STRATEGY FOR THE LONG HAUL

CSBA

The US Navy

Charting a Course for Tomorrow's Fleet

BY ROBERT O. WORK

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THE US NAVY:
CHARTING A COURSE FOR TOMORROW'S FLEET

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ABOUT THE **STRATEGY FOR THE LONG HAUL** SERIES

This report is one in a series comprising CSBA's Strategy for the Long Haul intended to inform and shape the next administration's defense strategy review.

THE CHALLENGES TO US NATIONAL SECURITY. Translates the principal challenges to US security into a representative set of contingencies in order to determine what resources will be required, and how they should be apportioned among forces and capabilities.

US MILITARY POWER AND CONCEPTS OF OPERATION. Provides the connective tissue between the threats to US security and the capabilities and force elements needed to address the new challenges confronting the nation.

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THE DEFENSE INDUSTRIAL BASE. Addresses the US defense industry's role as a strategic asset, and how it can best serve in that role.

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TRAINING, OPERATIONAL ART, AND STRATEGIC COMPETENCE. Assesses the need for an overhaul of training and education of America's service personnel and the importance of strategic thinking in senior leaders.

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GROUND FORCES. Explores how the US Army and Marine Corps might best be organized, structured, modernized, and postured to meet existing and emerging challenges to US security.

SPECIAL OPERATIONS FORCES. Addresses the expansion and growing role of US Special Operations Forces.

MARITIME FORCES. Addresses how US maritime forces might best be organized, structured, modernized, and postured to meet existing and emerging challenges to US Security.

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STRATEGIC FORCES. Examines the circumstances under which nuclear strategy and force posture decisions must be made today.

MODERNIZATION STRATEGIES. Explores potential modernization strategies that can best support the US defense posture in an era of great geopolitical uncertainty and rapid technological change.

ORGANIZING FOR NATIONAL SECURITY. Assesses how the United States Government can best organize itself to ensure effective strategic planning and execution of strategy.

A GRAND STRATEGY FOR THE UNITED STATES. Synthesizes the findings and insights of the study series.

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PREFACE

CHALLENGES TO US NATIONAL SECURITY

The United States faces three primary existing and emerging strategic challenges that are most likely to preoccupy senior decision-makers in the coming years:[1]

> Defeating both the Sunni Salifi-Takfiri and Shia Khomeinist brands of violent Islamist radicalism;

> Hedging against the rise of a hostile or more openly confrontational China and the potential challenge posed by authoritarian capitalist states; and

> Preparing for a world in which there are more nuclear-armed regional powers.

Addressing these specific challenges should be at the forefront of the incoming administration's strategic calculations, particularly during the 2009 Quadrennial Defense Review (QDR), which will help shape US defense strategy, planning, and force structure over the next twenty years.

Although none of these strategic challenges, individually, rivals the danger posed by the Soviet Union during the Cold War, they are certainly graver than the types of threats that prevailed immediately after the Cold War, during the period referred to by some as the "unipolar moment," when the power of the United States was at its peak and its dominance had not yet been put to the test. They are also quite different from the threats the United States confronted throughout the twentieth century (Imperial Germany, Nazi Germany, Imperial Japan, and the Soviet Union), all of which possessed militaries that, by and large, were very similar to the US military both in terms

[1] For an overview of these strategic challenges, see Andrew Krepinevich, Robert Martinage, and Robert Work, *The Challenges to US National Security*, the first monograph of the Center for Strategic and Budgetary Assessments' series that presents a "Strategy for the Long Haul."

of their structure and their modi operandi. For example, both the German and Soviet armies focused primarily on conducting combined arms mechanized land operations, as did the US Army. That is not the case with respect to today's threats and potential rivals, who instead focus their principal efforts on exploiting asymmetries to gain an advantage.

Radical Islamist movements, for example, use terror and subversion, engage in modern forms of irregular and insurgency warfare, and pursue weapons of mass destruction (WMD) to inflict catastrophic damage on the United States and its allies. China, who, of the three challenges, presents the military forces most similar to the US military, is emphasizing conventionally armed ballistic missiles, information warfare capabilities, anti-satellite weaponry, submarines, high-speed cruise missiles and other capabilities that could threaten the United States' access to the "global commons" of space, cyberspace, the air, the seas and the undersea, and possibly to US ally and partner nations in Japan, South Korea and Taiwan. Hostile and potentially unstable countries like North Korea and Iran have developed or may soon develop nuclear arsenals with which they could intimidate America's allies and challenge the US military's ability to protect vital national interests. Moreover, if these countries succeed in developing nuclear arsenals, they could spur others to follow suit.

THE KEY ROLE OF MILITARY POWER

Military power is central to the United States' ability to meet these strategic challenges successfully, whether in support of diplomatic and other elements of US security policy, or used in actual conflict. It follows, therefore, that the military means must be compatible and commensurate with the nation's security ends.

Given the long expected service life of most of its major assets, the US military force structure, which underlies the concepts of operation that drive the US "way of war," is still based primarily on the premises and experience of the Cold War and its immediate aftermath. Arguably, much of the current Program of Record (the forces the Department of Defense seeks to acquire in coming years) remains similarly reflective of that period. Yet the looming strategic challenges look to be significantly different. Thus there is a danger that many of the forces that the Defense Department plans to acquire may prove to be unsuitable for dealing with future threats.

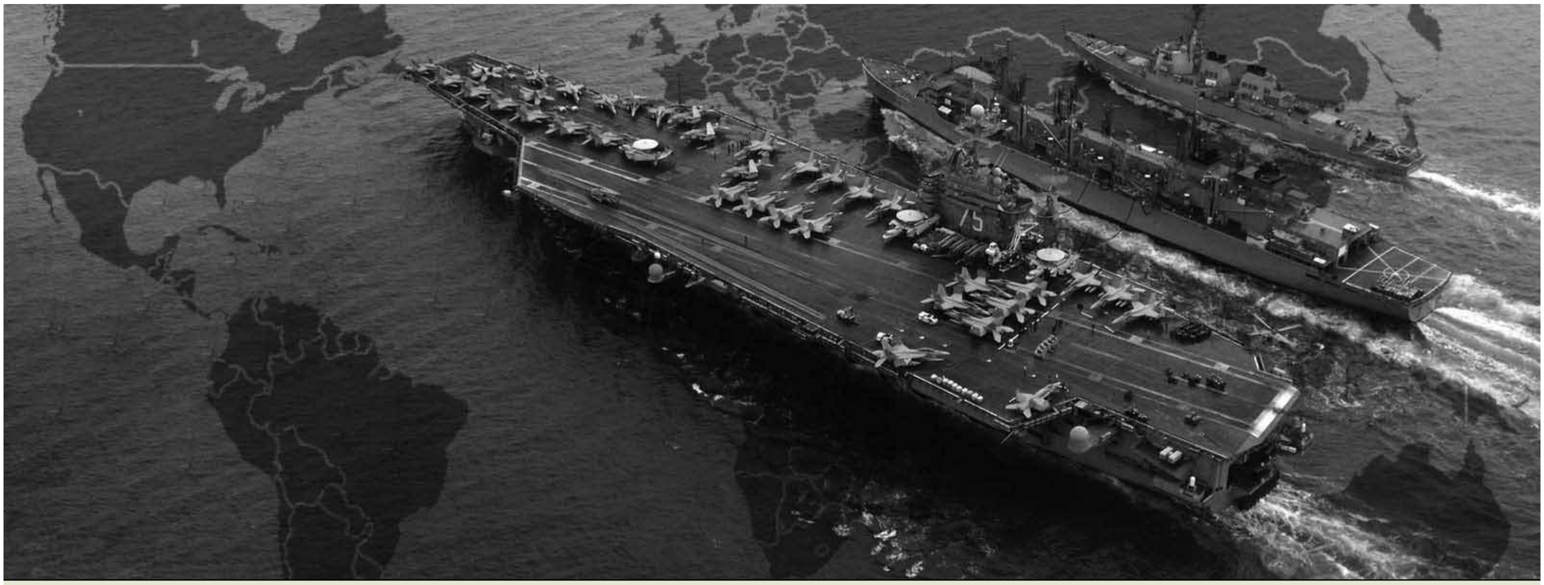
This monograph, and several others in the series comprising the *Strategy for the Long Haul* project, examines the readiness of the four Services, the Special Operations Forces, and the strategic forces to do their parts in meeting the emerging security challenges. Each monograph:

> Describes the current state of a Service or force;

> Discusses what that Service or force must be able to do to help meet the emerging strategic challenges successfully; and

- Assesses problematic areas and issues in the Service's or force's Program of Record and recommends measures to address them.

While these monographs address particular Services or forces, it must be kept in mind that the US military fights as a *joint force*. Accordingly, each Service or force must ensure that the forces it acquires and the operational concepts it employs are interoperable with those of the others, and, equally important, that there is not a major mismatch between the support one Service assumes that it can expect from another, and what is actually the case. These concerns have historically been problematic for the US military, and thus merit particularly close attention.



EXECUTIVE SUMMARY

This paper assesses the adequacy and affordability of current US Navy plans in light of current trends in naval warfare, expected future budget environments, and, most importantly, the likely operational demands associated with three enduring, long-term strategic challenges. These challenges are: defeating both the Sunni Salifi-Takfiri and Shia Khomeinist brands of violent Islamist radicalism; hedging against potential challenges posed by authoritarian capitalist states such as China and Russia; and preparing for a world in which there are more nuclear-armed regional powers. After conducting this assessment, the report lays out recommended changes to the current Navy plans in order to envision a future fleet that is both more capable and more affordable.

These recommended changes are shaped by the observation that the US Navy finds itself alone at the top of the global naval hierarchy with a comfortable margin of superiority. Given that the size of the Navy's battle force stands at 280 ships — less than half the size of the ultimate Cold War fleet — this may be surprising to some. However, while the US battle force is smaller than it has been in over seven decades, so too are the rest of the world's navies. Furthermore, the Navy is transitioning from a fleet of ships to what officials describe as *FORCEnet*: a system of collaborative battle networks that would share data from across the force to form common operational pictures and use internet protocol-based systems to enable interactive combat planning, targeting, and execution. This transition means that the Navy is now defined less by the numbers of ships in its Total Ship Battle Force, and more by the *combined capabilities* found in its Total Force Battle Network (TFBN). Moreover, the Navy's TFBN is itself part of both a larger National Fleet, defined by the combined capabilities of the US Navy, US Marine Corps, US Coast Guard, and Military Sealift Command, as well as a larger Joint Total Force Battle Network. Once the additional support drawn from these two entities is factored in, the US Navy's 280-ship fleet likely enjoys no less than a *thirteen-navy standard* in aggregate fleet combat power.

However, since 1990, comparing the US Navy against foreign navies is no longer an adequate way to judge US naval power. Instead, the Navy, along with the entire joint force, must prepare to fight two regional adversaries in overlapping timelines. Under this new *two-war standard*, in addition to conducting traditional naval fire and maneuver, the evolving TFBN would need to complete many additional tasks, such as: screening the arrival of joint forces, supporting joint operations ashore with air and missile attacks, and defending the joint force and allies from the same. In addition to preparing for two overlapping wars, the Navy also sizes its forces so that they can maintain persistent forward presence during peacetime. More than a decade's worth of Navy analysis suggests that a two-war-plus-presence TFBN standard requires between 300 and 346 active ships, with a current objective target of 313. This means that the current 280-ship active fleet is now just 33 ships short of the Navy's stated requirement.

CURRENT NAVY PLANS

The Navy plans to meet this 313-ship TFBN goal with an aggressive thirty-year shipbuilding and force modernization plan. However, these plans suffer from two deficiencies. First, the resulting fleet lacks certain capabilities required to meet the operational demands of the three aforementioned strategic challenges. Specifically, it lacks the range to face increasingly lethal, land-based, maritime reconnaissance-strike complexes, or nuclear-armed regional adversaries. Moreover, it does not adequately take into account the changing nature of undersea warfare, or the potential prospect of a major maritime competition with China.

Second, even if the Navy's desired TFBN could match up perfectly against future operational requirements, the signs are that the Navy's plans are far too ambitious given likely future resource allocations. Between FY 2003 and FY 2008, the Navy spent an average of $11.1 billion a year for new-ship construction (in constant FY 2009 dollars). In comparison, the average annual cost for new-ship construction projected by the Navy and Congressional Budget Office (CBO) is $20.4 and $22.4 billion, respectively. Moreover, these costs do *not* include the substantial resources necessary to build the twelve replacements for the current strategic ballistic missile submarine force. It seems clear, then, that the Navy needs to scale back its current plans; they are simply too ambitious for expected future budgets.

AN ALTERNATE PLAN

Based on the analysis of future tasks and missions for the TFBN, as well as expected future budgets, this paper makes several recommended changes to the Navy's current plans. These recommendations are shaped by the following assessments:

> The United States need not worry about losing global maritime superiority any time soon. Even with "only" 280 warships, the Navy's current Total Force Battle Network it still the most powerful naval force in the world by a wide margin. When considering the combined capabilities of the 583-ship National Fleet, as well as the support the Navy's TFBN receives from the broader Joint Total Force Battle Network, the margin of US naval superiority is even wider.

> The future TFBN should continue to be a two war-plus force, but with a more specific orientation. It must first be large and capable enough to support overlapping joint fights against a large, continental-sized adversary with advanced maritime recon-strike and undersea combat networks, and a mid-sized, nuclear-armed, regional adversary. The future TFBN should also be able to support operations against radical Islamist terrorists and the evolving Joint Global Counterterrorist/Counterproliferation Network, as well as maintain persistent forward presence requirements for both combat-credible forces and proactive maritime security and partnership-building operations.

> Meeting the foregoing warfighting requirements is less about increasing ship numbers, and more about getting the right mix of TFBN capabilities and capacities. Moreover, while creating favorable security conditions and supporting the Joint Global Counterterrorist/Counterproliferation Network may require new thinking about naval forward presence, it will not require a major expansion of ships. The idea is to build partnership maritime capacity in the world's littorals, not to flood the world's littorals with US ships.

> To support persistent global maritime security operations as well as the Joint Global Counterterrorist/Counterproliferation Network, the Navy will need to establish a minimum of seven Global Fleet Stations in the following regions: Caribbean and East Coast of South America, West Coast of Africa, East Coast of Africa, Southwest/South Asia, Southeast Asia, East Asia, and Western Pacific/Oceania.

> Fighting against advanced multidimensional maritime recon-strike networks and against regional nuclear-armed adversaries will require the future aircraft carrier and surface combatant fleets to operate and fight from greater ranges than they do today.

> Future multidimensional maritime recon-strike networks will likely include increasingly sophisticated undersea combat networks. As a result, the tactical submarine fleet must develop a whole new generation of undersea weapons and capabilities including smaller multipurpose submarines (both manned and unmanned), vehicles and weapons.

> Seabasing is *not* about replacing land bases. In the context of a two-war standard, seabasing is about exploiting command of the seas to enable the rapid transoceanic expeditionary maneuver of *ready-to-fight* combat units and the rapid movement

of personnel, goods, and services, thereby providing an interdependent joint force with a high degree of global freedom of action and *initial* operational independence from forward land bases.

