly the Army's forces.

## Candidate Concepts That Could Shape Future Land Forces

The 2017 Army–Marine Corps white paper, *Multi-Domain Battle: Combined Arms for the 21st Century*, states that "U.S. ground combat forces, operating as part of a [sic] joint, interorganizational, and multinational teams, are currently not sufficiently trained, organized, equipped, nor postured to deter or defeat highly capable peer enemies to win in future war."[148] The white paper acknowledges much needs to be done to prepare U.S. land forces, particularly the Army, to operate against enemies that can challenge and perhaps defeat U.S. operations in their local regions. The white paper presents an initial concept to address these challenges and proposes a "solutions synopsis" to prepare land forces for future joint fights:

146 DoD, *Joint Operations*, Joint Publication 3-0 (Washington, DC: DoD, January 17, 2017), p. V-2. Military engagement in this context is defined as "the routine contact and interaction between individuals or elements of the Armed Forces of the United States and those of another nation's armed forces, or foreign and domestic civilian authorities or agencies, to build trust and confidence, share information, coordinate mutual activities, and maintain influence."

147 A previous CSBA report addressed these priorities. See Jim Thomas and Chris Dougherty, *Beyond the Ramparts: The Future of U.S. Special Operations Forces* (Washington, DC: Center for Strategic and Budgetary Assessments, 2013).

148 U.S. Army–Marine Corps, *Multi-Domain Battle*, p. 4.

> *Multi-Domain Battle: Combined Arms for the 21st Century* requires ready and resilient Army and Marine Corps combat forces capable of outmaneuvering adversaries physically and cognitively through the extension of combined arms across all domains. . . . Through credible forward presence and resilient battle formations, future Army and Marine Corps forces integrate and synchronize capabilities as part of a joint team to create temporary windows of superiority across multiple domains and throughout the depth of the battlefield in order to seize, retain, and exploit the initiative; defeat enemies; and achieve military objectives.[149]

Before discussing concepts that might bolster ideas outlined in the *Multi-Domain Battle* white paper, it is worth noting capabilities the Army brings to the fight; this includes the ability to:[150]

- Maneuver on the land and take advantage of terrain;
- Counter adversary maneuver and protect against adversary SOF activities;
- Build partner capacity by training and advising;
- Operate more easily without the highly "nodal" structures of air and maritime forces;
- Harden, conceal, and disperse their capabilities;
- Network with terrestrial links (e.g., buried fiber optics) that are hard to access and disrupt;
- Stockpile relatively large magazine depth that can be protected;
- Reload, resupply, and refuel in theater and away from large, vulnerable bases;
- Maneuver and target enemy forces in the absence of overhead ISR and global positioning system data; and
- Enable operation in the other domains from ground positions (e.g., counter-integrated air defense fires).

149 Ibid., p. 4. Emphasis in the original.

150 David E. Johnson, "An Overview of Land Warfare," in *2018 Index of U.S. Military Strength* (Washington, DC: Heritage Foundation, forthcoming in 2017).

The Army's ability to perform its primary functions against high-end adversaries has dramatically decreased since the Cold War.[151] Acknowledging this and assessing what must be done to prepare land forces for high-end conflicts is a first-order task. A starting point is to develop operating concepts that will help flesh-out multi-domain battle. These concepts should then drive changes to the future capabilities and overseas posture of America's land forces.

### Shifting toward postures for forward defense

Given the nature of A2/AD threats in both regions, the U.S. overseas basing concept should shift from maintaining forward presence toward creating force postures that are better capable of forward defense. Otherwise, minimal theater presence forces will be little more than speed-bumps for near-peer military aggressors that are capable of acting before the U.S. military can deploy additional forces to a theater of operations.

It should be stipulated that a minimal force presence approach has utility on the Korean Peninsula, considering that U.S. forces stationed in Korea are part of a combined command that includes a capable Republic of Korea military with about 630,000 active personnel. This force could help create the time needed for U.S. reinforcements to arrive on the peninsula in a crisis.[152] U.S. land forces in the rest of the Pacific and in Europe, however, are inadequate, episodic, or even non-existent. Indeed, the Army's force posture in Europe is a shadow of what it was during the Cold War (see Table 4).[153]

151 DoD Directive 5100.01 specifies the primary functions for which the Department of the Army is required by law to develop "concepts, doctrine, tactics, techniques, and procedures, and organize, train, equip, and provide forces." This includes: "conduct prompt and sustained combined arms combat operations on land in all environments and types of terrain, including complex urban environments, in order to defeat enemy land forces, and seize, occupy, and defend land areas; conduct air and missile defense to support joint campaigns and assist in achieving air superiority; interdict enemy sea, space, and air forces and their communications; provide logistics to joint operations and campaigns; provide support for space operations to enhance joint campaigns; conduct reconnaissance, surveillance, and target acquisition; operate land lines of communication." DoD Directive 5100.01, pp. 29–30.

152 The International Institute for Strategic Studies (IISS), *The Military Balance 2017* (London: IISS, 2017), pp. 306–310. South Korea's active forces include an army of 495,000 personnel, a navy of 70,000 personnel (including 29,000 marines), and an air force of 65,000 personnel. South Korea has a military reserve of 4,500,000 personnel and a reserve paramilitary of 3,000,000 personnel. As noted by Charles Krauthammer, "Today we have 28,000 troops in South Korea. . . . Why? Not to repel an invasion. They couldn't. They're not strong enough. To put it very coldly, they're there to die. They're a deliberate message to the enemy that if you invade our ally you will have to kill a lot of Americans first. Which will galvanize us into a full-scale war against you." Charles Krauthammer, "To Die for Estonia?" *The Washington Post,* June 2, 2017, available at https://www.washingtonpost.com/opinions/global-opinions/to-die-for-estonia/2017/06/01/465619a6-46f1-11e7-a196-a1bb629f64cb_story.html?utm_term=.a6e4b1167ba7.

153 Adapted from IISS, *The Military Balance 2017*, Wall Chart insert, "U.S. Forces in Europe, 1989 and 2017." The single armored brigade is a rotational unit.

### TABLE 4: U.S. LAND FORCES AND MAJOR EQUIPMENT IN EUROPE

| | 1989 | 2017 |
|---|---|---|
| **Personnel** | 213,000 | 25,000 |
| **Organizations** | | |
| Army Corps Headquarters | 2 | 0 |
| Armored Division Headquarters | 2 | 0 |
| Mechanized Infantry Division Headquarters | 2 | 0 |
| Armored Cavalry Regiments | 2 | 0 |
| Stryker Brigade | 0 | 1 |
| Armored Brigades | 10 | 1 (rotational) |
| Mechanized Infantry Brigades | 4 | 0 |
| Light Infantry Brigade | 1 | 0 |
| Airborne Brigade | 0 | 1 |
| Marine Expeditionary Unit | 1 | 0 |
| **Equipment** | | |
| Main Battle Tanks | 5,000 | 200 |
| Infantry Fighting Vehicles | 940 | 200 |
| Artillery | 1,600 | 100 |
| Attack Helicopters | 279 | 24 |

This is particularly true in the Baltic region, which is particularly vulnerable to Russian aggression given the proximity of Russia's forces and NATO's small force presence in Lithuania, Latvia, and Estonia. Numerous wargames have determined that invading Russian forces may be able to reach the outskirts of a Baltic state capital city in 60 hours or less, leaving NATO forces little time to respond.[154] In short, NATO's current land force posture in the Baltic region is a speedbump that may not deter Russia or prevent it from achieving a quick *fait accompli* should it choose to invade a Baltic state.

154 For output from one such wargame, see David A. Shlapak and Michael W. Johnson, *Reinforcing Deterrence on NATO's Eastern Flank: Wargaming the Defense of the Baltics* (Santa Monica, CA: RAND Corporation, 2016).

FIGURE 21: U.S. PARATROOPERS PRACTICING AIRFIELD SEIZURE OPERATIONS IN BULGARIA

U.S. Army paratroopers with the 173rd Airborne Brigade conduct a Joint Forcible Entry exercise onto Bezmer Air Base, Bulgaria, as part of Exercise Saber Guardian '17 on July 18. U.S. Air Force Photo by Tech. Sgt. Liliana Moreno.

The following sections elaborate on new postures and capabilities that could enable U.S. land forces to improve deterrence in Europe and the Pacific. They also recommend candidate operating concepts and capabilities that, in addition to creating more effective deterrence postures, could prepare land forces for multi-domain operations against great power aggressors. These concepts and capabilities should be informed by new warfighting strategies adopted by China and Russia, rather than the attrition-focused combined arms warfare strategies of the past.

## Countering China

It is no secret that China continues to improve its capabilities and increase its capacity to challenge U.S. access and freedom of action throughout the Western Pacific. In addition to bolstering partner capability and capacity to deter PLA actions, properly trained and equipped U.S. land forces could contribute significantly to future operations in this theater by:

- Executing maneuver to counter enemy SOF, airborne forces, or amphibious forces in conjunction with U.S. SOF and Marine Corps forces;
- Providing area security (maneuver, fires, air and missile defense) to protect ground and air LOCs, ports, airfields, and critical infrastructure;

- Providing air defense; land-based fires; reconnaissance, surveillance, and target acquisition; and cyber, EW, and counterspace capabilities to support strike operations; and
- Providing logistics support (including medical) and engineering services to U.S. forces.

Forward basing sufficient land forces in the Western Pacific would be fundamental to performing these operations.[155] Conceptually, there are two broad cases to consider: 1) land forces postured in U.S. Pacific territories and possibly in allied states such as South Korea and Japan; and 2) land forces postured along the First Island Chain and in other land areas located near China. In both cases, U.S. land forces could provide capabilities that impede the PLA's ability to maneuver in the air and maritime domains and increase freedom of U.S. and partner militaries.

### Land-based air and missile defense operations

Future land forces could be principally responsible for providing the U.S. contributions to coalition mid- and long-range theater air and missile defenses. Land-based mobile and relocatable air defenses could help provide screens behind which large aircraft such as AWACS and aerial refueling tankers operate, enabling them to better support joint operations. They could also help protect U.S. strike aircraft from Chinese interceptor aircraft and other threats within range. Importantly, ground-based systems should be highly mobile or stationed at hardened and camouflaged fixed sites that have pre-stocked magazines. Future land-based defenses in the Pacific could include directed energy weapons with mobile or fixed and hardened power and cooling sources that give them virtually bottomless magazines.

### Precision strike and sea denial operations

Future land forces permanently stationed and rotationally deployed to the Pacific could conduct surface-to-surface precision strikes, support counter-space operations, and assist in coastal sea denial missions (both surface and undersea) to the limits of their range. A land-based, integrated network of long-range radars, information fusion centers, elevated

155 Agreeing to accept a U.S. force presence is often a major issue with partner states, as was the case with the deployment of THAAD batteries to South Korea. Scott A. Snyder, "The Halt of South Korea's THAAD Deployment," *Asia Unbound*, Council on Foreign Relations blog, June 12, 2017, available at https://www.cfr.org/blog-post/halt-south-koreas-thaad-deployment. As Ross Babbage notes, "Some allied leaders may be tempted to do nothing or continue to take timid, token actions in response to Beijing's expansionism. This flat-footed stance is already fostering major changes in Southeast Asia. The Philippines' President Rodrigo Duterte, appears tempted to bandwagon with Beijing. Cambodia, Laos, Thailand, and even Malaysia are also developing closer relationships with China. Regional governments now view China as not only their most important economic partner, but also as a friend who doesn't interfere with their sensitive domestic issues, unlike the United States. Moreover, they appreciate that China is aggressive and has, by far, the largest military force in the South China Sea. By contrast, the United States and its allies have sporadic military presences in the region and are behaving very cautiously. Significant damage is being done to U.S. and allied credibility. In the absence of major changes, much of Southeast Asia will shift into Beijing's orbit." Ross Babbage, *Countering China's Adventurism in The South China Sea: Strategy Options for the Trump Administration* (Washington, DC: Center for Strategic and Budgetary Assessments, 2016), pp. ii–iii.

communications and sensors, fiber-based communications, and fires could help bottle-up PLA naval forces in their home waters.

Importantly, the short ranges of ground-based IADS and precision strike and sea denial capabilities positioned along the Second Island Chain and in Hawaii would severely limit their operational utility in a fight with the PLA. Future land-launched missiles with ranges that exceed 500 km would require revisiting the INF Treaty, which is reasonable in the face of Russia's apparent violations. Existing and envisioned Army systems that are INF compliant would have the potential to hold at risk Chinese targets *if* they are postured in countries contiguous to China or in locations that would allow them to engage Chinese naval targets. For instance, U.S. land forces located in South Korea and possibly Vietnam could present more formidable challenges to future PLA operations. These ground-based systems would have a greater potential to range some targets in China, further eroding the PLA's ability to project power. Close-in U.S. ground-based fires should be dispersed, concealed, or hardened to make them more difficult to be targeted and attacked. These positions would be augmented by a physical and electronic deception plan that would further complicate the PLA's targeting challenge.

### An illustration: potential U.S. forward defense land force operations in Vietnam

Future permanently stationed and rotationally deployed U.S. land forces in Vietnam would present a formidable threat to a PLA offensive in Southeast Asia.[156] U.S. and Vietnamese forces dispersed throughout Vietnam could hold at risk PLA forces in the South China Sea, the Straits of Malacca, and parts of Southern China. They could also conduct combined operations to significantly degrade air, maritime, space, and cyber operations supporting a PLA invasion. Conceptually, the following land force actions could also support future combined force operations:

- Army, Marine Corps, and SOF ground forces could operate with Vietnamese forces to protect friendly ground LOCs, defend critical infrastructure and bases, and defeat PLA SOF and conventional forces including airborne and amphibious forces. Many future U.S. ground force capabilities for these missions could be robotic or teamed man-machine systems.
- Future Army precision and area long-range fires (cannons, missiles, rockets, and hypersonic weapons) and cyber and EW forces could conduct strikes against Chinese land targets; suppress Chinese air defense systems to open air corridors for attacks; and provide counterfires to disrupt, neutralize, or destroy Chinese fire systems.

156 Although this degree of cooperation with Vietnam may now seem implausible, concerns about Chinese ambitions in the region may make new partnerships with Vietnam and other regional actors possible and desirable. Importantly, Vietnam has substantial military forces: 482,000 active duty personnel (412,000 army, 40,000 navy, and 30,000 air force); 40,000 paramilitary personnel; and 5,000,000 reserve personnel. IISS, *The Military Balance 2017*, p. 338. The United States could enhance Vietnam's defensive capabilities in the coming years through training, advising, and equipping their military.

- A combination of ground-based long-range fires, offensive cyber operations, and EW systems could target Chinese installations (particularly ports and airfields), maritime forces, C2 nodes, and ground formations. Ground-based non-kinetic capabilities could also disrupt and deny PLA space systems, particularly systems that provide precision targeting and PNT information to China's A2/AD capabilities.
- Ground-based long-range radars, elevated communications and sensors, communications gateways, and big data management systems could provide fusion centers for RSTA and help synchronize coalition kinetic and non-kinetic attacks across the battlespace.
- Directed energy defenses supported by multiple displaced radars linked to firing units via fiber optic lines could augment defenses against PLA missile and rocket salvos.
- U.S. forces, using Army and Air Force engineering assets, could construct multiple small airfields and repair them if damaged to support V/STOL (vertical/short takeoff and landing) fighters, attack helicopters, unmanned combat air systems, and RSTA UAS.
- Army and Marine Corps forces could provide mobile reserves to reinforce areas where Chinese SOF or maneuver forces have had success.
- Army logistics units could support deployed forces and provide dispersed adaptive manufacturing locations to reduce theater logistics demands.

### FIGURE 22: U.S. MARINES PRACTICING AN AMPHIBIOUS LANDING IN AUSTRALIA

On July 8, 2017, Marines assigned to the 31st MEU participate in an amphibious raid rehearsal as a part of Talisman Saber, a biennial U.S.-Australia bilateral exercise held off the coast of Australia meant to achieve interoperability and strengthen the U.S.-Australia alliance. U.S. Navy photo by Mass Communication Specialist 3rd Class Sarah Myers.

U.S. land forces could make similar contributions to the security of other friendly countries in the region. If possible, these operations should be fully integrated with operations of regional militaries that are capable and have significant capacity—especially South Korea, Japan, and Indonesia. Potential operations against Russian military aggression in Europe, however, may be a different matter.