> The idea of an integrated and interoperable National Fleet—incorporating the combined capabilities of the Navy, Marine Corps, Coast Guard, Military Sealift Command, and the strategic sealift fleet—is a powerful one that should be realized to the greatest possible degree.

> As a result of its great margin of maritime superiority, the United States can patiently and carefully assess the direction of the long-term global naval competition before making any dramatic changes to its force structure or organization. In the meantime, to strengthen its long-term competitiveness, the US Navy must invest in robust research and development while sustaining the country's naval design and industrial base. It must also work to reduce both costs for individual ships and projected expenditures for building and sustaining the fleet.

> The four best ways to reduce shipbuilding costs and conserve resources are: exploit ship and aircraft designs now in production to the fullest extent possible in order to benefit from learning curve efficiencies; reduce the total number of different ship types to accrue savings in training, maintenance, and logistics; reduce crew sizes, which are the largest driver of a ship's life-cycle costs; and aggressively pursue improved networking capabilities.

> Given expected future defense budgets, the levels of resources needed to support the Navy's current plan are unrealistic. A more plausible total yearly shipbuilding target might be in the vicinity of $20 billion—a 25 percent reduction over the Navy's plan. Given the uncertainty over future defense budgets, assuming the Navy will receive even $20 billion a year for shipbuilding may be too optimistic.

Based on these assessments, the Navy should consider making the following changes to their current plans. Unless indicated, all costs are expressed in FY 2009 constant dollars.

Strategic Deterrent Fleet

After completing the ongoing mid-life refueling cycle for the first twelve of fourteen Ohio-class SSBNs, immediately reduce the strategic deterrent fleet to its final TFBN target of twelve boats. Commence work on the SSBN(X) design immediately.

Large Undersea Combat Systems

> Begin a concerted research and development program for small manned undersea vehicles, autonomous underwater vehicles and other unmanned underwater systems, as well as a new generation of littoral ASW weapons.

> Increase the build rate for Virginia-class SSNs to two per year no later than FY 2011, while continuing to upgrade the class in successive flights.

> Convert the last two Ohio-class SSBNs to SSGNs at their regularly scheduled mid-life overhauls.

> Develop new types of smaller, manned multipurpose, underwater vehicles designed for parasite operations from both SSGNs and SSNs.

Large Tactical Aviation Seabases

> Slow the production rate of nuclear-powered carriers (CVNs) from one every four years to one every five years.

> Consider accelerating both the current unmanned combat air system (UCAS) demonstration program and the planned operational debut of the Navy's UCAS.

Large Battle Network Combatants

> Halt production of the DDG-1000 after three ships, restart the Arleigh Burke-class DDG production line in FY 2010, and delay the start of the CG(X), now planned for FY 2011, until at least FY 2015.

> Commence and complete the planned mid-life modernizations for fifteen of the twenty-two Ticonderoga-class cruisers, and all sixty-two of the authorized Arleigh Burke-class destroyers. Retire the first seven Ticonderoga-class cruisers early.

> Immediately begin designing a new modular large battle network combatant (LBNC) which would have a conventionally-powered, integrated electric propulsion and power system similar to the system designed for the DDG-1000, but with more advanced electric motors.

Small Battle Network Combatants

Ramp up production to a maximum of four new Littoral Combat Ships (LCSs) per year and sustain that rate even after reaching the 55-ship TFBN target.

Naval Special Warfare/Naval Expeditionary Combat Command Ships and Craft

> Build six Joint Multi-Mission Submersibles as rapidly as possible. Develop an even smaller manned multipurpose underwater vehicle (MMUV), designed to fit vertically inside an SSGN or SSN payload tube.

- Stand up a dedicated special warfare helicopter squadron with MH-60S helicopters, modified as necessary to support the clandestine, low-level insertion of SEAL Teams and other special operations personnel.
- For each of the seven aforementioned Global Fleet Stations, build/convert and assign one station command ship (a retired amphibious landing ship manned and crewed by the Military Sealift Command); a Naval Reserve Force Maritime Security Frigate (based on the *Legend*-class National Security Cutter); one Joint High Speed Vessel; one riverine squadron of thirteen boats; and four Coastal Patrol Ships.

Naval Maneuver and Maneuver Support (Prepositioning) Ships

- Size the TFBN naval maneuver and maneuver support fleet to support a naval maneuver operation with two Marine Expeditionary Brigades (MEBs), reinforced by three additional brigades delivered by a combination of maritime prepositioning force (MPF) ships (vehicles and supplies) and airlift (personnel).
- Cancel the Future MPF squadron as now configured. Build only three Mobile Landing Platforms, and assign one to each legacy MPF squadron.
- Build "escort carriers" (CVEs) designed to carry Marine Corps F-35B short takeoff and vertical landing aircraft.
- Build an eleventh LPD-17 in FY 2010, and then build eleven LSD replacements based on the LPD-17 hull at a rate of one per year between FY 2011 and FY 2021.
- Take the seven Whidbey Island and Harpers Ferry-class LSDs in best condition, transfer them to the Military Sealift Command, give them a modest mid-life upgrade, and use them as the command ships for the aforementioned Global Fleet Stations. Retire the remaining five ships.

Joint Sealift Ships

Replace the eight Fast Sealift Ships now in service with a new class of High Speed Shallow Draft ships.

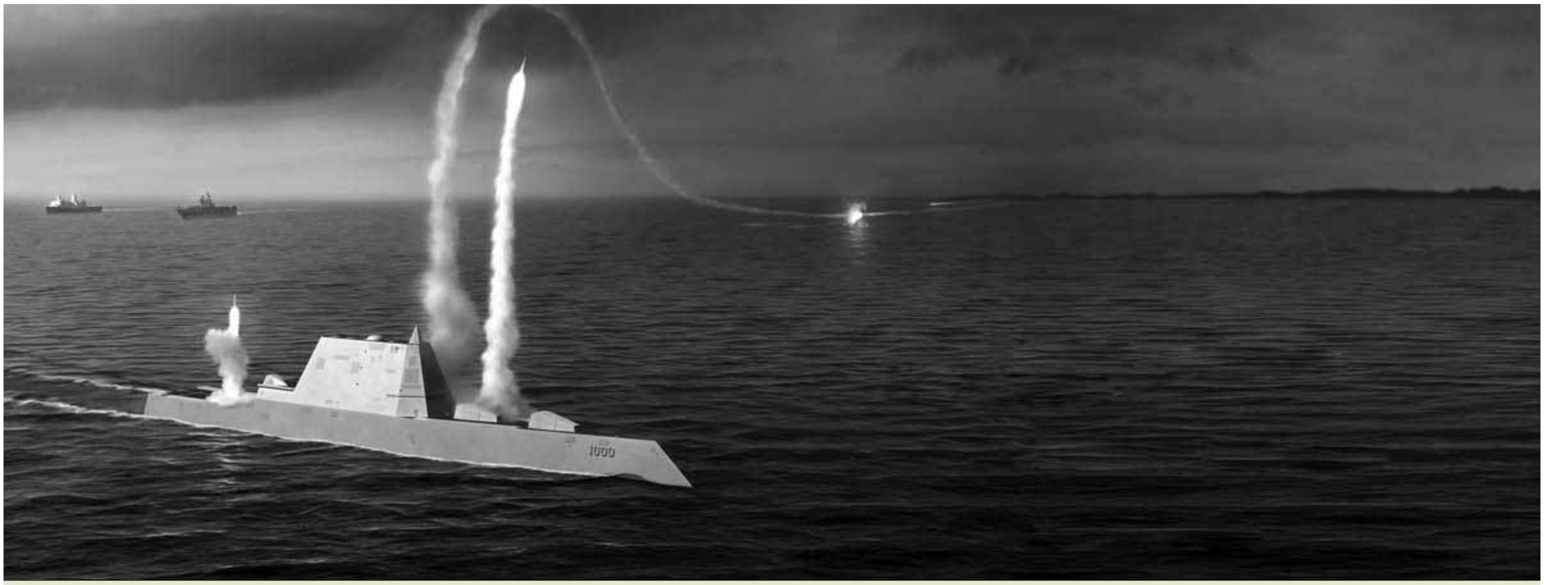
Combat Logistics Force and Support Ships

The Navy should transfer the twelfth T-AKE ship from the now-defunct MPF(F) to the Combat Logistics Force (CLF) while also consolidating future CLF shipbuilding on this hull form. The Navy should begin to replace its oilers from FY 2011 until FY 2025 at the rate of one per year with a hull based on the T-AKE. In FY 2027, the Navy would then shift over to a new T-AOE(X) station ship, based on the T-AKE hull, at an average rate of one per year. By the mid-2030s, the CLF fleet would thus consist of 31 ships, all based on a common hull, providing a significant savings in training and maintenance costs. The Navy should also purchase an additional five JHSVs for general fleet support.

A LARGER, MORE CAPABLE, AND MORE AFFORDABLE TFBN

Compared to today's fleet, the 2028 TFBN would be more capable across the full naval warfighting spectrum. At the lower end of the spectrum, the TFBN would have substantially more capacity for day-to-day engagement with smaller navies and for counterterrorism and maritime security missions. At the higher end, the TFBN's undersea combat fleet would be more capable of taking on undersea combat networks, and its surface fleet would be far more able to fight from range against maritime A2/AD networks and nuclear-armed regional powers. Meanwhile, the TFBN would be in the midst of a fleet-wide transition and consolidation of ship types, with significant payoffs for training, maintenance, and logistics. These ships would also have a high degree of interoperability and mission flexibility that would result in a TFBN that is more adaptable and versatile.

Over the next thirty years, this plan would see the new construction of 328 major warships and submarines, not counting any ships built or leased for the sealift fleet. Using the more conservative Congressional Budget Office estimates as a basis for comparison, the average yearly total shipbuilding costs for this plan would be $21.8 billion, including $19.9 billion in new-ship construction. These figures include the costs for the SSBN(X), as well as those for small boats, craft, and manned underwater vehicles. Nevertheless, the plan would still call for a significant increase in shipbuilding resources—about 74 percent more than the $12.6 billion per year spent on shipbuilding between FY 2003 and FY 2008.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INTRODUCTION

In July 2008, the US Navy made a very public course correction to its plans for future large surface combatants. It requested a reduction in the procurement of the advanced, stealthy Zumwalt-class (DDG-1000) guided-missile destroyers, from seven down to two. Although once seen as central to the Navy's future plans, rising costs and fleet-wide deficiencies in ballistic missile defense and open-ocean antisubmarine warfare (two missions that the Navy sees as increasingly important in the future) convinced the Navy to halt the program in favor of restarting production of the prior generation Arleigh Burke-class (DDG-51) destroyers. Congress has since pushed back against this request and encouraged the Navy to build one more DDG-1000 for the purpose of maintaining the maritime industrial base. Despite this compromise, the matter is likely far from settled. The debate over this issue exposed the shaky strategic rationale behind the DDG-1000 program, as well as the fiscal stresses on the Navy's overall shipbuilding plans. The Navy, and indeed the nation, are fortunate that this happens at a time when US naval power is essentially unchallenged, because the resultant losses are only financial. In a future security environment characterized by more intense naval competition, the United States might not be afforded such a large margin for error.

In order to ensure that future Navy shipbuilding initiatives do not suffer the same fate as the DDG-1000, this paper will assess the adequacy and affordability of current US Navy plans in light of current trends in naval warfare, expected future budget environments, and, most importantly, the likely operational demands associated with three enduring, long-term strategic challenges. These challenges are: defeating both the Sunni Salifi-Takfiri and Shia Khomeinist brands of violent Islamist radicalism; hedging against potential challenges posed by authoritarian capitalist states such as China and Russia; and preparing for a world in which there are more nuclear-armed regional powers.

This monograph is organized into three chapters. Chapter 1 is divided into two sections. The first compares today's 280-ship Navy to those of other nations, while analyzing the capabilities that make this relatively small fleet much more powerful than its numbers suggest. It also explains how the Navy's tasks have grown beyond combating other navies for control of the seas, and now focus more on maintaining persistent forward naval presence and supporting joint operations in two overlapping conflicts. According to the Navy's internal analysis, these tasks call for a fleet of some 313 ships and supporting capabilities.

The second section of Chapter 1 describes the Navy's current plans to grow the fleet to the new 313-ship target. This description includes production rates, schedules and costs, as well as an analysis of added capabilities and capacities. This chapter also discusses other key Navy components and systems (such as the Naval Special Warfare Command, Naval Expeditionary Combat Command, and the new P-8A Poseidon multi-mission manned aircraft) that contribute to achieving the Navy's missions.

Chapter 2 then assesses the Navy's plans by asking and answering two fundamental questions. First, given the Navy's new maritime strategic concept and the expected future national security environment, what tasks must the future Navy be able to perform? Second, are Navy plans consistent with expected future budgets? Only by answering these two questions can policymakers assess the adequacy of Navy plans and judge the size and the makeup of the Navy's future fleet.

Based on the derived answers to these two important questions, Chapter 3 offers specific recommended changes to the Navy's plans, and the rationale behind them. Although these recommendations are detailed, they are meant to be illustrative, not prescriptive. However, they would result in a more affordable TFBN that is better able to meet the tasks outlined in the Chapter 3.


YTB 812..........12/01/1971..........ACTIVE, IN SERVICE
LABAMA..........
SSN 753..........
SSN 706..........05/21/1983..........
ACTIVE, IN COMMISSION

CHAPTER 1 > **STATE OF THE FLEET**

WORRYING ABOUT SHIP COUNTS

On September 30, 1987, the US Navy's Total Ship Battle Force (TSBF), the official count of the number of vessels in the Navy's active fleet, stood at 594 ships.[2] This was as close as the Navy would get to the 600 ships deemed necessary to defeat the Soviet Navy by President Ronald Reagan and his pugnacious Secretary of the Navy, John Lehman. However, many naval proponents both inside and outside the Department of the Navy still consider the "600-ship Navy" to be the standard by which all contemporary fleets are judged.

On August 1, 2008, the TSBF numbered 280 ships of all types (see Figure One).[3] Predictably, naval advocates fretted that the smaller fleet posed a great risk to US national security. For example, Seth Cropsey, a Deputy Undersecretary of the Navy in the Reagan and George H. W. Bush administrations, cautioned that, "Without intending it, US policy is verging toward unilateral naval disarmament."[4] He went on to say:

> The Navy's focus is [unclear]. Its [280] combat ships — a number that House Armed Services Committee Chairman Ike Skelton called "shocking" — comprise a force that is less than half the size achieved during the Reagan years . . . The last time the US possessed so small a fleet was sometime between December 1916 and April 1917, on the eve of the nation's entry into World War I.

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[2] "US Navy Active Ship Force Levels, 1886–present" available online at http://www.history.navy.mil/branches/org9-4.htm#1945, accessed June 21, 2006.

[3] Numbers taken from Naval Vessel Register, available online at http://www.nvr.navy.mil/nvrships/FLEET.HTM, accessed on July 6, 2008.

[4] Seth Cropsey, "Peril at Sea," *Armed Forces Journal*, August 2007, p. 32.