## Countering Russia

The stability and security of NATO Europe is challenged by a Russia whose "objective is to overturn the European security order that emerged after the end of the Cold War."[157] Russia is funding a military modernization program that promises to significantly increase its ability to execute A2/AD operations in the Black Sea and Baltic Sea regions, in the air over Poland, and in other areas on its periphery. Russia's conventional invasion of Georgia, its gray zone operations in Ukraine, its intervention to prop up Bashar al-Assad's regime in Syria, and its cyberattacks against nearly every Western government and major world player prove that it is willing to use force to achieve its ambitions. In sum, Russia has "an extremely flexible toolkit

157 Eric S. Edelman and Whitney M. McNamara, *U.S. Strategy for Maintaining a Europe Whole and Free* (Washington, DC: Center for Strategic and Budgetary Assessments, 2017), p. 40.

to deploy against adversaries: one that attempts to calculate strategic moves that fall below the threshold likely to elicit a U.S. or NATO military response."[158]

Given the size, capabilities, and proximity of Russia's military to NATO's eastern flank, the need for forward basing more U.S. land forces in the region may be significantly greater than the need for basing them in the Pacific. As previously illustrated, the U.S. military's land force posture in Europe is a shadow of the Cold War-era force created to deter a Soviet invasion. The U.S. Army's forces are also out of position, given that its two brigades stationed in Europe—an airborne brigade combat team (BCT) and a Stryker BCT—are in Italy and Germany, respectively. These forces are augmented by a single rotational armored BCT—the only U.S. armored force on the ground in Europe—as well as a special forces battalion and modest SOF forces. This "presence" force is incapable of defending forward, and it is questionable if it even constitutes a credible deterrent.

The small size of Allied militaries along NATO's eastern front is another reason why a U.S. forward defense force posture in Europe could better deter Russia. For instance, the combined militaries of Estonia, Latvia, and Lithuania total 28,040 active duty and 41,650 reserve/paramilitary personnel, lack any heavy units and fighter aircraft, and field negligible ground fires and air defense capabilities. This is unlikely to change significantly in the near future, given that their combined population of approximately 6,000,000 citizens constrains the size of the militaries they are able to field. Poland has comparatively greater military capacity and capability, with 99,300 active and 73,400 paramilitary forces. Additionally, they have armored, combat air, artillery, naval, and air defense capabilities focused principally on a territorial defense against Russian aggression.[159]

Finally, a U.S. land force posture for forward defense in Europe could reduce the time needed for the United States to respond to a building crisis. The United States should not assume that it will be able to quickly reinforce NATO forces in Europe after hostilities with Russia begin. This is due to several reasons, including the extensive amount of time needed to move heavy forces from the United States and other distant theaters to Europe, the difficulty of deploying forces to areas that are covered by Russia's A2/AD envelopes, and Russia's threat to resort to the use of nuclear weapons if necessary.[160]

158 Ibid., p. ii.

159 IISS, *The Military Balance 2017*, pp. 106–108, 131–134, and 145–147.

160 See Edelman and McNamara, *U.S. Strategy for Maintaining a Europe Whole and Free*, pp. ii–iii. The authors elaborate on the gravity of the current situation: "As Russia continues to invest aggressively in modernizing its military, many NATO countries continue to pursue policies of disarmament, divest themselves of key capabilities, and struggle to meet NATO's 2 percent of GDP defense spending requirement. Europe's political disunity, lack of leadership, and absence of appetite for confrontation with Russia, as well as the weakest United States military presence in Europe since World War II, allow the Kremlin to exploit its growing military capabilities along its periphery. The dwindling presence of NATO forces is now running the risk of failing to deter Russian aggression; it may have already fallen below this threshold with regard to the Baltics. Ultimately, maintaining forward presence and readiness to wage sustained joint and combined operations may be the greatest challenge for NATO's forces."

## FIGURE 23: LOADING BRADLEY FIGHTING VEHICLES IN TEXAS FOR TRANSPORT TO THE BALTICS


Soldiers loading and chaining down a line of Bradley Fighting Vehicles for transport to Poland, Estonia, Latvia, and Lithuania as part of the brigade's participation in Atlantic Resolve on August 19, 2014 at Fort Hood, Texas. U.S. Army photo by Staff Sgt. Keith Anderson.

The following illustrative case addresses operating concepts, capabilities, and a force posture to counter Russian aggression against NATO's most vulnerable flank. The concepts discussed in the illustrative Pacific conflict are also relevant to the defense of the Baltic states, with the stipulation that the latter case may be the more challenging given the geographic isolation and meager defenses of the Baltic states.

### An illustration: potential U.S. forward defense land force operations in the Baltics

U.S. and NATO forces postured in key Baltic cities could be the heart of a forward defense to prevent Russian forces from quickly overrunning Lithuania, Estonia, and Latvia. The 1999 battle for Grozny provides insights into operations Russia's military could undertake to seize control over a major population center in a Baltic state.

Within Grozny, Russian military planners divided the city into 15 sectors to identify rebel strongpoints, underground corridors, and arsenals. In doing so, the planners gained a better understanding of the vertical dimensions of urban fighting in Grozny. Instead of trying to storm the city, Russia essentially besieged it with 50,000 troops and employed a deliberate approach to systematically destroy the 4,000 rebels still in the city.[161] Grozny was also subjected to an unrelenting air campaign. The objective of the air campaign was "demoralizing the will of the populations to resist and the complete ruination of the internal infrastructure of Chechnya. . . . Targets included dams, weirs, water distributions systems, fuel dumps, oil installations, the telephone system, and the electricity supply system."[162] Essentially, Grozny was a "freefire zone."[163]

Russia conducted ground-based fires operations (including the use of thermobaric weapons), air operations, and ground maneuver to besiege and then take Grozny. Chechen rebels were mostly armed with small arms and rocket-propelled grenades against Russian armored and infantry maneuver forces, SOF, and police forces that outnumbered them by more than twelve to one. In addition to their ground maneuver advantage, Russia had air supremacy. Should Russia decide to invade a Baltic state, its forces may have a similar degree of overmatch—assuming NATO does not change its military posture in the region.

Forward-stationed U.S. ground forces performing many of the same operations suggested in the Vietnam case could turn selected Baltic cities into "hedgehogs" that are better capable of countering Russia's initial attacks.[164]

161 Lester W. Grau and Timothy L. Thomas, "Russian Lessons Learned from the Battles for Grozny," *Marine Corps Gazette*, April 2000, available at http://fmso.leavenworth.army.mil/documents/Rusn_leslrn.htm.

162 Richard D. Wallwork, *Artillery in Urban Operations: Reflections on Experiences in Chechnya*, thesis (Fort Leavenworth, KS: U.S. Army Command and General Staff College, 2004), p. 51. Russian forces used mortars including the 2S2 250mm Tyulpan self-propelled mortar; artillery (122mm and 152mm); rockets (Smerch 300mm, Uragan 220mm, and TOS-1 220mm); and SCUD, SS-1, and SS-21 missiles. They also employed cluster munitions.

163 This block quote is from Gian Gentile et al., *Reimagining the Character of Urban Operations for the U.S. Army: How the Past Can Inform the Present and Future* (Santa Monica, CA: RAND Corporation, 2017), p. 34. The term "freefire zone" is from Timothy L. Thomas, "Grozny 2000: Urban Combat Lessons Learned," *Military Review*, July/August 2000, available at http://fmso.leavenworth.army.mil/documents/grozny2000/grozny2000.htm.

164 This is especially the case in the Baltic capital cities of Riga, Vilnius, and Tallinn.

FIGURE 24: U.S. AND POLISH TANKS IN LATVIA

Polish soldiers and U.S. Marines operate tanks during a combined arms live-fire training event at the Adazi training grounds in Latvia, June 9, 2017, as part of Saber Strike, an annual exercise in the Baltic region and Poland. U.S. Marine Corps photo by 1st Lt. Kristine Racicot.

More specifically, U.S. ground fires, electronic warfare, and cyber operations could suppress Russian ground batteries and help open air and maritime corridors for friendly forces. Long-range, surface-to-surface strikes could disrupt Russia's lines of communication to the Baltics, and ground-based, high-capacity air and missile defenses could degrade Russia's ability to support its ground operations by air. EW and cyberattacks could deny Russia its ability to maneuver in the EMS, and NATO maneuver forces could conduct combined arms maneuver to defeat invading forces and their irregular proxies.

## What Must Change to Realize These Concepts

### Commit to forward defense

None of the concepts described above will be possible if the United States does not commit to forward defense as a necessary component of deterrence against China and Russia. The United States now relies on episodic presence, permanently stationed force speedbumps, and power-projection processes (e.g., moving forces into theater; employing ports and airfields; and large forward reception, staging, onward movement, and integration operations) that assume the United States will have dominance in the air, maritime, land, space, and cyber domains. The effectiveness of Chinese and Russian A2/AD capabilities, coupled with the fact that they are operating in their own regions, means that many existing U.S. presence and deployment

doctrines are obsolete and may even encourage gray zone actions and higher-order aggression. Quite simply, the current U.S. force postures in Europe and the Pacific are increasingly less able to compete in the gray zone, deter opportunistic aggression, or punish aggressors should deterrence fail.

### Illustrative capability priorities

Operating concepts described in this chapter will require new capabilities for America's land forces. The following candidates are illustrative and do not cover all possible capabilities that may be needed in the future.