While technically true, these dire comments are misleading. Of the many ways to gauge US naval power, comparing the size of the current US battle force to that of past US fleets is the least useful. Past TSBFs are reflections of different strategic environments, federal budgets, national grand strategies, and stages of technological development. They also reflect the state of the contemporary global naval competition. In 1916, although the TSBF numbered only 245 ships of all types, the 36 battleships of the Navy's battle line placed it second among world navies behind the British Royal Navy. Despite having "only" 245 ships, it could safely assume it would never have to fight the Royal Navy, and be relatively confident that it could fight and defeat any other navy in the world. During the 1980s, even as it grew to a post-Vietnam high of nearly 600 vessels, the Navy was fighting off a concerted effort by the Soviet Navy to knock it out of the top spot.[5] In other words, whether today's TSBF is as big as the US fleets in 1916 or 1987 is utterly irrelevant.

Far more important is the answer to the following question: how does the US Navy stack up against its potential contemporary competitors? And the answer to this question paints a very different picture than comparing today's TSBF with that of past US fleets.

SECOND TO NONE

The first true indicator of US naval dominance comes from comparing the size of the US battle force with other world navies. What alarmists over fleet size fail to mention is that although the US TSBF is the smallest it has been in over ninety years, so too

[5] "US Navy Active Ship Force Levels, 1886–present."

FIGURE 1. **TOTAL SHIP BATTLE FORCE ON AUGUST 1, 2008**

Aircraft Carriers (CVNs, CVs)	11
Nuclear-powered Ballistic Missile Submarines (SSBNs)	14
Nuclear-powered Cruise Missile/SOF Transport Submarines (SSGNs)	4
Nuclear-powered Attack Submarines (SSNs)	52
Guided Missile Cruisers (CGs)	22
Guided Missile Destroyers (DDGs)	53
Frigates (FFs)	30
Mine Warfare Ships (MCMs)	14
Amphibious Assault Ships (LHAs/LHDs)	10
Amphibious Landing Ships (LPDs/LSDs)	21
Combat Logistics Force Ships (T-AE, T-AFS, T-AKE, T-AO, T-AOE)	32
Support Vessels	17
Total Ship Battle Force	280

are the rest of the world's navies.[6] At the height of its naval dominance, Great Britain strove to achieve at least a "two-navy standard." That is, the Royal Navy aimed to maintain a fleet and battle line that was as large as the combined fleets of the two closest naval powers. Today, counting those ships that can perform naval fire and maneuver in distant theaters—aviation platforms of all types, tactical submarines (nuclear and diesel-electric attack boats and conventional guided-missile submarines), and surface combatants and amphibious ships with full load displacements greater than 2,000 tons[7]—the next two largest contemporary navies belong to Russia and the People's Republic of China (PRC). Together, they operate a total of 215 warships of all types. The US Navy alone operates 203 such warships, very close to, but not quite, a two-navy standard.[8]

Today, counting those ships that can perform naval fire and maneuver in distant theaters, the next two largest contemporary navies belong to Russia and the People's Republic of China (PRC).

However, when factoring in a second important indicator of naval power—aggregate fleet displacement (tonnage)—the US Navy enjoys considerably more than a two-navy standard. As naval analyst Geoffrey Till explains, "[t]here is a rough correlation between the ambitions of a navy and the size and individual fighting capacity of its main units, provided they are properly maintained and manned."[9] Therefore, full load displacements and aggregate fleet warship displacements are the best proxies available to measure a ship's and a fleet's *overall combat capability,* respectively. Accordingly, both are useful measures for sizing up the contemporary global hierarchy of naval competitors.[10]

When considering aggregate fleet displacements, the US Navy's overwhelming advantage in combat capability is readily apparent. Besides the United States, there are only twenty navies in the world that operate fleets with aggregate displacements of 50,000 tons or more. In order of fleet displacement (largest to smallest), these navies are operated by: Russia, the PRC, Japan, the United Kingdom, France, India, Taiwan, Italy, Indonesia, Spain, South Korea, Brazil, Turkey, Australia, Greece, Canada, Germany, the Netherlands, Peru, and Singapore. Together, these twenty

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6 See for example, A.D. Baker III, "World Navies Are in Decline," *Proceedings*, March 2004, pp. 32–49.

7 A cut-off for surface ships at 2,000 tons removes small coastal navies from the following discussion, some of which are quite capable. For example, although the Israeli Navy operates no surface warship with a full load displacement greater than 1,275 tons, it is the dominant navy in its local region. Moreover, even small patrol boats with guided missiles give coastal navies the means to protect their contiguous seas. However, these ships generally cannot project meaningful naval power beyond their local waters or theaters, and are excluded from the following analysis.

8 The remaining 77 ships in the US TSBF number include 14 ballistic missile submarines (SSBNs), 14 mine warfare ships, 32 combat logistics force ships (oilers, ammunition ships, etc.), and 17 support ships (e.g., command ships, submarine tenders, etc.).

9 Geoffrey Till, "Can Small Navies Stay Afloat?" *Jane's Navy International*, May 1, 2003.

10 In the following analysis, tonnages for surface ships reflect their full load displacement—that is, the displacement of the ship once fully fueled and armed, and in combat condition. Tonnages for submarines reflect their submerged displacement, ready for combat patrol. Displacement for US ships and submarines are taken from the Naval Fleet Registry. Displacement for foreign ships and submarines are drawn from country entries in Commodore Stephen Saunders, RN, ed., *Jane's Fighting Ships 2007–2008* (Surrey, UK: Jane's Information Group, 2007).

navies operate a total of 719 ships with a combined displacement of 3,632,270 tons.[11] In comparison, the combined displacement of the US Navy's 203 fighting warships totals 3,121,014 tons — which exceeds the total tonnage of warships operated by the next thirteen navies combined. In other words, in terms of overall fleet combat capability, the US Navy enjoys a *thirteen-navy* standard.

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However, it is important to note that of the twenty countries discussed above, eighteen are formal US allies (Australia, Canada, France, Germany, Greece, Italy, Japan, the Netherlands, South Korea, Spain, Turkey, and the United Kingdom), governments friendly to the United States, (Peru, Brazil, Indonesia, and Singapore), or emerging strategic partners (India). Moreover, all of these nations are either full or partial democracies. The likelihood of the United States ever finding itself in a war or naval confrontation with any of these countries is extremely remote. Indeed, if anything, during times of crisis the US Navy can normally count on receiving important naval contributions from some or all of these nations. At the turn of the twentieth century, the officers of the British Royal Navy concluded that they would never again fight the US Navy, and could remove its rapidly expanding fleet from calculations over the minimal two-navy standard. Similarly, eight years after the turn of the twenty-first century, the US can confidently exclude these eighteen navies from its naval force planning calculations. This is the implicit message of the Navy's recently published *Cooperative Strategy for 21st Century Seapower,* which seeks to foster and sustain cooperative maritime relationships with more international partners.[12]

What this means is that the United States currently faces only two plausible naval competitors — Russia and China. The aggregate displacement of the combined fleets of these two countries amounts to 1,186,715 tons. With a war fleet of 3,121,014 tons, the US Navy enjoys a 2.63-to-one advantage in fleet displacement — and fleet capabilities — over the combined Russian-Chinese fleet. However, these figures assume that every Russian and Chinese ship is well maintained — a questionable assumption. For example, a recent review of the Russian Navy reveals that thirteen Russian ships, amounting to some 113,922 tons of shipping, are inoperable due to poor maintenance.[13] Despite some recent embarrassing maintenance inspections on US Navy ships,[14] in any comparison with these two potential naval adversaries, it seems likely that the US Navy enjoys an even wider advantage

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11 Of these twenty navies, eight operate war fleets of less than 100,000 tons aggregate displacement. A single US Nimitz-class nuclear-powered aircraft carrier has a displacement greater than 100,000 tons.

12 Admiral Gary Roughead, US Navy, General James T. Conway, US Marine Corps, and Admiral Thad W. Allen, US Coast Guard, *A Cooperative Strategy for 21st Century Seapower*, October 2007, available online at http://www.navy.mil/maritime/MaritimeStrategy.pdf, accessed online on June 20, 2008. p. 11.

13 See "State of the Russian Navy," available online at http://warfare.ru/?lang=&catid=243&linkid=1720, and Mikhail Barabanov, "A Survey of Russian Naval Forces: The Surface Fleet in Decline," available online at http://mdb.cast.ru/mdb/2-2004/rat/sfd/. Both accessed on July 31, 2008.

14 See Christopher P. Cavas, "2 USN Warships 'Unfit for Combat,'" *Defense News*, April 21, 2008, p. 1.

in terms of both immediately available combat-ready warships and overall combat capabilities than a simple comparison of fleet displacements suggests. When factoring in the 2,445,555 tons of warships operated by US friends and allies, the US naval advantage over its potential naval competitors only widens.

BASIS FOR US NAVAL SUPERIORITY

While aggregate fleet displacement is a good proxy for a navy's overall combat power, a quick review of the four components that make up a balanced fighting fleet gives an even clearer picture of the enormous advantage the United States enjoys in terms of overall naval capabilities and capacities.

When factoring in the 2,445,555 tons of warships operated by US friends and allies, the US naval advantage over its potential naval competitors only widens.

> The United States has an overwhelming lead in sea-based tactical aviation. It operates eleven aircraft carriers capable of launching and recovering large tactical jets (CVs and CVNs) and ten additional ships (CVVs) which can operate both short take-off and vertical landing jets and rotary-wing aircraft, for a total of twenty-one sea-based tactical aviation platforms.[15] Together, nine of the twenty next largest navies operate a total of sixteen such platforms: three carriers, eight CVVs, and an additional five helicopter carriers. The British and French navies both have a total of four aviation ships, and the Italians two. The remaining six navies operate one each. The US Navy thus has a *nine-navy standard* in these types of ships. Moreover, because US aviation platforms are much bigger than comparative foreign platforms, they can carry larger and more capable air wings. Together, the twenty-one US sea-based aviation platforms can support approximately 620 jets and over 360 rotary-wing aircraft—approximately 900 aircraft more than any other single navy, and over twice as many than those carried on all sixteen foreign sea-based tactical aviation platforms.

> The US TSBF includes 105 surface combatants. The next two largest surface fleets are operated by the PRC and Japan, with 98 total ships (49 ships apiece)—giving the US Navy a comfortable *two-navy* standard in this category of ships. However, these numbers are once again deceiving. The bulk of US surface combatant combat power comes from its 75 large, multi-mission cruisers and destroyers. Like US aircraft carriers, these warships are much larger than comparable foreign ships of the same class. In addition, all 75 are equipped with the below deck vertical launch (missile) system (VLS), which is much more space-efficient than legacy missile

[15] The term CVV is borrowed from *Jane's Fighting Ships* to denote all sea-based aviation platforms that are specially designed to operate both STOVL jet aircraft and rotary-wing aircraft like helicopters and tilt-rotors. In the US Navy, such ships are referred to as big-deck amphibious assault ships (LHDs and LHAs). This report recognizes three general types of aviation ships: aircraft carriers (CVNs and CVs), CVVs, and helicopter carriers (LPHs). Helicopter-carrying destroyers (DDHs) are considered surface combatants, although the new Japanese Hyuga-class DDH, with a full load displacement of 18,000 tons, has the inherent capability to operate as a CVV.

launch systems with above-deck launchers serviced by below-deck rotary magazines.[16] Consequently, the aggregate missile magazine capacity of these 75 US ships is 7,804 battle force missiles, for an average magazine capacity of 104 missiles per ship.[17] In contrast, the 367 surface combatants operated by the twenty next largest foreign navies carry only 65 more total battle force missiles (7,869), for an average war load of only 21 missiles per ship. In other words, the US surface combatant fleet currently enjoys a twenty-navy firepower standard. When adding in the awesome strike power of US carrier air wings, the overall US fleet firepower advantage only widens.

> The US Navy's tactical submarine fleet consists of 56 large nuclear-powered attack (SSNs) and cruise-missile carrying submarines (SSGNs).[18] The twenty next largest foreign navies operate a total of 222 tactical submarines, 45 of them nuclear-powered. In addition to being more heavily armed than most foreign boats,[19] US submarines generally have superior quieting and combat systems, better-trained crewmen, and much more rigorous maintenance standards. As a result, the US submarine force has generally been confident that it could defeat any potential undersea opponent, even if significantly outnumbered. For example, at the end of the Cold War, the United States operated 93 SSNs. These boats faced a force of 264 Soviet submarines, including 63 ballistic missile submarines, 72 guided missile submarines, 64 SSNs, and 65 conventional diesel-electric submarines. US submariners felt confident they could defeat the Soviet submarine fleet even though they faced an unfavorable force ratio of one US boat for every 2.84 Soviet boats.[20] Today,

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[16] The standard Mk 41 VLS combines the missile magazine and launcher in groups of below-deck missile modules. These modules consist of eight individual missile cells. Each cell can be loaded with one long-range surface-to-air missile (SAM); ballistic missile defense interceptor; vertical-launched anti-submarine rocket; or Tomahawk land attack cruise missile (TLAM). Alternatively, the cell can be "quad-packed" with four terminal defense SAMs. Once given a firing command, these missiles launch straight up out of their below-deck cells and then tip over toward their targets.

[17] For the purposes of this report, the term "battle force missile" includes long-range SAMs with ranges greater than 46 kilometers(km)/25 nautical miles (nm); medium-range SAMs with ranges between 16 and 46 km (10–25 nm); anti-ship cruise missiles (ASCMs); anti-submarine warfare (ASW) missiles and rockets; and land attack cruise missiles (LACMs). SAMs with ranges less than 16 m/10nm are considered self-defense missiles.

[18] These numbers do not include fourteen additional strategic ballistic missile submarines which are part of the US nuclear deterrent force.

[19] The 56 US submarines have an aggregate magazine capacity of 2,467 weapons (torpedoes and land attack cruise missiles, all sub-launched anti-ship missiles having been removed from US submarines). This equates to an impressive average weapons load of 44 weapons per boat, an important consideration on long-duration combat patrols. The 222 submarines in the twenty next largest foreign navies carry a total of 4,306 weapons, an average of 19 per weapons boat.

[20] Russian fleet numbers are taken from "Russian Warships," available online at http://www.globalsecurity.org/military/world/russia/ship.htm, accessed on August 3, 2008. Since one of the primary missions of US tactical submarine fleet is anti-submarine warfare, foreign strategic missile boats are included in the foreign submarine count. US numbers are taken from "Ship Force Levels, 1886–present."

Russia and China operate a combined total of 107 submarines: 17 strategic ballistic missile boats, 23 SSNs, seven SSGNs, and 60 diesel-electric boats.[21] This equates to a two-navy force ratio of one US boat for every 1.91 boats — considerably better than the Cold War ratio against a single adversary. This suggests that the relative US undersea advantage has improved since the end of the Cold War.[22]

> The 31-ship US amphibious fleet is the largest and most capable in the world, displacing an aggregate total of 778,846 tons. In comparison, the next twenty largest foreign navies operate 121 amphibious ships with an aggregate displacement of 875,913 tons. In terms of its overall capabilities, the US amphibious fleet enjoys a *seventeen-navy standard*.

Only a few navies can match the US Navy's high operational tempo, which translates directly into superior real-world training, operational experience, and tactical expertise.