**Upgrade and increase the capacity of U.S. fire systems.** U.S. land force fire systems are long overdue for upgrades that would increase their accuracy, range, lethality, and capacity. Area anti-armor and anti-personnel cluster munitions, smart munitions, and scatterable mines are needed to attack, isolate, and impede Russian ground maneuver forces and counter enemy SOF operations.

**Longer-range, ground-based fires.** Future U.S. ground forces equipped with long-range (up to 500 km) fires coupled with organic UAS for ISR and communications could conduct high-volume attacks against enemy A2/AD capabilities in contested areas, both destroying their capability and opening up attacks from the other domains.

**High-capacity air and missile defenses.** High-capacity SHORADS and medium- and long-range kinetic and non-kinetic (including directed energy) defenses, combined with other active and passive defense measures, could counter large salvos of guided weapons—potentially increasing the cost to adversaries of defeating defended U.S. targets to the extent that they choose not to attack.

**New dual-capable systems.** Some future U.S. ground fires should be dual-capable, which means they are capable of delivering conventional and low-yield nuclear weapons. Dual-capable systems would add rungs to the U.S. escalatory ladder and reduce reliance on air-delivered nonstrategic nuclear weapons which may not be able to penetrate A2/AD complexes. Posturing dual-capable weapon systems in Poland could help offset Russian nuclear-capable Iskander missiles emplaced on its periphery, greatly complicating the problems Russia must solve to seize the Baltics.

**Highly mobile maneuver units with active protection.** Future ground maneuver units protected from enemy fires by a combination of tactical mobility, passive measures, and organic active defenses (including ground and airborne manned and unmanned systems) are needed to deny critical terrain and degrade an enemy's freedom to maneuver in contested areas.

**Ground-based electronic warfare, counter-space, and cyber warfare systems.** Kinetic and non-kinetic capabilities are needed to ensure U.S. forces are able to exploit the electromagnetic spectrum and deny an enemy's ability to maneuver in the EMS. Prevailing in

the information warfare competition will be essential to U.S. operations in peace and in war in all domains, including space and cyberspace.

### Some capacity implications

The most brilliant operating concepts and revolutionary technologies will be ineffective if they are not supported with the right mix of capabilities and sufficient force capacity to provide a credible deterrent or thwart aggression if deterrence fails. In the Pacific and Europe, U.S. allies and partners could and should increase their contributions toward creating a favorable correlation of forces with China and Russia respectively.

Importantly, this is not the same dilemma that NATO faced during the Cold War, since Russia now has substantially fewer armed forces than it did during the Soviet era. Yet, the Cold War NATO had sufficient ground, air, and maritime forces—and tactical nuclear weapons—to deter or, if necessary, prevent a rapid Soviet advance into NATO territory. U.S. forward-postured air and maritime forces were also able to secure sea and air LOCs that were critical to reinforcing Europe's defenses. Those days are long gone. Without sufficient ground forces and the right mix of capabilities in place before a conflict begins, it is unlikely that NATO will be able to prevent Russia from achieving a *fait accompli* in the Baltics or other NATO frontline regions that it seeks to dominate.[165]

Although specific sizing recommendations are beyond the scope of this report, it is clear that America's land forces are not organized, equipped, and sized today to execute the operating concepts outlined above. This is more than a question of inadequate end strength, which by itself is a poor metric for assessing the health of U.S. land forces. More importantly, U.S. land forces lack appropriate operating concepts and a mix of capabilities needed for the era of great power competition. The Army, which is the service that will provide the preponderance of land-based capabilities to U.S. combatant commanders for conflicts in Asia and Europe, has significant shortfalls in air and missile defense batteries, long-range fires, EW and cyber capabilities, and other weapon systems needed for conflicts with great power aggressors. Furthermore, given that many of the capabilities (e.g., directed energy weapons) described earlier are not yet fielded, their introduction will require new types of formations or modifications to existing units. DoD will also have to address the Active-Reserve Component mix and mobilization plans for land forces, since many of the units needed to execute these new concepts would have to be forward stationed or rotationally deployed in sufficient numbers to sustain credible deterrence postures.

165 Posturing the majority of U.S. ground force capabilities in Poland rather than the Baltic states is a much riskier proposition. Although these forces could affect Russian operations, they alone may not be sufficient to prevent a *fait accompli* in one or more of the Baltic states. Either option, however, could greatly improve the ability of NATO to deter overt Russian action in Eastern Europe. These capabilities and concepts would also be useful in countering Russian hybrid and information warfare efforts below the threshold of direct combat.

CHAPTER 6

# Shaping Future Naval Expeditionary Forces

Throughout most of its history, the U.S. military depended on sealift to deploy its personnel, equipment, and supplies from the American homeland to distant theaters in response to crises. By the middle of World War II, the Services had refined the capabilities required to conduct expeditionary operations and possessed a large number of *access-insensitive* forces that could be "operated with little or no reliance on bases or other logistics infrastructure on the ground in their immediate area."[166] These expeditionary capabilities allowed the United States to use its sea-based forces to seize key terrain and create new power-projection hubs in Europe and the Pacific.

During the Cold War, DoD developed a global network of installations and a large overseas garrison force that was backed up by reinforcements based in the United States. U.S. *access-sensitive* reinforcements would be transported by sealift and airlift platforms to deep-water ports or large airbases in the event of a large-scale crisis. Upon arrival, reinforcing troops, equipment, and supplies would need to be unloaded and combined to form combat-ready formations through a process called reception, staging, onward movement, and integration (RSOI).[167]

The U.S. military's emphasis on forward garrisoned forces and rapid reinforcement operations during the Cold War was reflected in changes to the ratio of access-sensitive to access-insensitive ground forces in the Army and Marine Corps. As described by former Deputy Secretary of Defense Robert Work:

166 Congressional Budget Office (CBO), *Sea Basing and Alternatives for Deploying and Sustaining Ground Combat Forces* (Washington, DC: CBO, July 2007), p. vii.

167 Andrew F. Krepinevich and Robert Work, *A New U.S. Global Defense Posture for the Second Transoceanic Era* (Washington, DC: Center for Strategic and Budgetary Assessments, 2007), pp. 129–130.

> By the end of World War II, the [U.S. fleet] could lift 13 division equivalents. These sea-based assault forces could be augmented by an additional five airborne divisions, giving the United States a total of 18 access-insensitive assault divisions out of a combined Army and Marine force structure of 96 divisions (nearly 19 percent). By the end of the Cold War, the vestigial amphibious landing fleet could lift perhaps two brigades and the Army maintained four airborne brigades, giving the United States a total of two division equivalents of access-insensitive assault divisions out of a combined force structure of 32 Army, Army National Guard, and Marine Divisions (six percent).[168]

After the Cold War, the United States eliminated many of its overseas bases and downsized its military to cut costs. In 1989, U.S. Army Europe consisted of 213,000 soldiers based at 850 installations. By 1996, those numbers had declined to 75,315 soldiers based at 286 installations.[169] Similarly, the Air Force's European presence dropped from 30 fighter and reconnaissance squadrons based at 11 locations in 1982 to 9 squadrons at 4 locations in 1999.[170]

Despite these reductions, after the Cold War the United States continued to rely on an access-sensitive reinforcement model for large-scale ground force deployments. In the event of a regional crisis, ground units based in the U.S. homeland were expected to deploy to friendly air and seaports and assemble in an uncontested environment prior to moving to the battlefield. This model proved adequate for U.S. interventions in the 1990s and 2000s, albeit with some hiccups, including the delayed (and controversial) 1999 deployment of the Army's Task Force Hawk to Albania in support of Operation Allied Force and Turkey's refusal to allow the United States to use Turkish territory to deploy troops into Iraq in 2003.[171]

Today, the proliferation of precision weapons has provided adversaries with new capabilities to hold at risk ports and RSOI sites needed by U.S. forces. These logistics hubs are particularly vulnerable, since the debarkation infrastructure necessary to support major airlift and sealift operations is substantial, and only a few sites capable of hosting large-scale debarkation and RSOI activities are likely to exist close to a conflict area. Key logistics nodes may be some of the first locations an adversary will target during a conflict in a bid to slow or deny the United States theater access.[172] Even the threat of precision attacks may be sufficient to induce a host nation to deny the U.S. military the use of its territory for logistics and staging.

168 Robert Work, *Thinking About Seabasing: All Ahead, Slow* (Washington, DC: Center for Strategic and Budgetary Assessments, 2006), p. 71.

169 Michael J. Lostumbo et al., *Overseas Basing of U.S. Military Forces: An Assessment of Relative Costs and Strategic Benefits* (Santa Monica, CA: RAND Corporation, 2013), p. 8.