The US Navy enjoys three additional advantages that are not apparent in simple comparisons of fleet numbers and displacements, ship types, and magazine capacities. First, the US Navy operates globally twenty-four hours a day, seven days a week, 365 days a year. At any given time, approximately one third of the fleet is underway. Many of these ships are on operational deployments that last six months or longer. Not surprisingly, the Navy's 32-ship US combat logistics force (tasked with providing deployed US warships with fuel oil, ammunition, and stores) is the largest and most capable of its kind in the world. More importantly, however, only a few navies can match the US Navy's high operational tempo, which translates directly into superior real-world training, operational experience, and tactical expertise.[23]

Second, the US battle force is in the midst of a grand transformation from a fleet of ships to what Navy officials describe as a FORCEnet: "the architecture and building blocks of sensors, networks, decision aids, weapons, Warriors, and supporting systems integrated into a highly adaptive, human-centric comprehensive maritime system that operates from seabed to space and from sea to land."[24] This transformation began in earnest during the 1990s, after Operation Desert Storm suggested that guided weapons and the engagement networks that employed them were sparking a revolution in war. However, unlike the Soviets, who saw this revolution leading toward *automated* reconnaissance–strike complexes, the US military envisioned a future in which individual sensing, targeting, and engagement networks would be

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21 Foreign submarine counts are derived from Stephen Saunders, RN, ed., *Jane's Fighting Ships 2007–2008*.

22 As this paper will argue later, however, this comparison may be misleading. Other evidence suggests the US lead in undersea warfare may be under serious challenge.

23 The British Royal Navy had a similar advantage in the late eighteenth and early nineteenth centuries when fighting against foreign navies, and especially the French. French warships were the equal of British warships. Indeed, the famous British "74" was derived from a captured French ship. However, the French Navy could never match the operational experience of the globe-spanning British Navy, and this disadvantage dogged them in battle.

24 *FORCEnet and the 21st Century Warrior* (Newport, RI: CNO Strategic Studies Group XX, November 2001), p. xvii.

linked together to form collaborative *battle networks*. These battle networks would pool and share data from sensors across the force to form common operational pictures, and use internet protocol-based systems to enable interactive combat planning, targeting, and execution.[25] Consistent with this vision, the Navy is rapidly shifting to commercial-off-the-shelf (COTS)/open architecture computing environment (OACE) combat systems that will allow the rapid insertion of new hardware and software capabilities across its evolving FORCEnet.[26]

The Navy is also adding powerful new naval battle network capabilities, such as the cooperative engagement capability, or CEC. A CEC-equipped platform transmits the raw radar data from its onboard radars to nearby ships and aircraft in the local CEC-network. These platforms, in turn, pass the data to other ships and aircraft. In each ship or aircraft receiving the data, CEC hardware and software integrates the data received from all radars to form a "single, real-time, fire-control-quality composite track picture."[27] Future CEC engagement networks will also be able to integrate non-radar sensor data from electronic intelligence or other links to further improve the quality of air and missile tracks.[28]

CEC-equipped naval task forces will have dramatically improved fleet air defenses. Task forces connected by CEC will extend the range at which any of its ships can engage a target to well beyond their own radar horizon. Specifically, by using weapons that can engage on remote targets (i.e., use offboard sensors for targeting and guidance) or that have onboard active guidance systems, a CEC-equipped ship will be able to fire at a target that it would not normally sense, much less track, with its own sensors. Moreover, because most stealthy platforms are only "invisible" from certain radar aspects (e.g., head-on), and because CEC tracks will be developed along multiple radar bearings, CEC should also be able to detect and track stealthy aircraft and cruise missiles over both land and sea.[29] Future CEC-enabled battle networks will

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[25] For a definitive discussion on the evolution of the guided weapons/battle network revolution, see Barry Watts, *Six Decades of Guided Munitions and Battle Networks: Progress and Prospect* (Washington, DC: Center for Strategic and Budgetary Assessments, 2007).

[26] The ability to rapidly upgrade COTS systems may be offset from the vulnerability of COTS systems to network attack. For example, see Richard F. Forno, "Hidden Threats and Vulnerabilities to Information Systems at the Dawn of the 21st Century, available online at http://www.emergency.com/techthrt.htm, accessed on September 1, 2008.

[27] "Cooperative Engagement Capability," available online at http://www.fas.org/man/dod-101/sys/ship/weaps/cec.htm, accessed on August 1, 2008.

[28] Richard Scott, "Joining the Dots: Networked Platforms Extend Air Defense, *Jane's Navy International*, December 2005, pp. 28–30.

[29] Norman Polmar, *Ships and Aircraft of the US Fleet*, 18th edition (Annapolis, MD: US Institute Press, 2005), p. 136; Daniel Busch and Conrad J. Grant, "Changing the Face of War—the Cooperative Engagement Capability," available online at http://www.ccii.co.za/company/pressreleases/faceofwar.html, accessed on September 6, 2007; Dr. Norman Friedman, "They Link it Together—Data Exchange Requirements and Systems in Naval Warfare," *Naval Forces*, No. III/2005, Vol. XXVI, p. 42.

also be able to integrate non-radar sensor data from electronic intelligence or other links to further improve the quality of air and missile tracks.[30]

As a result of advances like these, former Chief of Naval Operations (CNO) Admiral Vernon Clark concluded that counting ships no longer gave the most accurate sense of the Navy's true fighting power:

> The number of ships in the fleet is important. But it is no longer the only, nor the most meaningful, measure of combat capability. Just as the number of people is no longer the primary yardstick by which we measure the strength or productivity of an organization, the number of ships is not the only way to gauge the Navy's health or combat capability.[31]

Said another way, the Navy is now defined less by the numbers of ships in its Total Ship Battle Force, and more by the *combined capabilities* found in its "Total Force Battle Network" (TFBN).[32] Since the United States is far ahead of foreign navies in its transformation toward a TFBN, its full combat capabilities are likely far greater than the above analysis of ship counts and aggregate fleet displacement suggests.

Finally, the TFBN receives substantial support from the naval power of it closest "ally:" the US Coast Guard. Another important message of the aforementioned *Cooperative Strategy for 21st Century Seapower* is that the existing and future TFBN will be able to draw on the combined capabilities and capacities of a *National Fleet*—a fully interoperable and operationally integrated US Navy and US Coast Guard—to form cooperative maritime relationships and partnerships. Many foreign navies, especially those smaller than the twenty foreign navies listed above, are more akin to coast guards, with offshore patrol vessels and smaller patrol craft that operate only within their own country's exclusive economic zone. The Coast Guard is often better suited for engaging with these smaller navies.

However, the Coast Guard brings much more in the way of capability and capacity to the National Fleet than just engaging with small navies. It operates 160 cutters of all types, and nearly 800 small boats and craft (these numbers do not include numerous buoy tenders and ice breakers). These ships and craft routinely perform important forward engagement tasks like counterdrug and maritime security operations, which free up Navy combatants for other duties. They also deploy forward in wartime, performing important maritime interdiction, harbor security, and protection of offshore infrastructure missions. When considering the combined capabilities and capacities of the National Fleet, the US lead in global naval power widens.

The Navy is now defined less by the numbers of ships in its Total Ship Battle Force, and more by the *combined capabilities* found in its "Total Force Battle Network" (TFBN).

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30 Scott, "Joining the Dots: Networked Platforms Extend Air Defense," pp. 28–30.

31 Statement of Admiral Vern Clark, US Navy, Chief of Naval Operations, before the Senate Armed Services Committee, April 12, 2005, available online at http://www.navy.mil/navydata/cno/testimony/clark050412.pdf, accessed on April 29, 2005.

32 The terms naval battle networks and TFBN are not official Navy terms; they are adopted solely for the purposes of this report.

Simply put, the United States finds itself alone at the top of the global naval hierarchy with a comfortable margin of superiority. Regardless of how its current fleet numbers compare in size with *past* US fleets, no contemporary naval competitor or plausible group of competitors comes close to matching the aggregate capabilities of the US Navy's evolving Total Force Battle Network — much less the combined capabilities of the National Fleet.

MOVING TO A TWO-WAR STANDARD

In addition to sizing the TFBN for war, the Navy also sizes its forces so that they can fulfill approved requirements for naval forward presence during peacetime.

During the "sea control century" between 1890 and 1990, comparing the US Total Ship Battle Force numbers with foreign fleet counts was a useful way to assess the United States' relative standing among world naval powers. Since 1990, however, comparing the US TSBF against foreign navies is no longer an adequate way to fully judge the sufficiency of US naval power. Between 1993 and 2001, three successive defense reviews (the 1993 Bottom-up Review, and the 1997 and 2001 Quadrennial Defense Reviews (QDRs)) established a new comparative standard. This standard required the Navy, along with the entire US joint force, to be prepared to fight two regional adversaries — including even some that lacked a credible navy — in overlapping timelines.

Under this new *two-war standard*, in addition to conducting traditional naval fire and maneuver, the evolving US Total Force Battle Network would need to complete many additional tasks, such as screening the arrival of joint forces, supporting joint operations ashore with air and missile attacks, and defending the joint force and allies from the same. These additional tasks would not be reflected when comparing US ship counts with other navies. To determine the minimum required TFBN capability and capacity to achieve a two-war standard, the Navy therefore runs classified campaign analyses for an array of potential conflicts, including, but not limited to: a North Korean invasion of South Korea; a PRC attack on Taiwan; an Iranian threat to close the Strait of Hormuz; or a prolonged joint force counterinsurgency campaign.

In addition to sizing the TFBN for war, the Navy also sizes its forces so that they can fulfill approved requirements for naval forward presence during peacetime. For example, the requirement to maintain a carrier task force continuously in the Persian Gulf requires a force structure of eight aircraft carriers. Keeping a single surface combatant in the eastern Mediterranean for ballistic missile defense requires five surface combatants. The Navy makes similar force structure adjustments to meet the persistent regional forward peacetime presence requirements for submarines and amphibious task forces. By running multiple classified models using different potential conflict scenarios and presence assumptions, the Navy develops a TFBN fleet capable of meeting both peacetime forward-presence requirements and potential wartime requirements.

The two-war TFBN standard does not result in a ship count substantially larger than today's 280-ship active fleet. The three aforementioned reviews, supported by extensive analyses, determined that the minimum two-war standard for the Navy's TFBN was 300 ships, with an average objective fleet target of about 320 ships.[33] A subsequent US Navy analysis, completed in 2005, determined that the future TFBN might include between 260 and 325 ships, depending on the level of technology insertion, overseas home-porting of ships, and the extent to which the Navy pursued multiple crewing for surface ships.[34] The most recent analysis, conducted in conjunction with the 2006 QDR—and the one that now drives Navy force planning—rejected multiple crewing options for all but strategic ballistic missile submarines and small surface ships. It establishes 313 ships as the minimum two-war TFBN standard, in the specific categories and numbers outlined in Figure Two. Accepting for the moment the Navy's analysis, this means that the current 280-ship active fleet is just 33 ships short of the new two-war TFBN requirement.

Despite being 33 ships short of the two-war TFBN requirement, it bears noting that the likelihood of two simultaneous major regional wars is relatively low, and that the US Navy thus has an overmatching capability and capacity to meet any plausible *single* contingency. As a result, the Navy has itself judged that keeping 313 ships in service is less important than getting the right mix of ships with the right capabilities. Since the end of the Cold War, to reflect shifting fleet requirements, save recurring operations and maintenance costs, and free up money to help recapitalize the fleet, the Navy has retired more than 79 ships and submarines well before the end of their expected service lives.[35] Using conservative estimates, 47 of these ships could still be in commission today, which would put the fleet 14 ships over its TFBN target. Clearly, the Navy believes that the benefits of decommissioning older ships while pursing new capabilities and building the fleet over time far outweigh the near-term risks of falling below 313 ships.

The Navy has itself judged that keeping 313 ships in service is less important than getting the right mix of ships with the right capabilities.

FACTORING IN JOINT CONTRIBUTIONS

Another thing that bears noting is that under the new two-war standard, the Navy's Total Force Battle Network is itself just a component of a larger Joint Total Force Battle Network. During the sea control century, and especially in the latter stages of the Cold War, US naval task forces were organized, trained, and equipped to operate

33 The 1993 Bottom-Up Review called for a fleet of 346 ships. The 1997 QDR established a fleet "redline"—the minimum number of ships needed to meet a two-war standard—at 300 ships. It called for a fleet of approximately 305 ships. The 2001 QDR called for a fleet of 310 Ships.

34 By assigning a ship multiple crews, and "sea swapping" them in forward theaters, the Navy hoped it might be able to achieve more presence days per ship, which would allow them to buy fewer ships. The 260-ship fleet assumed that most surface warships would have multiple crews. The 325-ship fleet assumed most ships would have single crews.

35 These numbers include 31 Spruance-class destroyers, 21 Oliver Hazard Perry-class frigates, 12 Osprey-class minehunters, 6 nuclear-powered cruisers, 5 Ticonderoga-class guided missile-cruisers, 4 Kidd-class guided missile destroyers, and numerous nuclear-powered attack submarines.

largely independently. As a result, during the 1990-91 Persian Gulf War, US carrier strike groups could not receive targeting information or communicate easily with Air Force units operating ashore. All this has changed. As a result of both clear direction from the Office of the Secretary of Defense and substantial Navy investments during the 1990s in jointly interoperable command, control, communications, computers, and intelligence, surveillance, and reconnaissance (C4ISR) systems, all naval battle networks can now communicate seamlessly with Air Force (and other Service) units. As a result, in any future war, Navy battle networks will *always* operate as part of joint multidimensional battle networks. Under these circumstances, while the Navy's TFBN will provide unique capabilities and support to the overall joint battle network, it will also receive considerable support from other joint forces.

In any future war, Navy battle networks will *always* operate as part of joint multidimensional battle networks.

Three simple examples illustrate the support that naval battle networks now receive from the Joint Total Force Battle Network. First, Air Force intelligence, surveillance, and reconnaissance data, provided by orbiting satellites and land-based, manned and unmanned aircraft, now routinely support US carrier and missile strike

FIGURE 2. **TFBN OBJECTIVE SHIP REQUIREMENT, BY SHIP CATEGORY**

Type/Class	Required	Description
Aircraft Carriers	11	Mixture of Nimitz-class and Gerald R. Ford-class nuclear-powered aircraft carriers (CVNs)
Strategic Ballistic Missile Submarines	14	Ohio-class SSBNs, transitioning in late 2020s to SSBN(X)s
Conventional Cruise Missile Submarines	4	4 Ohio-class cruise missile/SOF transport submarines (SSGNs)
Attack Submarines	48	Mixture of Los Angeles, Seawolf, Virginia, and Improved Virginia-class attack boats
Large Surface Combatants	88	Includes 19 Guided Missile Cruisers (CGs) and 69 Guided Missile Destroyers (DDGs)
Littoral Combat Ships	55	Sea frames (hulls) only; program also includes 64 anti-surface, anti-submarine, and counter-mine mission packages
Amphibious Warfare Ships	31	Includes 9 Amphibious Assault Ships (LHD/LHA(R)s), 10 Amphibious Transport Docks (LPDs), 12 Dock Landing Ships (LSDs)
Maritime Prepositioned Force (Future)	12	Includes 3 Amphibious Assault Ships; 3 modified Large Medium Speed Roll-on/Roll-off ships (LMSRs); 3 Dry Cargo/Ammunition ships (T-AKEs); and 3 Mobile Landing Platforms (MLPs)
Combat Logistics Force	30	Includes 4 Fast Combat Support Ships (T-AOEs), 11 Dry Cargo/Ammunition ships (T-AKEs), and 15 Underway Replenishment Oilers (T-AOs),
Support Vessels	20	Includes 2 Command Ships (LCCs), 2 Submarine Tenders (ASs), 4 Rescue and Salvage Ships (ARSs), 4 Fleet Ocean Tugs (T-ATFs), 4 Ocean Surveillance Ships (T-AGOS), 3 Joint High Speed Vessels (JHSVs), and 1 High-Speed Ship (HSS)
Total	313	

operations. Second, US Air Force aerial refueling aircraft provide direct support to US Navy and Marine aircraft operating from aircraft carriers and big-deck amphibious ships. Finally, naval task forces receive direct support from US Air Force offensive counter-air and strike operations. A B-2 stealth bomber that destroys sixteen enemy ships or submarines tied up at their piers with sixteen independently-targeted guided weapons goes a long way toward helping to establish safe naval operating areas close off an enemy's coast. As a result of such support, the TFBN can be smaller than might otherwise be expected.

CURRENT NAVY PLANS

The following sections review current Navy plans to achieve a two-war TFBN standard in each of the categories of ships outlined in Figure Two. To help the reader fully understand the Navy's plans, these sections go into some detail. When appropriate, a review of how these plans evolved is also included. Those not interested in the nuts and bolts of current Navy plans should jump forward to the section entitled "A New TFBN Ship Target?" on page 36 of this report.[36]

Nuclear-Powered Aircraft Carriers

The future TFBN has a requirement for eleven aircraft carriers, equal to the size of the current force. In January 2009, this force will consist entirely of nuclear-powered carriers.[37] Each will form the heart of a Carrier Strike Group (CSG), consisting of one CVN, four or more surface combatants, a nuclear-powered attack submarine in direct support, and accompanying combat logistics ships. Using established Navy maintenance and training schedules, an eleven-CVN force can keep two to three CSGs forward in distant theaters during peacetime. During times of crisis/war, the force can generate a total of six CSGs within thirty days' notice (counting those already deployed), and an additional one within ninety days, with the remainder in either extended maintenance/overhaul or in training.

The Navy plans to replace its eleven legacy CVNs with the new Gerald R. Ford-class, often referred to as the "twenty-first century aircraft carrier" (CVN-21). Advance construction on the first CVN-21 began in 2005, and full-scale production begins in

[36] Unless otherwise stated, all Navy plans are drawn from "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," prepared by the Director, Warfare Integration (OPNAV N8F) Office of the Chief of Naval Operations, 2000 Navy Pentagon, Washington, D.C. 20350-2000, February 2008. All ship characteristics are drawn from the appropriate ship section in Polmar, *Ships and Aircraft of the US Fleet*, 18th edition.

[37] The Navy will commission the tenth and final Nimitz-class CVN, USS *George H.W. Bush*, in January, 2009. Soon thereafter, USS *Kitty Hawk*, the last conventionally-powered carrier in active service, will be retired. This will give the Navy its baseline fleet of eleven CVNs—ten Nimitz-class CVNs and one Enterprise-class CVN.

Fiscal Year (FY) 2008. Construction on the second and third ships of the class will follow at four-year intervals (FY 2012 and FY 2016). The Navy will procure follow-on ships at an average rate of one every 4.5 years.

The CVN-21 will boast several key improvements, including a new reactor plant that can generate three times the electrical power of earlier Nimitz-class reactors. It will also have more efficient electrical distribution systems, allowing the installation of new electromagnetic aircraft launch and recovery systems. Together with a smaller island, redesigned flight deck, innovative aircraft "pit stops," and advanced weapons elevators, these new launch and recovery systems will allow Ford-class carriers to generate 25 percent more aircraft sorties per day than their predecessors.[38] Better still, a CVN-21 will require nearly 1,200 fewer officers and sailors to operate than a Nimitz-class carrier, leading to some $5 billion in total operating cost savings over its 50-year service life.

The "Sunday punch" of any aircraft carrier is its embarked air wing.

The first CVN-21 will be commissioned in 2015, three years after the Navy retires the oldest CVN in the US fleet, USS *Enterprise*. As a result, the Navy's shipbuilding plan projects the US aircraft carrier fleet to fall to ten ships in FY 2013 and FY 2014.[39] On the other hand, because Congress approved the Navy's plan to build the first three CVN-21s at four-year intervals, the carrier fleet will actually reach twelve CVNs (ten Nimitz-class and two Ford-class) in FY 2019, and stabilize at this higher number through at least FY 2037. A twelve-carrier force can generate six CSGs within thirty days and an additional two in ninety days (one more than an eleven-carrier force).

Carrier Air Wings

The "Sunday punch" of any aircraft carrier is its embarked air wing. By 2025, the standard carrier air wing should include forty-four fighter/attack aircraft: one twelve-plane squadron of Navy single-seat F/A-18E Super Hornets; one twelve-plane squadron of Navy dual-seat F/A-18F Super Hornets; one ten-plane Navy squadron of stealthy F-35C Lightning II Joint Strike Fighters (JSFs); and one ten-plane squadron of US Marine F-35 JSFs (either a carrier variant or short take-off/vertical landing version).[40] These aircraft will be supported by five E/A-18G Growler electronic attack

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[38] Statement of Vice Admiral Barry McCullough, Deputy Chief of Naval Operations for Capabilities and Requirements, and Ms Allison Stiller, Deputy Assistant Secretary of the Navy (Ship Programs), before the Subcommittee on Seapower of the Senate Armed Services Committee on Navy Force Structure and Shipbuilding, April 8, 2008, pp. 4–5.

[39] This plan will require Congressional approval, as Congress has passed a law that requires the Navy to maintain a fleet of eleven carriers. If Congress balks, the Navy will be forced to spend money it does not want to spend to keep the *Enterprise* in service for an additional three years. See "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," pp. A-2–3.

[40] The Marines would like this squadron to equipped with the F-35B STOVL version of the JSF. The Navy believes integrating a STOVL aircraft into the carrier deck launching and landing cycle would be disruptive. They therefore would like the Marine squadron to be equipped with the F-35C carrier version. This disagreement will not be resolved until at least FY 2011, when STOVL versions can be tested in carrier deck cycle operations.

aircraft (a modified version of the Super Hornet); five E-2D Advanced Hawkeye airborne early warning and battle management aircraft; and nineteen MH-60R/S helicopters, eight of which will normally operate from the carrier's accompanying surface escorts and logistics ships. In addition, two specialized cargo aircraft will be onboard the carrier to support the entire CSG.[41] The seventy-five fixed and rotary-wing aircraft accompanying every CSG will represent the largest, most diverse, and most capable sea-based tactical aviation elements in the world.

The Navy plans to start transitioning its Super Hornet squadrons to an advanced aircraft system, tentatively referred to as the F/A-XX, in 2025. Currently, Navy plans are for this new system to be a stealthy, air-refuelable, unmanned combat air system (N-UCAS), capable of operating with minimal human intervention in either denied or heavily defended airspace.[42] With an unrefueled combat radius on the order of 1,500 nautical miles (nm), and a maximum aerial endurance of fifty to one hundred hours, the N-UCAS will greatly extend the strike reach of every CSG.[43]

Because aircraft carriers have a fifty-year design life, one of the active carriers is normally in the yards undergoing a three-year-long mid-life refueling and complex overhaul. As a result, the current program of record eleven-carrier fleet has ten active air wings and one reserve air wing. Fully supporting a twelve-carrier force will require either an additional active or reserve air wing, a substantial investment.

The current program of record eleven-carrier fleet has ten active air wings and one reserve air wing.

Nuclear-powered Strategic Ballistic Missile Submarines

The United States has kept strategic ballistic missile submarines (SSBNs) on constant underwater patrol since 1961, forming the most stealthy and survivable component of the US nuclear strategic deterrent. The current force consists of fourteen Ohio-class SSBNs, each armed with twenty-four Trident D-5 submarine-launched ballistic missiles. With each boat assigned two complete crews, and having been designed for seventy-day patrols followed by twenty-five-day replenishment/training periods, up to 66 percent of the force can be on patrol at any given time.

The minimum operational requirement for the undersea strategic deterrent force is actually twelve SSBNs, but the force must be larger to allow for class upkeep. The Ohio-class boats are designed to serve forty years—two twenty-year operational cycles divided by a two-year midlife nuclear reactor refueling and general overhaul. With all of the SSBNs near their twentieth year of service, the Navy is now refueling them at the rate of one per year. Because two boats are therefore out of service at any

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41 For a detailed look at the Navy's aviation plans, see Naval Aviation Enterprise, *Naval Aviation Vision* (Washington, D.C: Department of the Navy, January 2008), available online at http://www.cnaf.navy.mil/nae/main.asp?ItemID=12, accessed July 26, 2008.

42 Ibid.

43 For a through discussion of the N-UCAS, see Thomas P. Ehrhard, PhD, and Robert O. Work, *Range, Persistence, Stealth, and Networking: the Case for a Carrier-Based Unmanned Combat Air System* (Washington, DC: Center for Strategic and Budgetary Assessments, 2008).

given time (one boat in the second year of a two-year cycle, the other in its first), fourteen boats are needed to meet the minimum operational SSBN requirement.[44]

To reduce the future force requirement for SSBNs, the Navy intends to give the planned follow-on to the Ohio-class — now referred to as SSBN(X) — nuclear reactors with "life-of-the-ship cores." This will allow the Navy to avoid a major SSBN(X)-class midlife overhaul, and to maintain the force using more numerous but shorter maintenance periods scheduled throughout the life of the boats. As a result, the Navy plans to replace the current fourteen-boat SSBN force with just twelve new SSBN(X)s.

The Navy's thirty-year shipbuilding plan does *not* include the funds necessary to procure SSBN ships.

Under current plans, the Navy will authorize the first SSBN(X) in FY 2019, and procure them at a rate designed to maintain a twelve-boat SSBN fleet after FY 2030. However, the Navy's thirty-year shipbuilding plan does *not* include the funds necessary to procure these ships. According to Navy officials, "absent additional resources . . . the Navy will be unable to concurrently replace the existing [SSBNs] and the balance of its force structure requirements." Not surprisingly, they say this is "a strategic issue that merits immediate attention."[45]

Nuclear-powered Cruise Missile and Special Operations Transport Submarines

The Navy actually built eighteen Ohio-class SSBNs during the Cold War. However, with its end, subsequent nuclear posture reviews concluded that the operational SSBN force could be reduced to fourteen boats (see above). This meant that the Navy had four excess Ohio-class SSBNs with two decades of service life left in them to convert to other purposes, should it wish to do so. With prodding from both the Office of the Secretary of Defense and Congress, the Navy ultimately converted these four strategic ballistic missile boats into conventional cruise missile and special operations forces (SOF) transport submarines (SSGNs) during their regularly scheduled mid-life overhauls.

The conversion program gave the new SSGNs berthing, messing, storage, and planning and command spaces for 66 SOF personnel, with a surge capacity of up to 102 personnel. In addition, the two missile tubes closest to the submarine's conning tower, or sail, were converted into five-man lock-in/lock-out chambers and docking stations for either an external Dry Deck Shelter (DDS) which can store small swimmer delivery vehicles (SDVs), or an Advanced Seal Delivery System (ASDS) — a small

44 Ronald O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," Congressional Research Service Report to Congress, RL 32655, updated version dated June 10, 2008, p. 8.

45 "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," p. 8.

submarine capable of transporting SOF personnel close to shore.[46] The remaining twenty-two missile tubes were converted into multi-function payload tubes, able to accept either additional SOF storage canisters or weapons canisters. The current version of the weapons canister carries seven VLS cells for Tomahawk land attack cruise missiles (TLAMs). Future canisters may carry different weapons, unmanned underwater vehicles (UUVs),[47] unmanned aerial systems (UASs), or deployable sensors.[48] Using two dedicated crews per boat, and conducting crew changeovers at forward bases like Guam, the Navy can keep two or three SSGNs deployed at all times, providing presence in multiple theaters.

Although the requirement for 313 TFBN ships includes four SSGNs, the Navy has deferred plans for their replacement until after their combat capabilities can be assessed, indicating residual doubts about the utility of these platforms. As a result, the current long-range inventory profile shows all four SSGNs retiring by FY 2028, with no replacements. If future operational experience proves these platforms to be useful, the Navy would need to authorize replacement platforms around FY 2020, if not before.[49]

The current long-range inventory profile shows all four SSGNs retiring by FY 2028, with no replacements.

Nuclear-Powered Attack Submarines

Today, the Navy operates a total of fifty-two SSNs—four over the TFBN requirement for forty-eight boats. The bulk of the fleet consists of forty-five Los Angeles-class SSNs, the survivors of a class of sixty-two boats designed in the late 1960s and commissioned between 1976 and 1996.[50]

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[46] The Navy's ten MK VIII SDVs are "wet" mini-submarines that can carry six to eight swimmers (one of them piloting the vehicle) wearing SCUBA-type breathing apparatus. As to one Navy official describes them, "They are cramped, short-legged, slow, and, in some climates, very cold . . . SDV operations are like cramming as many people as you can in the trunk of a small car, opening it up to the sea, and subjecting them to whatever military or environmental hazards lie ahead." The single ASDS is faster, quieter, and has much greater depth and range than the SDVs. It is a "dry" heated submarine that has a lock-out/lock-in capability for its crew of two and up to as many as 16 SOF personnel. The ASDS is also capable of operating independently for several days. See Scott C. Truver, "Mission Success Assured," *Seapower*, July 2001, available online at http://findarticles.com/p/articles/mi_qa3738/is_200107/ai_n8979859/pg_3?tag=artBody;col1, accessed on August 22, 2008.

[47] Unmanned underwater vehicles come in two basic types: remotely operated vehicles, which are controlled through a tether connected to the mothership, or an autonomous underwater vehicle (AUV), which can be programmed to conduct specific missions. Most military UUVs are autonomous underwater vehicles.

[48] In the maximum strike configuration, each SSGN can carry 154 TLAMs (22 tubes times 7 TLAMs per payload tube). When carrying SOF personnel, two or four payload tubes would be designated for equipment storage, which would reduce the missile load to 140 or 126 TLAMs, respectively.

[49] "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," p. 8.

[50] Of the forty-five surviving Los Angeles-class boats, fourteen are armed with four 21-inch torpedo tubes and a total of 25 Mk-48 heavyweight torpedoes or TLAMs. The remaining thirty-one add 12 non-reloadable VLS cells in the bow, each capable of launching a single TLAM, giving them a total magazine capacity of 37 weapons. In addition, twenty-three of the boats have a lower acoustic signature and were designed for better under-ice performance. This made them better anti-submarine warfare (ASW) platforms overall, and particularly effective in hunting for Soviet SSBNs in Arctic waters. These twenty-three boats are referred to as Improved Los Angeles-class SSNs.