170 David A. Shlapak et al., *A Global Access Strategy for the U.S. Air Force* (Santa Monica, CA: RAND Corporation, 2002), p. 2.

171 Work, *Thinking About Seabasing*, pp. 134–137 and 180–181.

172 One example that highlights the magnitude of the access challenge is the use of ASCMs by Houthi rebels in Yemen. In at least three instances in October 2016, Houthi irregular forces fired C-801 or C-802 missiles at U.S. ships operating in the Red Sea, forcing the USS *Mason* (DDG-87) to launch countermeasures and Standard Missile-2 and Evolved Sea Sparrow Missiles to defeat threats. Although U.S. forces emerged unscathed, a United Arab Emirates high-speed intra-theater transport was nearly sunk that same month by a single Houthi ASCM.

## Advantages of U.S. Naval Expeditionary Forces

Over time, the definition of "expeditionary" has evolved from a general description of any force conducting operations on foreign soil to a label used to denote a specialized crisis-response force. In the United States, the term expeditionary is most frequently associated with the Marine Corps, a Service that describes itself as being the nation's expeditionary force-in-readiness. Marine publications define an expeditionary force as one that is "strategically mobile . . . [and] light enough to get to the crisis quickly, yet able to accomplish the mission or provide time and options prior to the arrival of additional forces."[173] The Marine Corps emphasizes the importance of cultivating a specialized mindset in expeditionary forces and has tried to build a "culture [which] can be summarized simply: fast, austere, and lethal."[174]

Expeditionary forces can be married with maritime assets to carry out naval maneuver operations, defined by the strategist Wayne Hughes as the "swift movement [of forces by sea] to successive positions the loss of which will hurt the enemy badly."[175] Naval forces can take advantage of ships to transport heavy payloads an order of magnitude faster than they could be moved on land. Whereas ground combat forces may average between 15 and 20 miles per day in moderately contested areas, a ship moving at a speed of 15 knots would travel more than 400 miles.[176] Cargo aircraft are much faster than ships, but air platforms are hindered by weight and size limitations that make them efficient transporters of only very light equipment; a single Large, Medium-Speed Roll-on/Roll-off (LMSR) sealift vessel can carry the cargo tonnage equivalent of 180 C-5 Galaxy airlifters.[177]

173 Headquarters U.S. Marine Corps, *Expeditionary Force 21 Forward and Ready: Now and in the Future* (Washington, DC: U.S. Marine Corps, March 2014), p. 6. In addition to the Marines, special operations forces, the Army's Global Reaction Force (GRF), and other forces from all Services are considered expeditionary.

174 Ibid., p. 6.

175 Wayne Hughes, "Naval Maneuver Warfare," *Naval War College Review*, Summer 1997.

176 Work, *Thinking About Seabasing*, p. 17.

177 CBO, *Options for Strategic Military Transportation Systems* (Washington, DC: CBO, September 2005), pp. 4–5.

## FIGURE 25: LOADING A BLACK HAWK HELICOPTER ON AN LMSR

A helicopter is loaded aboard Military Sealift Command LMSR ship USNS Bob Hope in Antwerp, Belgium. U.S. Navy photo by Bram de Jong.

The bulk of U.S. naval expeditionary forces reside in the Navy's amphibious fleet and the Marine Corps. The Corps' combat units have limited weight and size to ensure they can deploy quickly aboard amphibious shipping. As a result, the Marine Corps describes itself as a middleweight force that is "light enough for rapid response," yet still "heavy enough to prevail in the littorals."[178] The Marine Corps organizes for combat in MAGTFs that combine a ground combat element (GCE) with an air combat element (ACE) and a logistics combat element (LCE). Marine forces and the amphibious component of the Navy have specialized training and equipment that enable them to conduct forcible entry operations and sustain combat operations ashore for a limited period of time.

The growing number of states with A2/AD capabilities has created a host of new challenges to U.S. power-projection operations. Russia and China possess the world's most sophisticated counter-intervention architectures, and they continue to field offensive and defensive weapons with increasing ranges to extend their A2/AD effects to areas the U.S. military has traditionally assumed would be operational sanctuaries.

178 Headquarters U.S. Marine Corps, *Expeditionary Force 21*, p. 7.

To contend with these challenges, the U.S. military will need forces that operate over very long ranges from bases outside the reach of most enemy strike systems. Inside contested areas, U.S. forces must be highly mobile, less reliant on fixed infrastructures, and capable of conducting distributed operations. Naval expeditionary forces already possess many of these latter attributes by virtue of the unique demands of the forcible entry mission. In combat against a near-peer competitor, for example, Marine Corps forces could take advantage of their light footprint, surface connectors, and organic intra-theater airlift capability to operate inside A2/AD threat envelopes where larger and less mobile units would be at higher risk of being located and attacked. In order to maximize their utility in future conflicts against advanced adversaries, naval expeditionary forces should adopt new—or reembrace old—operating concepts and acquire new capabilities.

## Creating Advance Bases for Power-Projection Forces

In the first half of the 20th century, the Marine Corps developed new methods for offensive and defensive advance base operations. Future naval expeditionary forces could establish and sustain advance bases capable of supporting U.S. forces that must operate in contested areas.

It is important to note that advance base operations would be aided immensely by prepositioning supplies and infrastructure in appropriate forward locations during peacetime. Auxiliary airfields, for example, may require a considerable amount of preparation before they are acceptable for operations. Building this infrastructure in peacetime, perhaps as part of repeated theater security cooperation exercises, would allow naval expeditionary forces to fall in on existing advance base sites rather than start from scratch after a crisis has begun.

### Intermediate staging bases

An intermediate staging base (ISB) is a "principal staging base" employed "in order to secure a lodgment to project the force for the rapid delivery of combat power."[179] ISBs also serve as hubs for transitioning troops, equipment, and supplies from inter-theater lift platforms to smaller and more survivable intra-theater lift platforms.

Future expeditionary forces could set up ISBs in a number of ways, including constructing austere bases from scratch, converting civilian air or seaports to military logistics hubs, or seizing bases from an adversary. Once ISBs are established, specialized expeditionary equipment could be brought in to supplement existing port facilities and allow ISB sites to support greater logistics throughput than they could with their existing infrastructure.[180]

179 DoD, *Deployment and Redeployment Operations*, Joint Publication 3-35 (Washington, DC: DoD, 2013), p. VI-20.

180 Specialized expeditionary equipment could include, for example, the fuel transfer and causeway systems that the Army and Navy field as part of DoD's Joint Logistics Over-the-Shore (JLOTS) architecture.

ISBs located in littoral locations along U.S. lines of communication would allow the United States to move forces and supplies over comparatively short distances between defended outposts rather than over long distances between a few scarce main logistics hubs. In theaters such as the Western Pacific where LOCs are stretched over very long distances, the use of ISBs to refuel aircraft and ships would have the additional benefit of freeing scarce tanker aircraft and oiler ships to support platforms conducting combat operations rather than servicing sealift and airlift assets.

### Distributed expeditionary airbases

The U.S. military is accustomed to concentrating its overseas combat air forces at a small number of large main operating bases. An enemy faced with a few such targets could concentrate its weapons on a handful of locations and overwhelm the capacity of airbase defenses. To counter this threat, expeditionary forces could establish networks of austere airbases to allow aircraft to disperse throughout a theater. It is highly unlikely that expeditionary airbases would be able to generate the same number of aircraft sorties as MOBs. However, expeditionary airbase operations, combined with improvements to active and passive defenses at MOBs, would improve the overall resiliency of the U.S. military's force posture and increase the number of enemy sorties and weapons needed to suppress U.S. theater air operations.

The Marine Corps' STOVL F-35B Lightning II is particularly well-suited for distributed operations from small expeditionary airfields because it is capable of launching and recovering from short runways or airfield matting.[181] The F-35B could also enable the use of alternate launch and recovery surfaces—such as taxiways—at MOBs and civilian airfields whose runways have been damaged by attacks.

181 For more information on a concept for distributed STOVL operations, see Gunzinger and Clark, *Sustaining America's Precision Strike Advantage*, pp.33–34.

FIGURE 26: F-35B EXECUTING A VERTICAL LANDING

F-35B Lighting II prepares to land during an exercise at MCAS Beaufort, April 14, 2017. U.S. Marine Corps photo.

## Sensor networks

Future naval expeditionary forces could emplace active and passive sensors to create sensor networks in strategic littoral areas capable of detecting enemy air and missile attacks and other threats. Sensors deployed along the First Island Chain in the Pacific could provide early warning of missiles and bomber aircraft launched from the Chinese mainland, cueing long-range U.S. air and missile defense operations. Ground sensors could be widely distributed to increase the survivability of the overall network and enable multistatic operations in which one or more emitters are linked with passive receivers in the network or on different U.S. weapon systems. Ground-based sensors could also be physically linked through landlines rather than by radio or other forms of communications that are susceptible to detection and jamming. Active or passive ground-based sensor networks in contested areas would reduce the need for U.S. forces to rely on aircraft and ships for ISR, both of which are vulnerable to attack and detection by an enemy.

## Reinforce Allies

At the outset of a conflict, the threat to major seaports in a country adjacent to a battlespace may be so great that the U.S. military will choose to rely on its amphibious shipping to rapidly deploy middleweight expeditionary reinforcements rather than move heavier ground forces via Maritime Sealift Command vessels. Civilian-crewed MSC ships have no weaponry and lack the defenses of modern warships. In addition, the troops and equipment that are offloaded from MSC ships must conduct RSOI operations at port facilities, which creates a window of opportunity for an adversary to attack U.S. forces when they are highly vulnerable.

By contrast, amphibious ships are constructed to warship survivability standards, have self-defense weapons, and can launch and recover surface connectors that are capable of landing ground forces without any supporting infrastructure ashore. Marine air-ground task forces are organized and loaded so that they can fight immediately after landing rather than having to go through an RSOI process during which they would be vulnerable to attack.

Naval expeditionary forces can also be moved ashore at more locations than traditional reinforcing forces. Amphibious ships could also expand the number of locations that could be used for reinforcement operations. Most of the vessels in the MSC's prepositioning and sealift fleets require ports that can accommodate ships with drafts of 35 feet or more. A DoD study of 282 seaports in the U.S. Central Command and U.S. Pacific Command areas of responsibility determined that just 27 percent of ports were accessible by LMSRs and other deep draft ships. An enemy attempting to hinder offload operations at deep draft ports would be able to concentrate its ISR sensors and weapons on a small number of locations, increasing the likelihood that its offensive salvo would overwhelm U.S. defenses.[182]

## Sea and Air Denial Operations

### Create a survivable threat-in-being

Deploying naval expeditionary forces equipped with SAMs and ground-launched anti-ship missiles to littoral areas could help deny an opponent's freedom of action in the air and at sea. Expeditionary missile fires distributed at appropriate locations, such as throughout an archipelago or along a coastline, could use geography to create chokepoints for an enemy's air and naval surface forces.

Even well-escorted amphibious ships are unlikely to survive deep inside an opponent's A2/AD zone. Naval expeditionary forces in littoral environments could employ surface

182 Joseph P. Crowley, *Does the Army Need the Theater Support Vessel? If So, How Many?* (Carlisle, PA: U.S. Army War College, 2004), p. 6.

connectors to reduce the threat of attacks and increase the mobility of their fires. These small craft could shuttle launchers and reloads to new locations more quickly than the vehicles could move over land. If necessary, barges or other vessels that resemble civilian small craft could be employed to reduce the likelihood that they will be positively identified and attacked. An opponent that does locate and track these small transport vessels may still decide they are not worth the expenditure of expensive long-range fires.

### FIGURE 27: A LANDING CRAFT AIR-CUSHION (LCAC) SURFACE CONNECTOR LANDS ON A BEACH


An LCAC transporting U.S. Marines lands at Pinheiro Da Cruz, Praia Da Raposa beach, Portugal, to participate in a combined amphibious assault exercise, October 20, 2015, during Trident Juncture 15, a NATO-led exercise. U.S. Marine Corps photo by Sgt. Austin Long.

Missile units could take advantage of their low signatures, distributed dispositions, and mobility to present an adversary with a highly survivable threat-in-being. Dispersed ground forces can be more resilient than high-signature aircraft and ships, allowing ground elements to persist in forward locations where many air and sea platforms cannot. A single ground unit can disperse its constituent components and force an enemy to conduct separate attacks on each element rather than striking a single ship or airplane. Ground forces can also reduce their detectable signatures by hiding in terrain, trees, and structures; employing camouflage, concealment, and deception tactics; and using physical datalinks such as fiber optic cables to minimize their electromagnetic emissions. These tactics in combination could significantly increase the total number of weapons an enemy must use to effectively attack dispersed troops and vehicles.

### Imposing virtual attrition on an enemy

Finding and attacking mobile missile TELs is a difficult operational challenge. A 2001 RAND report concluded that while "it may be possible to detect and destroy TELs after launch or while moving . . . it is unlikely that missiles will be routinely detected in hiding." The report also determined that, "It is near impossible—at least with projected systems—to detect, recognize, and target TELs if they operate in more built-up areas."[183] The U.S. military's difficulties in finding and attacking SCUD missile TELs in the 1991 Gulf War bear out this observation. Despite searching for targets in the open desert and with the benefit of air supremacy, Coalition air forces failed to halt SCUD launches and eliminate Iraq's sizable launch capacity.[184]

**FIGURE 28: IRAQI SCUD MISSILE LAUNCHER IDENTIFIED BY A TARGETING POD DURING THE 1991 GULF WAR**

U.S. Air Force image.

The United States could force an opponent to contend with a similar challenge by deploying its own mobile anti-air and anti-ship missile launchers to dispersed locations in strategic areas. Even mobile defenses that have a low probability of kill (Pk) against some weapons could force an opponent to honor the threat they pose and either devote resources to finding and killing them or altering their aircraft and surface ship routes to avoid them. Either response would impose a form of virtual attrition on hostile forces by reducing the resources they are able to allocate to offensive operations.

183 Alan Vick et al., *Aerospace Operations Against Elusive Ground Targets* (Santa Monica, CA: RAND Corporation, 2001), pp. 86–87.

184 Ibid., p. 41.

U.S. expeditionary missile fires would be most effective when networked with fixed or mobile sensors that allow the units to fire at the maximum ranges of their weapons. ISR enablers could range from small UAVs that are organically deployed as part of the missile artillery units to more persistent high-altitude aerostats. In addition, a multi-domain command and control architecture would allow fires units to receive targeting information from off-board sensors carried aboard other U.S. platforms, including fighter aircraft and ships.

## Support to Blockade Operations

Future naval expeditionary forces should be capable of supporting blockade operations. Marine light infantry and Navy small boats and amphibious ships could supplement surface combatants tasked with stopping vessels at maritime chokepoints. The Navy now maintains visit, board, search, and seizure (VBSS) teams of sailors that are drawn from crews of its surface combatants. These sailors support the VBSS mission as a collateral rather than a primary duty. Large-scale blockades that require many boardings per day would tax these sailors and could degrade their readiness for other missions. Delegating the primary responsibility for boardings to naval expeditionary forces and their amphibious ships would free other surface combatants to focus on their primary warfighting duties. Marine expeditionary units (MEU) and other MAGTF constructs also deploy with elite force reconnaissance elements capable of executing opposed boardings, a high-risk mission that regular Navy VBSS teams are not trained and equipped to perform.

## Capability and Sizing Implications

### Future naval expeditionary capabilities

Expeditionary naval forces will need to acquire new capabilities or use existing capabilities in new ways in order to execute the operating concepts described above.

**Develop and procure ground-based anti-ship missiles and advanced SAMs.** The Marine Corps lacks both an anti-ship missile capability and an air defense system that is effective against high-performance aircraft and cruise missiles. In order to maximize their ability to contribute to sea and air denial concepts, naval expeditionary forces should be equipped with mobile anti-ship fires and advanced SAMs along with the sensors necessary for them to attacks threats at over-the-horizon ranges.

**Optimize surface connectors for ocean travel and vehicles for ground combat.** The Navy and Marine Corps should optimize their surface connectors for ocean transit and their vehicles for ground combat. Improvements in anti-ship missile systems are driving swim requirements for amphibious armored vehicles to ranges that exceed what is now technically feasible at an acceptable cost. Instead, the Navy and Marine Corps should focus on acquiring surface connectors that can transport vehicles over long distances and deploy

them either at, or very close to, landing points. Reducing the swimming requirements for ground vehicles to just a few miles would also allow DoD to purchase platforms that are optimized for land warfare without having to accept the design tradeoffs necessary to provide the vehicles with an extended-range amphibious capability.

**Develop and procure JLOTS systems that operate in high sea states.** The Joint Logistics Over-the-Shore system-of-systems, including both lighterage and causeway systems, allows U.S. forces to conduct logistics operations without the need to completely rely on large, developed seaports. Today, logistics over-the-shore operations in seas with waves of four feet or higher would be considered hazardous for all but a few JLOTS components. The Navy and Army should continue to invest in research and development so that it can procure JLOTS systems that are capable of functioning in higher sea states.