The 52-boat SSN fleet also includes three Seawolf-class SSNs. The Seawolf-class was the ultimate Cold War attack boat, designed to ensure continued US superiority over a rapidly improving Soviet submarine force. These boats were larger, quieter, faster, and more heavily armed than Los Angeles-class SSNs.[51] However, because of these improvements, they were quite expensive. Hence, when the Cold War came to an end, and as the focus of future US submarine operations shifted from operations north of the Greenland-Iceland-United Kingdom gap and under the Arctic ice to shallower littoral waters around the Eurasian continent, the Navy halted the planned thirty-boat class after three boats and converted the last of the class, USS *Jimmy Carter*, into a special mission submarine. It did so by installing a 2,000-ton Multi-Mission Platform aft of the submarine's conning tower, designed for the launch and recovery of unmanned underwater vehicles and special operations forces.

The Virginia-class SSNs are the first US submarines with reactors with life-of-the-ship cores, which will eliminate the need for an expensive mid-life refueling.

The remainder of the 52-boat SSN fleet consists of four new Virginia-class SSNs. These boats are substantially smaller and less expensive than the Seawolf-class, but with equal or better acoustic silencing. They are also designed to be better than both the Seawolf and Los Angeles-class SSNs for operations in shallower littoral waters, and in being able to incorporate major new submarine technologies as they became available. In addition, the Virginia-class SSNs are the first US submarines with reactors with life-of-the-ship cores, which will eliminate the need for an expensive mid-life refueling.

The Virginia-class SSNs remain in serial production. Reflecting their new littoral operations role, the ships have a flexible payload capability. When configured for anti-submarine and strike warfare, they carry a total of twenty-seven weapons internally and twelve non-reloadable VLS tubes, for a maximum patrol load of thirty-nine weapons. However, the torpedo room is designed for the rapid removal of its torpedo stowage and handling equipment to facilitate the transport of up to forty Special Operations Forces personnel. The submarine is also equipped with a nine-diver lock-in/lock-out chamber to allow the launch and recovery of swimmers while underwater. Like the SSGNs, the Virginia-class SSNs can also carry a Dry Deck Shelter or Advanced SEAL Delivery System on its hull above the lock-in/lock-out chamber.

The Navy plans to build no less than forty-two Virginia-class SSNs in successive blocks, each with improvements. For example, Congress authorized the eleventh ship of the class and the first Block III ship in FY 2009. The Block III ships will see the traditional spherical bow sonar array, found on all US SSNs since the early 1960s, replaced by a large aperture bow array. In addition, the twelve individual VLS cells will be replaced by two large (seven-foot diameter) multi-function payload tubes. These tubes are generally identical to those found on the four SSGNs, except that they are shorter to account for a Virginia's smaller beam. As a result, these tubes can

[51] Despite being seven feet shorter than the Los Angeles-class, the Seawolf-class SSNs have a hull diameter that is seven feet larger, giving them much more interior volume. This is reflected by their larger torpedo rooms, which have eight 21-inch torpedo tubes and storage space for 50 weapons.

only carry six TLAMs instead of the seven found on the larger boat. This allows the Block III Virginias to carry the same twelve TLAMs found on the Block I and II boats. However, with 2,300 cubic feet of payload space, the two new tubes nearly double the amount of useful space compared with the former VLS installation—and give the Block III SSNs much greater payload flexibility. Indeed, most future weapons and payloads (e.g., unmanned underwater vehicles) designed for the SSGN force will be interchangeable with the Virginia force. Block IV and subsequent Blocks of Virginia-class SSNs will have additional improvements.[52]

In FY 2024, upon completion of the 42-boat Virginia run, the Navy plans to shift over to the next-generation SSN. Reflecting the Navy's great satisfaction with the current boat, this new attack boat is referred to as either the Improved Virginia-class SSN or as SSN-774(X) (the USS *Virginia's* hull number). By FY 3033, all SSNs in service will be a version of the Virginia-class with the exception of the special mission submarine USS *Jimmy Carter*.

As a result of earlier SSN building profiles, the TFBN will see the SSN fleet fall below its 48-boat requirement between FY 2022 and FY 2034. The Navy stopped authorizing attack boats for a period of six years in the 1990s as it switched over production from the Seawolf to Virginia-class SSN. Moreover, since FY 1998, it has been building Virginia-class SSNs at the average rate of one boat per year. Unless the Navy soon increases the build rate to at least two boats per year, the future SSN force will fall well below the forty-eight boat requirement at some point in the future. Currently, the Navy plans to increase the production of Virginia-class SSNs to two boats per year in FY 2011, and to keep it there for eighteen years before shifting over to a sustaining rate of three submarines every two years.[53] However, this plan will not fully offset the large number of Los Angeles-class SSN retirements coming in the 2020s.[54] As a result, the US SSN force will bottom out at forty-one boats in FY 2028 before rebounding toward the TFBN target of forty-eight SSNs.

Unless the Navy soon increases the build rate to at least two boats per year, the future SSN force will fall well below the forty-eight boat requirement at some point in the future.

With the retirement of the last SSGN in FY 2028, that year the combined US tactical submarine fleet will fall eleven boats short of the 52-boat overall requirement (forty-eight SSNs and four SSGNs). On the brighter side, between FY 2034 and FY 2037 the SSN force will rise to fifty-three boats before trending back down to the objective requirement of forty-eight boats.[55] If the Navy desired to maintain the tactical

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[52] See "SSN-774 Virginia-class Batch 2/Block III," available online at http://www.globalsecurity.org/military/systems/ship/ssn-774-spiral-2.htm, accessed on August 21, 2008.

[53] US SSNs have design lives of thirty-three years. To maintain a fleet of forty-eight boats, the Navy would need to build SSNs at a rate of three boats every two years (e.g., 1-2-1-2-1-2). A sustained rate of one SSN per year would result in a force of thirty-three boats—fifteen boats below requirement. Because the Navy built no SSNs for a period of six years and has been building only one boat per year for more than ten years, it will need to maintain a rate of two boats per year for some time before shifting over to the optimal sustained rate of three boats every two years.

[54] Los Angeles-class SSNs were built at a rate of three or more per year during the Cold War, and will retire at similar rates between FY 2014 and FY 2029.

[55] "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," pp. 6–8.

submarine fleet at fifty-two boats, it could easily do so by modifying the future build rate for SSNs.

Large Surface Combatants

The Navy currently has twenty-two Ticonderoga-class CGs and fifty-three Arleigh Burke-class DDGs in commission; these seventy-five warships pack the same amount of missile firepower as do the 367 surface combatants found in the next twenty largest foreign navies.

The TFBN's surface combatant fleet consists of large, multi-mission guided-missile cruisers (CGs) and destroyers (DDGs). The Navy currently has twenty-two Ticonderoga-class CGs and fifty-three Arleigh Burke-class DDGs in commission, all of them equipped with the superb Aegis anti-air warfare combat system with the powerful SPY-1 passive phased array radar, and large numbers of VLS missile cells. As discussed earlier, these seventy-five warships pack the same amount of missile firepower as do the 367 surface combatants found in the next twenty largest foreign navies.

In addition to the seventy-five ships in active commission, nine additional Burke-class DDGs are in various stages of production. When the last one (DDG-112) is commissioned in 2011, the US will have twenty-two CGs and sixty-two DDGs, against a TFBN requirement for nineteen CGs and sixty-nine DDGs. The combined combat power of these eighty-four Aegis/VLS ships will be staggering: 8,468 VLS missile cells; 400 Harpoon anti-ship cruise missiles; 106 5-inch naval guns; and hangar spaces for 112 MH-60 helicopters.

The Navy's original surface combatant modernization/recapitalization plan consisted of three separate tracks. The first was a modernization program for the eighty-four Aegis/VLS ships. In addition to hull, machinery, and electrical system repairs and improvements, the Navy hoped to bring the combat systems on most of the eighty-four Aegis/VLS ships to a common configuration with the most up-to-date open architecture combat systems.[56]

The second track was to replace the twenty-two Ticonderoga-class cruisers (survivors of a 27-ship class) with twenty-six new large surface combatants in two versions: seven DDG-1000s and nineteen CG(X)s built on the same hull. This track would bring the Navy up to the nineteen guided missile cruisers and sixteen guided missile destroyers called for in the 313-ship TFBN plan. Although the first Ticonderoga-class CG will not reach the end of its 35-year service life until late FY 2021, to preserve the industrial base and to inject new technologies into the fleet, the Navy planned to initiate this track in FY 2007 with the first two DDG-1000s. After skipping a year, the Navy would build the remaining five DDG-1000s at the rate of one per year from FY 2009 through 2013, and begin an overlapping run of nineteen CG(X)s starting in FY 2011. The transition from Ticonderoga-class CGs to the DDG-1000/CG(X) family of ships would be complete in FY 2029.

[56] The oldest seven Ticonderoga-class CGs have the earliest version of the Aegis combat system with the SPY-1A radar. All subsequent ships have either a SPY-1B or –1D version which can all be affordably brought up to the most recent SPY-1D(V) open architecture configuration. The earlier versions cannot be.

The third track was to begin replacing the sixty-two Arleigh Burke-class DDGs with a new guided-missile destroyer, now referred to as the DDG(X). However the planned start date of FY 2023 was too late to have the first new ship in the fleet before the oldest Burke DDG retired. Moreover, the planned building rate was only two ships per year, which was not enough to keep pace with the projected Burke-class retirement schedule. As a result, the TFBN was expected to fall below its objective requirement for DDGs in FY 2026 and never recover.[57]

By 2008, however, these plans had all changed. The DDG midlife modernization program was expanded to include a service life extension program, designed to increase the expected service lives of the sixty-two Burke-class DDGs from thirty-five to forty years. In addition, it now appears that the Navy will give them all ballistic missile defense capabilities—something not originally planned.[58] Moreover, the planned production rate for the DDG(X) has been increased to three ships per year starting in FY 2025. As a result of these changes, the shortfalls initially projected for the future cruiser-destroyer force have now been eliminated.

The Navy also changed its recapitalization plan for the Ticonderoga-class CGs—continuing a long line of changes extending back to the 1997 QDR. At that time, the Navy planned a production run of thirty-two inexpensive, tailored-mission twenty-first century destroyers (referred to as DD-21s) before switching over to a twenty-first century cruiser (CG-21). However, the supposedly low-cost ship quickly became the Navy's technological flagship, with a new stealthy hull that displaced 18,000 tons at full load and was packed with ten new technologies. Predictably, costs started to rise. To justify its continued existence, the tailored-mission DD-21 was renamed the multi-mission DD(X) after the 2001 QDR. However, due to its greater cost, the planned production run was reduced to twenty-four ships.[59]

The supposedly low-cost ship quickly became the Navy's technological flagship, with a new stealthy hull that displaced 18,000 tons at full load and was packed with ten new technologies.

After the 2001 QDR, the Navy tried to rein in continued cost growth in the DD(X) program by reducing the ship's displacement by 4,000 tons; cutting its planned missile battery from 120 newly-designed VLS cells to 80; and reducing the magazine capacity for its two large 6-inch (155mm) guns from 1200 to 600 rounds. At the same time, it started referring to the ship as DDG-1000, implying that it could employ long-range

57 Ron O'Rourke, a respected analyst at the Congressional Research Service, projected that the combined cruiser and destroyer fleet would fall to fifty-four ships sometime between FY 2044 and FY 2046 (thirty-four ships below the total 88-ship requirement) before rebounding to the steady-state force of seventy ships sometime after 2050 (assuming an expected ship service life of 35 years). See Ronald O'Rourke, "Navy DDG-1000 (DDG(X)), CG(X), and LCS Acquisition Programs: Oversight Issues and Options for Congress," Congressional Research Service Report RL32109, dated August 14, 2006, pp. 18–19.

58 Otto Kreisher, "Plan Would Give All DDG-51s Improved Missile Defense Capabilities," *Seapower*, August 2008, pp. 12–14.

59 Initially, the Navy reduced the run to sixteen ships.

surface-to-air missiles.[60] However, by the 2006 QDR, cost estimates for the first two DDG-1000s ranged from a low of $6.6 billion to a high of $10 billion. As a result, the Navy began referring to the ship as a technological bridge to the new CG(X), and reduced its planned production run to just seven ships.

In late July 2008, the Navy announced it wanted to halt the DDG-1000 production run and re-start the Arleigh Burke production line.

Even this modest plan floundered after the Navy evidently determined that the CG(X) combat system could not comfortably fit inside the DDG-1000's hull. Moreover, the FY 2008 National Defense Authorization Act required the Navy to build all major future surface combatants — starting with the CG(X) — with an integrated nuclear power plant.[61] Finally, the Navy concluded that while the future TFBN had sufficient capacity in land attack, it was deficient in both capability and capacity in ballistic missile defense and open ocean anti-submarine warfare — roles in which the Arleigh Burke-class DDGs excel. In addition, it would take additional funds to give the DDG-1000 a ballistic missile defense capability. As a result, in late July 2008, the Navy announced it wanted to halt the DDG-1000 production run and re-start the Arleigh Burke production line. Its preferred plan was to convert the DDG-1000 already authorized in FY 2009 into a Burke-class DDG (truncating the DDG-1000 class to two ships), and to build eleven additional Burkes (for a total of twelve) before shifting production over to the new CG(X).[62] However, in the face of mounting Congressional questions over its plans, the Navy subsequently announced it would build the third DDG-1000 in FY 2009 and restart the Burke production line in FY 2010.[63]

The Navy's long-range plans have not yet been updated to reflect these changes. However, assuming Congress approves them, and the Navy decommissions no Aegis/VLS ships before the end of their thirty-five year service lives, the FY 2021 surface fleet might consist of one CG(X), twenty-one Ticonderoga class CGs, seventy-three to

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[60] The DDG-1000 can carry SAMs in its VLS cells, and fire them. However, the Navy's Standard SM-2 SAM cannot receive commands from the DDG-1000's X-band multi-function radar. Unless the Navy develops a special variant of the SM-2, the DDG-1000 will not be able to independently employ long-range SAMs. Until it does, the vessel is better characterized as DD-1000.

[61] "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," p. 7. The Act did stipulate that should the Secretary of Defense deem this move not to be in the national interest, the Navy would not have to comply with the law.

[62] Navy officials have stated that they seek approximately ninety Aegis/VLS ballistic missile defense ships. They intend to convert only seventy-seven of the current eighty-four ships into BMD ships, foregoing modifications on the seven oldest Ticonderoga-class CGs. Seven of the twelve additional Burke-class DDGs would replace them; five more would allow the permanent stationing of a BMD ship in the Eastern Mediterranean. Assuming the Navy does not retire the seven oldest Ticonderoga-class CGs, these twelve additional Burke-class DDG would give the Navy a total ninety-six Aegis/VLS ships, eighty-nine configured for the BMD role. Statement of Vice Admiral Barry McCullough, Deputy Chief of Naval Operations for Capabilities and Requirements, and Ms Allison Stiller, Deputy Assistant Secretary of the Navy (Ship Programs), before the Subcommittee on Seapower and Expeditionary Forces of the House Armed Services Committee on Surface Combatant Requirements and Acquisition Strategies, July 31, 2008.

[63] "Navy Reverses Course, Now Wants 3rd New Zumwalt Destroyer," *Boston Globe*, August 19, 2008.

seventy-four Arleigh Burke-class DDGs, and three DDG-1000s. The CG(X) will be in serial production and the DDG(X) in design.[64]

Littoral Combat Ships

Between 1977 and 1989, the US Navy built fifty-one Oliver Hazard Perry-class guided-missile frigates to perform protection of shipping missions (e.g. escorting convoys). By 2003, twenty-one of these ships had been retired, all well before the end of their expected service lives. The remaining thirty remained in commission (nine in the active Naval Reserve Force), performing anti-surface and anti-submarine warfare missions in littoral waters.[65]

Between 1987 and 1999, the Navy commissioned twenty-six mine warfare vessels—fourteen larger Avenger-class mine countermeasure ships and twelve smaller Osprey-class coastal minehunters. These ships specialized in searching for, localizing, and destroying underwater mines. In 2003, all twenty-six were in service, with ten in the Naval Reserve.

In 2001, the Navy announced plans to replace all fifty-six of these legacy tailored-mission ships with fifty-five new Littoral Combat Ships (LCSs). These ships were to be a new type of modular battle network combatant, with sea frames (i.e., hulls) designed around twenty mission stations designed to carry different mission modules.[66] The mission stations have interfaces that allow a module to "plug into" the sea frame, thereby forming an integrated LCS combat system. By assembling and installing assorted mission modules, the sea frames carry a complete "plug-and-fight" mission package tailored to a single mission. An associated mission package crew and aviation detachment comes aboard with each package to operate its unique sensors, systems, and weapons, augmenting the sea frame's core crew.[67]

The mission stations have interfaces that allow a module to "plug into" the sea frame, thereby forming an integrated LCS combat system.

64 These numbers assume that the first CG(X) will be authorized in FY 2015, in time to replace the first Ticonderoga-class CG which will retire in FY 2021. When announcing that it would not seek to convert the FY 2009 DDG-1000 to a Burke-class DDG, the Navy did not clarify if it would build eleven or twelve more Burke-class DDGs. Finally, it bears noting that few large surface combatants ever reach the end of their projected 35-year design lives. The costs for maintaining older ships and to update their combat systems are considerable. As a result, the ships are retired between twenty and thirty years of service, if not before.

65 To save costs, the Navy subsequently removed the ships' aging medium-range guided missile launching system, converting the ships into basic frigates.

66 Two of these stations are sized to store either one helicopter or up to three vertically-launched unmanned aerial vehicles (UAVs); two are sized to store an 11-meter boat, unmanned surface vessel (USV) or unmanned underwater vehicle (UUV); two are sized to store a 7-meter boat, USV, or UUV; and three are designed to store either vertical-launch missile cells or automatic cannons. The rest can carry either stand-alone sensors such as deployable acoustic arrays or mission sensors for any of the aforementioned off-board systems; or a standard 8x8x20-foot shipping container carrying either parts, sensors, or other logistical support items.

67 For a complete discussion of the LCS, see Robert O. Work, *Naval Transformation and the Littoral Combat Ship* (Washington, D.C.: Center for Strategic and Budgetary Assessments, 2004).

Two different LCS sea frames are now in production. One team, led by General Dynamics, is building a 420-foot-long aluminum trimaran, while the other team, led by Lockheed Martin, is building a 380-foot-long steel semi-planing mono-hull. Both will have full load displacements around 3,000 tons, and have drafts of less than 15 feet, which will allow them to operate extremely close to shore. They will be operated by a core crew of approximately forty officers and sailors, and will carry a navigation system and an open architecture C4ISR suite that allows them to plug into a naval battle network in order to receive data from other battle network platforms and sensors and to share the data derived from their own systems. Each sea frame is also equipped with the equipment necessary to handle, launch and recover boats, unmanned surface vehicles (USVs) and unmanned underwater vehicles; an extra-large flight deck and aviation hangar capable of storing either two MH-60 helicopters or three unmanned aerial vehicles, or a combination of both; and a basic self-defense suite consisting of a 57 mm rapid-fire cannon, a close-in missile defense system consisting of both hard and soft-kill systems and .50 caliber machine guns.

The Navy conceives of the new Littoral Combat Ship less as a traditional warship than as "the Swiss Army knife of the TFBN," capable of being configured and used for a variety of purposes that would normally require a full set of completely different tools.

At this point, the Navy plans to have three different types of mission packages for the sea frames. Each mission package crew, counting its aviation detachment, should have no more than thirty-five personnel. The Navy hopes an LCS equipped with armed helicopters and unmanned aerial systems, vertically-launched guided missiles, 30 mm rapid-fire cannons, and armed unmanned surface vehicles will become the scourge of small enemy craft and suicide boats that threaten larger, high-value ships operating close to shore. With a mission package consisting of an embarked helicopter, unmanned underwater vehicles and USVs equipped with sonar and anti-submarine torpedoes, it hopes an LCS will be able to find and sink quiet diesel-electric submarines operating in shallow littoral waters. It hopes a mission package containing helicopters, UUVs, and USVs equipped with the proper sensors and weapons will transform the LCS into a capable mine warfare ship. In other words, the Navy conceives of the new Littoral Combat Ship less as a traditional warship than as "the Swiss Army knife of the TFBN," capable of being configured and used for a variety of purposes that would normally require a full set of completely different tools (hulls).

By de-coupling the mission packages and their crews from the sea frame and its core crew, the Navy also hopes to be able to swiftly reconfigure LCS mission packages without any delays for crew retraining or mission familiarization. The plan is for an LCS configured for one mission to enter port and to swap out its mission package and crew for a new one. As this is happening, the core crew replenishes the sea frame and makes ready for sea. In this way, an LCS might be able to set sail, prepared for a completely different mission, in as little as twenty-four hours. With high sprint speeds of over 40 knots, the ships will also be able to sail quickly to their operating areas.

The Navy plans to fully exploit the LCS's unique design features by maintaining additional core crews and mission packages and core crews. Current plans call for the TFBN to have four core sea frame crews for every three LCS sea frames, and a total of sixty-four different mission packages and crews: twenty-four mine warfare packages, twenty-four anti-submarine warfare packages, and sixteen anti-boat packages.[68] In other words, at any given time, with a planned fleet size of fifty-five sea frames, the Navy will have a total of eighteen additional core crews and nine additional mission packages. By rotating four core crews among every three sea frames, the Navy estimates that it will take only three LCSs to keep one LCS operating forward in a distant theater. This compares to the normal composite ratio of five ships to keep one ship forward. As a result, fifty-five LCSs manned with multiple crews will provide the same number of peacetime deployed days as a fleet of eighty-seven single-crewed ships.[69] Moreover, by maintaining the extra mission packages and crews at forward bases, these forward-deployed ships will be able to reconfigure quickly for required missions.[70]

By maintaining the extra mission packages and crews at forward bases, these forward-deployed ships will be able to reconfigure quickly for required missions.

Because it can configure for a specialized mission, and aided by a high degree of shipboard automation, an LCS will operate with a combined crew (core crew, mission crew, and aviation detachment) of only 75 officers and sailors. This compares to combined crews of 237, 83, and 53 personnel on the Perry frigates, Avenger mine countermeasures ships, and Osprey coastal minehunters, respectively.[71] Even when counting the eighteen extra core and nine extra mission package crews, the 55-ship/64-mission package LCS fleet will require nearly 3,800 fewer personnel to man than the 56 single-crewed legacy ships it will replace. This will result in significant TFBN life-cycle savings.

Despite its exciting promise, the LCS program has run into troubled waters. Congress authorized the first Lockheed Martin sea frame in FY 2005, followed by the first General Dynamics sea frame in FY 2006. To hold down costs, both sea frames were originally designed to modified commercial standards, with not-to-exceed cost targets of $220 million (FY 2005 dollars). The Navy also hoped to quickly ramp LCS production up to six ships per year, and to have all fifty-five ships in active service by FY 2018. However, the Navy decided to change both designs to incorporate more rigorous damage control standards. Although the result was a more robust and survivable ship, the stricter standards and the inevitable disruption to the ambitious LCS development timeline caused costs to spiral and production timelines to slip. The new

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68 Rebekah Gordon, "Before the Hulls are Ready . . . Littoral Combat Ship Modules to be Tested on Other Vessels. *Inside the Navy*, May 12, 2008, p. 1.

69 The Navy has announced that it hopes to keep 23 LCSs constantly deployed, counting seven based in Japan. It will take 48 multiple-crewed LCSs based in the continental United States and Hawaii to maintain the remaining 16 forward (48 divided by three). It would take 80 single-crewed LCSs to maintain 16 ships forward (80 divided by five). See Congressional Budget Office, "Crew Rotation in the Navy: The Long Term Effect on Forward Presence." Oct. 2007, primary author Dr. Eric Labs.

70 The new multiple-crewing and mission package swap out concepts developed for the LCS have yet to be proven in the fleet. Many questions remain about their viability.

71 These are average numbers; crew sizes for active and reserve ships differ slightly.

not-to-exceed cost for follow-on sea frames has more than doubled, to $460 million (FY 2008 dollars).[72]

The ship will also arrive later than planned, which will cause some TFBN inventory management problems. To save money, the Navy retired all twelve Osprey-class coastal minehunters by FY 2007, leaving the active mine warfare fleet with only fourteen Avenger-class mine countermeasure ships. With the thirty Oliver Hazard Perry-class frigates still in commission, the Navy is currently eleven ships short of its 55-ship TFBN requirement for littoral combat ships. The original aggressive LCS production plan would have allowed the Navy to make up this shortfall by FY 2011 (twenty-nine Perrys; fifteen LCSs; and fourteen Avengers). However, LCS program delays will mean that the Navy will not be able to keep up with the pace of upcoming retirements for the Perry-class frigates. As a result, the shortfall in littoral combat ship capacity will grow to twenty-one ships in FY 2015, and the TFBN will not reach its 55-ship objective until FY 2022 — ten years later than originally planned.

Amphibious Warfare and Maritime Prepositioning Force Ships

By the end of the Cold War, the "600-ship Navy" had a requirement for about seventy-five amphibious ships capable of lifting the assault echelons of a Marine Expeditionary Force (built around a Marine division and air wing) and a Marine Expeditionary Brigade (built around a Marine regiment and air group).[73] These seventy-five ships were included as part of the official fleet count for the "600-ship Navy."

The Navy also operated thirteen maritime prepositioning force (MPF) ships, configured into three squadrons. Conceived of and procured during the 1980s, each MPF squadron was filled with the equipment, ammunition, and supplies to support a Marine brigade in combat for thirty days. During a crisis, a squadron would sail from its forward anchorage to a port near the expected operating area and the marines associated with the embarked equipment would fly to a nearby airfield from bases outside the theater. The marines would then marry up with and prepare their equipment for combat, and move to the sound of the guns. In other words, the MPF squadrons provided the amphibious landing force with a rapid reinforcement/maneuver support capability. When conditions permitted, they could also operate independently of the amphibious force, as proven during the 1991 Gulf War.[74] However, because the ships were considered part of the sealift force, they were not a part of the "600-ship Navy."

Since the end of the Cold War, the Navy and Marine Corps have engaged in an ongoing debate over the proper size and ship mix for TFBN naval maneuver and maneuver

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[72] See Ron O'Rourke, Congressional Research Service (CRS), "Navy Littoral Combat Ship (LCS) Program: Background, Oversight Issues, and Options for Congress," CRS Report to Congress, Report Code RL33741, updated May 23, 2008,

[73] At the time, these units were known as Marine Amphibious Forces (MAFs) and Brigades (MABs).

[74] See "Maritime Prepositioning Ships (MPS), available online at http://www.globalsecurity.org/military/systems/ship/sealift-mps.htm, accessed August 28. 2008.

support fleet. In the early 1990s, the judgment of both Navy and Marine Corps officers was that the fleet should maintain the capability to land three Marine Expeditionary Brigades (MEBs). However, because of post-Cold War budgetary constraints, the fleet lift requirement was set at 2.5 MEBs. At the same time, each MPF squadron received an extra ship, increasing the total number of MPF ships to sixteen.

The 1997 QDR outlined a future amphibious fleet able to meet the 2.5-MEB lift requirement, and the 2001 QDR affirmed it. The landing fleet would have a total of thirty-six ships, including:

> Twelve "big-deck" amphibious assault ships (LHAs and LHDs), which are very large (approximately 40,000 tons FLD) multi-mission ships that resemble small aircraft carriers, with full-length flight decks and islands on their starboard sides.[75] By 2001, the Navy had achieved their force structure target, with five Tarawa-class LHAs and seven Wasp-class LHDs in service. However, the Tarawa-class LHAs, commissioned over a five-year period from 1976 to 1980, would reach the end of their 35-year service lives between 2011 and 2015. An LHA replacement plan was required if the Navy intended to keep the big-deck fleet at twelve ships.

> Twelve dock landing ships (LSDs), optimized for landing craft operations. In 2001, the LSD fleet including eight ships of Whidbey Island-class and four ships of the Harpers Ferry-class.[76] The Navy commissioned all twelve of these LSDs between 1985 and 1998. With anticipated service lives of forty years, their replacements—referred to as LSD(X)s—would not need to start building before 2020.

> Twelve amphibious transport docks (LPDs), multi-mission platforms capable of supporting both rotary-wing aircraft and landing craft. In 2001, the fleet consisted of eleven aging Austin-class LPDs, one short of requirement. As these ships were all commissioned between 1965 and 1971, they were either past or nearing their 35-year expected service lives. They were to be replaced by twelve new LPD-17s, the first of which was to be commissioned in 2002.[77]

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75 In addition to carrying over forty rotary-wing aircraft or twenty STOVL strike-fighters, or a combination of both, these ships have berthing space for approximately 1,700 marines, considerable storage space for vehicles and supplies, and a large floodable docking well for displacement and air-cushioned landing craft.

76 The former carry 560 marines, a fair amount of vehicles and equipment, and a small flight deck with no hangar facilities. However, they have capacious docking wells that can hold up to four air-cushioned landing craft (LCAC). The four Harpers Ferry-class ships are variants of the Whidbey Island LSDs that trade the docking well space for two LCACs for additional cargo space.

77 With full load displacements of 25,300 tons, the LPD-17s were described as the functional replacement for forty-one legacy amphibious ships of four different classes. They were designed to carry approximately 700 marines, nearly 25,000 square feet of vehicles, and two LCACs. They would also have a good-sized flight deck and a helicopter hangar. Congress authorized the first of class, the USS *San Antonio*, in FY 1996, with a projected delivery date of September 2002.

During peacetime, these thirty-six amphibious ships would be organized into twelve 3-ship amphibious ready groups (with one ship of each type) capable of carrying a task-organized Marine Expeditionary Unit. After the 2001 QDR, the Navy announced these amphibious ready groups would be accompanied by surface escorts, forming co-called Expeditionary Strike Groups (ESGs). The twelve ESGs would be augmented by the sixteen cargo ships organized into three MPF squadrons. This combined TFBN naval maneuver and rapid reinforcement/maneuver support fleet could lift 5.5 MEBs. As was the case during the Cold War, the MPF ships did not officially contribute to the TFBN ship count.