**Expand the capabilities of Expeditionary Fast Transport ships.** The EPF class of ships, formerly known as Joint High Speed Vessels (JHSV), are shallow draft sealift assets that are capable of traveling at speeds in excess of 40 knots and transporting over 300 personnel. EPFs are significantly cheaper than amphibious ships, and their speed and versatility would allow them to conduct intra-theater transport operations and support unmanned vehicles and expeditionary operations in littoral environments. DoD should evaluate the efficacy of procuring add-ons and modifications that would make EPF ships even more capable, including an enhanced interface ramp, offensive or defensive deck missile systems, unmanned vehicle sustainment systems, and the ability to launch amphibious vehicles.

**Increase the armament of amphibious ships.** Amphibious ships currently lack VLS that allow U.S. large surface combatants to carry and launch advanced missiles. Adding VLS to amphibious ships would improve both their offensive capacity and defensive anti-air warfare capacity, increasing the ships' ability to provide fire support to expeditionary ground forces and reducing the number of escort ships required to operate alongside them.

### Some Capacity Implications

The sizes of the Navy's amphibious fleet and the Marine Corps are tied to overseas presence and the warfighting requirements levied on naval expeditionary forces. They are also contingent on DoD decisions regarding the size of its access-sensitive forces. Currently, U.S. military ground power remains heavily weighted towards access-sensitive forces despite the continuing proliferation of A2/AD threats. In order to counter these threats, DoD may need to forward posture more of its ground forces in critical regions, increase the size of its access-insensitive naval expeditionary forces, or both.

In addition to their value in major conflicts, naval expeditionary forces provide combatant commanders with peacetime presence in three ways: MEUs are embarked onboard ARGs that rotationally deploy to various areas of responsibility (AOR); MAGTFs of various sizes are deployed as part of regularly-scheduled training or crisis response rotations; and Navy and

Marine forces are garrisoned permanently at forward bases in the Pacific. Manpower is the major factor that constrains the Marine Corps' ability to support these steady-state requirements over time.

**Increase end strength to sustain force rotations.** At a minimum, the Marine Corps must be large enough to ensure that the force-wide deployment-to-dwell (D2D) ratio for long-duration operations is sustainable while still allowing the Corps to meet its regular presence demands. The Corps' preferred D2D ratio is 1:3, or three months at home for every one month spent deployed. A 1:3 D2D ratio would provide Marines with sufficient time between deployments to rest, refit, receive training, and attend professional military education.

The Corps' 2010 Force Structure Review (FSR) determined that a total active-duty force of 186,800 or larger would allow the Marines to meet current operational demands while maintaining a 1:3 D2D ratio.185 The Fiscal Year 2018 DoD budget request called for the Marine Corps' Active Component end strength to rise to 185,000 personnel, slightly lower than the 2010 FSR target but higher than its 2017 level. However, Marine leaders have stated that new requirements have emerged since the FSR study was completed, and they believe that the Corps' end strength should be greater than 186,800.[186]

**Increase amphibious shipping capacity.** Amphibious warships are the most survivable expeditionary sealift assets in the U.S. military's inventory, and their well decks allow them to launch surface connectors that can deploy forces ashore without land-based infrastructure.

In addition to their utility as transporters for a MAGTF, amphibious ships could carry out other roles in the battle fleet. The well decks that most amphibious ships contain could be used to launch and recover USVs and UUVs, allowing amphibious ships to serve as support vessels for UUV and USV operations. Large-deck amphibious ships—Landing Helicopter Assault (LHA) and Landing Helicopter Dock (LHD)—embarked with a fighter-heavy aviation contingent of 16 to 20 F-35Bs could substitute for CVNs in certain situations or augment a carrier strike group in contingencies where more sea-based 5th generation fighters are required than a CVN could embark on its own.

The requirement for amphibious shipping currently stands at 38 vessels, the number needed to provide lift to the assault echelons of two MEBs.[187] Despite this stated goal, the Navy's Fiscal Year 2017 30-year shipbuilding plan fails to reach that target during most of its out years. The 2.0 AE requirement itself represents a one-third decrease in the lift capacity required at the end of the Cold War, a time when the United States had more troops stationed overseas than it does today. In 1990, the AE requirement was reduced from 3.0 to 2.5, and in

185 U.S. Marine Corps, *2010 Force Structure Review* (Washington, DC: U.S. Marine Corps, November 2011), p. 2.

186 Otto Kreisher, "Paxton: USMC Will Need End Strength 'North of 186,800'," *Seapower Magazine*, May 16, 2016.

187 Leed, *Amphibious Shipping Shortfalls*, p. 3.

2006 it was further lowered from 2.5 to 2.0.188 These decisions were largely based on fiscal constraints rather than assessments of the future strategic and operational environments. In addition, the 2.0 AE requirement was reached at a time when the Marine Corps was expecting the Navy to expand the MSC Maritime Prepositioning Force (MPF) by 12 ships. That enhanced MPF squadron has since been canceled, calling into question whether the Corps would have agreed to a 2.0 AE requirement knowing that greater MPF capacity would not be forthcoming.189 In summary, the need for amphibious shipping capacity may be greater than the 2.0 AE "requirement," which is not based on analyses of distributed operations and other future roles that amphibious ships may be required to carry out in addition to their primary missions.

**Increase intra-theater lift capacity.** Many of the operating concepts described in this chapter hinge on DoD's ability to sustain units that are widely dispersed across the battlefield. These logistics requirements will likely strain DoD's current intra-theater lift capacity, which is designed to support units that are aggregated in comparatively large formations close to major air and sea ports. In particular, the operation of disaggregated airbases would severely tax current fuel and munitions distribution methods and platforms. The U.S. military should increase its intra-theater lift capacity and explore new technologies that can enhance intra-theater lift. Autonomous systems are an especially promising avenue for investment and could allow DoD to procure large numbers of unmanned barges, light cargo helicopters, trucks, and other cheap lift platforms that can be operated in dangerous environments with a low risk to human personnel.

188 Work, *Thinking About Seabasing*, p. 203; and Leed, *Amphibious Shipping Shortfalls,* p. 3.

189 Leed, *Amphibious Shipping Shortfalls: Risks and Opportunities to Bridge the Gap*, p. 4.

# Conclusion

As required by Congress, DoD is developing a new National Defense Strategy that will provide a foundation for its plans, capability investments, and budget requests. The strategy will include a force planning construct that establishes priorities for organizing, training, and equipping forces to support U.S. combatant commanders now and in the future. For the most part, DoD's FPC iterations since the end of the Cold War embraced assumptions about the nature of the security environment, theater access, and other factors that reinforced status quo plans and programs. Moreover, FPC priorities driven by budget considerations and near-term operational needs failed to encourage the kind of innovations and doctrinal changes needed for our nation's military to keep pace with resurging great power competitors, as well as lesser powers that have taken advantage of proliferating advanced military technologies.

This administration has an opportunity to chart a different course by creating an FPC and associated force planning process that encourage the creation of innovative operating concepts and a mix of capabilities needed for long-term competitions and conflict with great powers. As it does so, it should consider the following recommendations:

- **Create a planning process that focuses on operating concepts and capabilities.** DoD should adopt a force planning process that first assesses the need for new operational concepts and rebalanced capability mixes, instead of continuing planning practices that create a rationale to support projected budgets.
- **Plan for long-term competitions with great powers.** DoD's planning scenarios should address long-term competitions with China and Russia that include gray zone operations and other actions in peacetime that are intended to undermine U.S. influence in their regions. These scenarios should be supported by net assessments of technology trends as part of an overall assessment of the military balance between the United States and its great power competitors. Net assessments should identify opportunities to develop operating concepts and new technologies that would create advantages for the U.S. military or exploit the weaknesses of its competitors.

- **Plan for the new warfighting strategies of China and Russia.** DoD should develop or mature overall strategies and operating concepts for major Informationized Warfare and New Generation Warfare conflict scenarios.

- **Create force postures for forward defense.** DoD should shift from maintaining forward presence in the Pacific and Europe to force postures that are better capable of deterring great power aggression and countering their A2/AD complexes. Rather than large, concentrated formations reminiscent of the forces DoD maintained overseas during the Cold War, future postures should include distributed air and naval forces, land-based long-range fires, coastal anti-ship missile batteries, and high-capacity air and missile defenses that could help harden U.S. forces against A2/AD threats. These postures should be complimented by long-range ISR and strike forces that can operate from lower threats areas located outside A2/AD threat environments.

- **Rebalance capabilities for future challenges.** DoD should rebalance its capability portfolios to prepare for great power competition and conflict. Future force alternatives that are sized and shaped for threats posed by Russia and China should then be stressed against other possible challenges, including conflicts with Iran and North Korea or operations against violent extremist organizations. Preparing for great power conflict would be a major break from DoD's post-Cold War planning priorities, which focused primarily on sizing its forces for defeating regional aggressors and, since 2001, conducting operations in Iraq, Afghanistan, and against al Qaeda globally.

- **Differentiating pacing threats.** DoD's next force planning construct should define the key pacing threats that should affect the shape and size of different elements of its forces. This differentiation could help reduce excessive overlap in capabilities and capacity across the joint force. For planning purposes, the near-term pacing threat for U.S. fixed-wing combat air forces should be conflict with China in the Western Pacific. China should also be the pacing threat for U.S. naval forces, although U.S. naval concepts and capabilities will need to address Russia's strengths in undersea and electromagnetic warfare. The near-term pacing threat for U.S. land forces should be Russia, while China should be the high-end pacing threat in the mid-term.

- **Avoid "more of the same."** Rather than continue to pursue new weapon systems that offer marginal performance improvements over existing systems, defense planners should first assess the potential for alternative operating concepts and maturing technologies to create more enduring competitive advantages for the U.S. military.

- **Sizing as well as shaping the future force.** DoD's next force planning construct should size the force to support multiple contingency operations in overlapping timeframes. This could include large-scale operations against one or more great powers, as well as lesser conflicts with rogue states and non-state actors. Rather than focus exclusively on temporary surges to major conflicts, DoD's FPC should also address force requirements for long-duration contingency operations that require force rotations.

In conclusion, rebuilding America's military will require an end to the harmful cycle of trading force structure and modernization funding to sustain readiness for current operations. This will require years of increased defense spending and stable budget projections that will allow U.S. defense planners to plan for the future instead of react to budget uncertainties. The alternative will be a force that is increasingly hollow and unable to deter aggression, respond to crises, and win America's wars.

## LIST OF ACRONYMS

| | |
|---|---|
| **A2/AD** | anti-access/area-denial |
| **ACE** | air combat element |
| **ACM** | Advanced Cruise Missile |
| **AE** | assault echelon |
| **ALCM** | Air-Launched Cruise Missile |
| **AOR** | area of responsibility |
| **ARC** | Adaptive Radar Countermeasures |
| **ARG** | amphibious readiness group") |
| **ASCM** | Anti-Ship Cruise Missile |
| **ASW** | anti-submarine warfare |
| **AWACS** | Airborne Warning and Control System |
| **BCA** | Budget Control Act |
| **BCT** | brigade combat team |
| **BLADE** | Behavioral Learning for Adaptive Electronic Warfare |
| **BMC3I** | Battle Management, Command, Control, Communications, and Intelligence |
| **BUR** | Bottom-Up Review |
| **BVR** | beyond visual range |
| **C2** | command and control |
| **C3ISR** | command, control, communications, intelligence, surveillance, and reconnaissance |
| **CAP** | combat air patrol |
| **CAS** | close air support |
| **CEC** | Cooperative Engagement Capability |
| **CG** | Guided missile cruiser |
| **COA** | Courses of Action |
| **CONOPS** | concept of operations |
| **CSBA** | Center for Strategic and Budgetary Assessments |
| **CSG** | carrier strike group |
| **CTOL** | conventional takeoff and landing |
| **CVN** | aircraft carrier |
| **CVW** | carrier air wing |
| **D2D** | deployment-to-dwell |
| **DARPA** | Defense Advanced Research Projects Agency |
| **DDG** | destroyer |
| **DoD** | Department of Defense |

## LIST OF ACRONYMS

| | |
|---|---|
| **EM** | electromagnetic |
| **EMC2** | Electromagnetic Maneuver and Control Capability |
| **EMCON** | emissions control |
| **EMS** | electromagnetic spectrum |
| **EMW** | electromagnetic warfare or Electromagnetic Maneuver Warfare |
| **EO/IR** | electro-optical/infrared |
| **EPF** | Expeditionary Fast Transport |
| **ESSM** | Evolved Sea Sparrow Missile |
| **EW** | electronic warfare |
| **FFG** | guided missile frigate |
| **FPC** | force planning construct |
| **FSR** | Force Structure Review |
| **G-I-UK** | Greenland-Iceland-United Kingdom |
| **GCE** | ground combat element |
| **GLONASS** | Russia's Global Navigation Satellite System |
| **GPS** | Global Positioning System |
| **GRF** | Global Reaction Force |
| **HALE** | high-altitude, long-endurance |
| **HPM** | high-power microwave |
| **HPRF** | high-power radiofrequency |
| **HVP** | hypervelocity projectile |
| **IADS** | integrated air defense system |
| **ICBM** | intercontinental ballistic missile |
| **IFPC Inc 2-I** | Indirect Fire Protection Capability Increment 2-Intercept |
| **INF Treaty** | Intermediate-Range Nuclear Forces Treaty |
| **IO** | information operations |
| **IR** | infrared |
| **ISB** | intermediate staging base |
| **ISR** | intelligence, surveillance, and reconnaissance |
| **JDAM** | Joint Direct Attack Munition |
| **JHSV** | Joint High Speed Vessel |
| **JLOTS** | Joint Logistics Over-The-Shore |
| **KM** | kilometers |
| **LCAC** | Landing Craft Air-Cushion |

## LIST OF ACRONYMS

| | |
|---|---|
| **LCE** | logistics combat element |
| **LCS** | Littoral Combat Ship |
| **LHA** | Landing Helicopter Assault |
| **LHA/LHD** | Amphibious Assault Ship |
| **LHD** | Landing Helicopter Dock |
| **LMSR** | Large, Medium-Speed Roll-On/Roll-Off |
| **LOC** | line of communication |
| **LPI/LPD** | low probability of intercept/low probability of detection |
| **LRSO** | Long-Range Standoff Weapon |
| **MADL** | Multifunction Advanced Datalink |
| **MAGTF** | Marine Air-Ground Task Force |
| **MANPADS** | man-portable air defense systems |
| **MCM** | mine countermeasures |
| **MDUSV** | Medium-Displacement USV |
| **MEB** | Marine expeditionary brigade |
| **MEU** | Marine expeditionary unit |
| **MOB** | Main Operating Base |
| **MPF** | Maritime Prepositioning Force |
| **MRC** | major regional contingency |
| **MSC** | Maritime Sealift Command |
| **NATO** | North Atlantic Treaty Organization |
| **NEMESIS** | Netted Emulation of Multi-Element Signatures Against Integrated Sensors |
| **NM** | nautical miles |
| **OA-X** | Observation/Attack-X |
| **OCO** | overseas contingency operations |
| **OFRP** | Optimized Fleet Response Plan |
| **OSD** | Office of the Secretary of Defense |
| **PCA** | Penetrating Counterair Aircraft |
| **PGM** | precision-guided munition |
| **Pk** | probability of kill |
| **PLA** | People's Liberation Army |
| **PLAN** | PLA Navy |
| **PLARF** | PLA Rocket Force |
| **PMAI** | Primary Mission Aircraft Inventory |

## LIST OF ACRONYMS

| | |
|---|---|
| **PNT** | positioning, navigation and timing |
| **QDR** | Quadrennial Defense Review |
| **RF** | radiofrequency |
| **RFID** | radio frequency identification |
| **RFN** | Russian Federation Navy |
| **RSOI** | reception, staging, onward movement, and integration |
| **RSTA** | reconnaissance, surveillance, and target acquisition |
| **SAG** | surface action group |
| **SAM** | surface-to-air missile |
| **SHORAD** | short-range air defense |
| **SLMM** | Submarine-Launched Mobile Mine |
| **SOF** | Special Operations Forces |
| **SOSUS** | Sound Surveillance System |
| **SSC** | smaller-scale contingency |
| **SSN** | nuclear attack submarine |
| **SSPk** | single-shot probability of kill |
| **STOVL** | short takeoff and vertical landing |
| **sUAS** | small Unmanned Aircraft System |
| **SUW** | surface warfare |
| **TEL** | transporter erector launcher |
| **TERN** | Tactically Exploitable Reconnaissance Node |
| **TOA** | total obligation authority |
| **TRAPS** | Transformational Reliable Acoustic Path Sensor |
| **TTNT** | Tactical Targeting Network Technology |
| **UAS** | unmanned aircraft system |
| **UAV** | unmanned aerial vehicle |
| **UCAS** | Unmanned Combat Air System |
| **UCAV** | unmanned combat aerial vehicle |
| **USV** | unmanned surface vehicle |
| **UUV** | unmanned undersea vehicle |
| **VBSS** | visit, board, search, and seizure |
| **VHF** | very high frequency |
| **VLS** | vertical launch system |
| **V/STOL** | vertical/short takeoff and landing |
| **WMD** | weapons of mass destruction |

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