Soon after the 2001 QDR, however, this plan started to unravel. First, the delivery date of the first LPD-17, USS *San Antonio,* was delayed several times. As it turned out, the ship did not commission until 2006, ten years after being authorized. Furthermore, it experienced a 160-percent cost overrun and was delivered to the Navy in shockingly bad condition. While follow-on ships of the class have fared better, the delays meant that aging Austin-class LPDs would have to continue in service longer than expected. Moreover, the bad experience helped to weaken the Navy's support for the ship. Second, Congress took the first step toward replacing the five Tarawa-class LHAs by authorizing an eighth LHD, an improved version of the Wasp-class. Third, and most consequentially, the Navy concluded that future amphibious assaults would be conducted primarily by aerial maneuver from ships located far over-the-horizon. This conclusion had one immediate and one long-term impact on plans for the future TFBN maneuver/maneuver support force. The near-term result was that the replacements for the remaining four *Tarawa*-class ships, now known collectively as the LHA-6 class, would lose their docking wells and be optimized for carrying STOVL jet aircraft and the rotary-wing and tilt-rotor aircraft needed for the aerial delivery of marines. The long-term result was that the Navy believed that future MPF (MPFF) ships could participate in amphibious assaults, and become operational TFBN assets. This meant the ships would now count toward the TFBN ship requirement, and could compete directly with the more expensive amphibious ships for the amphibious assault mission.

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In 2005, the Navy announced the future landing force would consist of seventeen to twenty-four amphibious warships and up to twenty MPFF ships. This plan was met with stiff opposition by the Marine Corps, which never accepted the argument that amphibious warships and MPFF ships were interchangeable for amphibious assaults. As a result, after the 2006 QDR, the Navy announced the naval maneuver fleet would consist of thirty-one amphibious ships and one 12-ship MPFF squadron. The amphibious fleet would consist of nine LHDs/LHAs, ten LPD-17s, and twelve LSDs. In peacetime, these ships would be organized in nine 3-ship ESGs, leaving four LPDs/LSDs for global presence operations or independent missions. The twelve MPFF ships included three additional LHDs/LHAs loaded with short take-off/vertical landing jet aircraft, rotary-wing aircraft, and marines and their equipment;[78] three new Large Medium-speed Roll-on/Roll-off (LMSR) cargo ships, packed with the majority of the MEB's vehicles;[79] three T-AKE dry cargo/ammunition ships, loaded with thirty days of ammunition and supplies;[80] and three specially-designed Mobile Landing Platforms with space for up to six air-cushioned landing craft, which would serve as the squadron's at-sea intermediate transfer station for marines, vehicles, equipment.[81] Together, the amphibious landing fleet and MPFF squadron could lift a total of three MEBs.[82]

The naval maneuver fleet would continue to be supported by one or two legacy MPF squadrons, which would continue to provide a rapid reinforcement capability for naval maneuver forces. Consistent with past practice, however, the ships in these squadrons would be considered sealift ships and not included in the official TFBN ship count; nor would two densely-packed MPF ships that would routinely operate as part of the MPFF squadron. Depending on the final number of legacy MPF squadrons in the TFBN, the entire naval maneuver fleet would be able to lift either four or five MEBs.

Between 2006 and 2008, the Navy's plans changed once again. After a thorough review, OSD decided that the MPFF squadron would *not* be used directly in future amphibious assaults. Instead, they would flow in behind and reinforce the landing operations of the amphibious fleet, or operate independently in benign environments. At the same time, the Marine Corps successfully argued that a two-MEB amphibious assault would require a minimum of thirty-three ships, including eleven LHD/LHAs, eleven LPD-17s, and eleven LSDs (e.g., eleven ESGs). Because of these events, in its FY 2009 shipbuilding plan, the Navy deferred two of the three planned MPFF T-AKE dry/cargo ships from their shipbuilding plans, pending further review of the MPFF concept. This dropped the planned size of the MPFF squadron from twelve to

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78 Because these ships would not generally operate independently, these ships would not have all of the command and control and combat systems found on the LHDs/LHAs in the amphibious fleet. In all other respects, they would be identical to them.

79 As a result of experience in the First Gulf War (1990–91), DoD decided to upgrade the strategic sealift fleet. One concrete outcome was the building/conversion of nineteen LMSRs to offset the shortage of militarily useful cargo ships available in the commercial sector. These are among the largest sealift ships in the world. Each can carry an entire U.S. Army Task Force, including 58 tanks, 48 other tracked vehicles, as well as more than 900 trucks and other wheeled vehicles. The three new MPFF LMSRs would be variants of these 19 vessels. See "LMSR Fact Sheet," available online at http://www.msc.navy.mil/N00P/Savannah/fact-lmsr.htm, accessed on September 1, 2008.

80 These ships will be discussed in greater detail in the upcoming section devoted to the Navy's combat logistics force.

81 These will be large Flow-on/Flow-off (FLO-FLO) ships that can be ballasted down to allow landing craft operations. See "Mobile Landing Platform/Intermediate Transfer Station," available online at http://www.globalsecurity.org/military/systems/ship/mlp.htm, accessed on September 2, 2008.

82 The amphibious landing fleet could land two MEBs; the MPFF could support one "seabased" MEB.

ten ships, which would be achieved in FY 2022.[83] The Navy also pushed back some planned amphibious ship retirement dates to cover shortfalls in the LPD and big-deck numbers, and announced it would begin building big-deck amphibious assault ships at a sustained rate of one every three years, starting in FY 2014. Finally, the Navy announced it would begin building new LSD(X)s at a sustained rate of one every other year starting in FY 2016. When taken together, these moves ensured that the active amphibious landing fleet would remain close to the overall 33-ship amphibious force requirement, and would never fall below thirty-two ships in any year after FY 2010. However, the exact force mix would never quite match up with the "11-11-11" mix desired by the Marine Corps.[84]

Combat Logistics and Support Ships

Combat logistics force (CLF) ships transfer fuel, stores (e.g. food and spare parts), and selected ordnance to warships at sea.[85] By so doing, they allow the warships to operate for extended periods of time without returning to port for replenishment. CLF ships are typically divided into station ships and shuttle ships. The station ships are preferably large, high-speed, "triple-product" logistics ship with the speed to keep pace with a Carrier Strike Group.[86] They meet the immediate replenishment needs for CSG ships. Shuttle ships sail from forward logistics bases to deployed strike groups, topping off both station ships as well as warships during each shuttle run, before returning to prepare for the next replenishment mission. Throughout the Cold War, shuttle ships came in three distinct types of "single-product" ships: fleet oilers that carried ship and aviation fuel; combat store ships that carried supply parts, food, and other consumable supplies; and ammunition ships. If station ships were unavailable for a CSG, a fleet oiler and ammunition ship could be used as a station ship substitute, albeit with penalties to capabilities and speed.

During the 1990s, the Navy decided to transfer all active CLF ships to the Military Sealift Command (MSC). As a result, all of today's CLF ships are operated by the MSC

[83] In its FY 2009 shipbuilding plan, the Navy requested funding for an eleventh and twelfth T-AKE. The eleventh ship is to go to the combat logistic force; the twelfth will go to the MPFF, rounding out the programmed ten-ship squadron (three LHDs/LHAs; three LMSRs; three MLPS; and one T-AKE). If follow-on analysis shows that the MPFF should continue to have T-AKEs, then two more will be built, increasing the MPFF squadron from ten to twelve ships (three LHDs/LHAs; three LMSRs; three MLPS; and three T-AKEs). However, if subsequent analysis shows the MPFF should not have T-AKEs, the MPFF squadron requirement will fall to nine ships and the twelfth T-AKE will be transferred to the combat logistic force. The fact that the FY 2009 plan does not include three T-AKEs may indicate the Navy assumes that the MPFF T-AKE requirement will go away.

[84] "Report to Congress on Annual Long-Range Plan for Construction of Naval Vessels for FY 2009," p. 7.

[85] The US Navy experimented with replenishing missiles at sea, but concluded that the rearming of surface combatant VLS cells would have to occur in a port or protected anchorage. Therefore only gun and air-delivered ordnance is transferred at sea.

[86] A "triple-product ship" carries fuel oil, supplies and stores, and ammunition.

as US Naval Service ships.[87] Although these ships are all crewed and operated primarily by civil service mariners (augmented by small active-duty Navy communications, ordnance handling, and helicopter detachments), they still count toward the TFBN's 313 ship requirement. Manning MSC ships with civilian contract mariners provides two important payoffs for the TFBN. First, it frees up expensive active-duty personnel to perform other duties.[88] Second, civilian mariners are not constrained by the personnel tempo rules that dictate the maximum amount of time active-duty sailors are allowed to be away from their homeports. This means that MSC-crewed ships can spend nearly 80 percent of their time at sea. In contrast, Navy-crewed ships typically spend about 24 percent of their time at sea. As a result, MSC ships can maintain extremely high in-service rates and operational tempos during peacetime, rivaled only by TFBN SSBNs, which are manned by dual crews.[89]

Also in the 1990s, the Navy designed a flexible new type of "triple-product" shuttle ship that could carry 5,900 tons of dry cargo—including dry food, refrigerated food, supplies, or ammunition—as well as 18,000 barrels of fuel (10,000 barrels of ship fuel and 8,000 barrels of jet fuel). With full load displacements of 35,400 tons, these ships, now known as Lewis and Clark-class dry cargo/ammunition ships (T-AKEs), are about twice as big as the ammunition and store ships they were designed to replace. Due to both the higher availability of MSC-operated CLF ships and the added size and capability of the new T-AKE, the Navy was able to reduce its overall target for TFBN combat logistics ships to thirty: four purpose-built T-AOE station ships; eleven T-AKEs; and fifteen fleet oilers (T-AOs). As stated earlier, an eleven-carrier force can generate six CSGs in thirty days and one more within ninety. Since a T-AKE and T-AO can perform as a station ship substitute, this implies the future station ship requirement is four T-AOEs, three T-AKEs, and three oilers. The remaining eight T-AKEs and twelve oilers would serve in the shuttle ship role.

The TFBN is now transitioning to this new CLF fleet. Today's CLF fleet consists of thirty-two ships: four T-AOEs, four store ships, five ammunition ships, five T-AKEs, and fourteen oilers. A fifteenth oiler in reduced operating service is not included in the 32-ship count. The final transition to the T-AKE and to the objective requirement for thirty CLF ships will be complete by FY 2014 (by activating the fifteenth oiler). The

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87 US Naval Service (USNS) ships are identified by a "T" in front of their normal class designator. For example, a fleet oiler operated by an active duty Navy crew would have a designator AO. When operated by the MSC, the same ship would be identified as a T-AO.

88 For example, large fast combat support ships (AOEs) require a crew of 541 active-duty Navy personnel. The same ship operated by the MSC (T-AOE) has a crew of 176 civil service mariners and 59 active-duty sailors. The smaller crew reflects both the experience of the civilian mariners and the MSC policy of substituting overtime for additional crew members. In other words, shifting a Fast Combat Support Ship from the active Navy to the MSC frees up nearly 500 active-duty personnel for service elsewhere in the TFBN. "MSC Commander Envisions a Sea Base with Air Express Service into the War Zone," *Seapower*, May 2003, pp. 26–27.

89 During wartime or major combat operations, personnel tempo rules are waived for all officers and sailors.

Navy then plans to replace its oilers and T-AOEs on a one-for-one basis, maintaining the CLF indefinitely at thirty ships.[90]

The Navy's 313-ship TFBN requirement for support ships includes twenty ships: two command ships; two submarine tenders, used to support SSNs and SSGNs operating in forward theaters; four fleet tugs and four salvage ships, designed to remove damaged ships from forward theaters; four ocean surveillance ships, equipped with long passive towed sonar arrays that support fleet anti-submarine operations; and four high-speed transports designed for the rapid movement of troops and equipment. The high-speed transports include three smaller Joint High Speed Vessels (JHSVs) optimized for intra-theater lift, and one larger Joint High-Speed Ship for the rapid transport of US Marine Corps helicopters to forward theaters.

The FY 2009 long-range shipbuilding plan includes three modifications that indicate the requirement for support ships has changed. First, the Navy increased its planned JHSV purchase from three to seven ships to support forward theater security cooperation efforts. Second, the Navy cancelled its plan to build the larger Joint High-Speed Ship. Third, the Navy now plans to maintain five ocean surveillance ships instead of four. Reflecting these new plans, the support fleet stabilizes at twenty-four ships in FY 2019, and remains at this higher number thereafter.

A NEW TFBN SHIP TARGET?

As these plans suggest, the stated TFBN target of 313 ships is best thought of as a general planning guideline rather than a firm planning target. Indeed, the foregoing review of the Navy's plans suggests the true TFBN ship target is a range that falls between 311 and 317 ships, as indicated in Figure 3.

Based on Figure 3, if current US Navy plans come to fruition:

> Except for a three-year period between November 2012 and September 2015, the aircraft carrier fleet will never fall below the objective requirement for eleven CVNs. The fleet will be above requirement (twelve carriers) from FY 2019 on.

> The SSBN fleet will remain two boats above its twelve-boat target objective until FY 2027. It falls to twelve boats in FY 2030, and remains at this level thereafter.

> The tactical submarine fleet remains above its 52-boat target through FY 2021, at which point it begins to fall below requirement, bottoming out at forty-one boats (forty-one SSNs, zero SSGNs) in FY 2028. The force rebounds to fifty-two boats (all SSNs) in FY 2036. The longer-term force level will depend on whether the Navy decides to replace the four SSGNs, raise the long-term tactical submarine target to fifty-two SSNs, or let the tactical submarine remain at just forty-eight boats.

90 As explained earlier, if subsequent analysis shows that the MPFF squadron should not have T-AKEs, then the single T-AKE now being built for the MPFF would shift to the CLF, and raise the overall CLF target to thirty-one ships.

> The surface combatant fleet will reach eighty-four guided-missile cruisers and destroyers by FY 2011, four short of the 88-ship objective requirement. Future numbers will depend on whether or not Congress approves the Navy's plan to truncate the DDG-1000 program, re-start the Burke-class DDG production line, and delay the start of CG(X), and whether or not the Navy changes its overall requirement for guided-missile cruisers and destroyers.

> The littoral combat ship fleet will not meet or exceed its 55-ship requirement until FY 2022. After this time, the fleet remains at fifty-five ships.

> The amphibious landing fleet will remain within one ship of its objective target of thirty-three ships after FY 2010, but with variations from the desired mix of ships. Under current plans, the MPFF will reach ten ships in FY 2022. Pending the results of ongoing analysis on MPFF requirements for T-AKEs, the MPFF force target may increase to twelve ships, or fall to nine ships.[91]

[91] Once again, *if* analysis shows the MPFF needs T-AKEs, the requirement for T-AKEs in the MPFF will jump to three, and the overall MPFF squadron requirement will jump to twelve ships. If it shows the MPFF does not need T-AKEs, the MPFF squadron requirement will drop to nine ships and combat logistics force requirement will increase to twelve ships.

FIGURE 3. **NAVY'S REVISED OBJECTIVE TFBN SHIP REQUIREMENT**

Type/Class	Required	Description
Aircraft Carriers	11	Mixture of Nimitz and Ford-class CVNs
Strategic Ballistic Missile Submarines	12	Ohio-class SSBNs, transitioning to SSBN(X)s
Tactical Submarines (SSNs and SSGNs)	48–52	Current force target is for 48 SSNs and 4 SSGNs. However, unless fleet experience proves otherwise, the 4 active SSGNs now in service will be retired in the late 2020s without replacement
Large Surface Combatants	88	Includes 19 CGs and 69 DDGs
Littoral Combat Ships	55	Sea frames (hulls) only
Amphibious Warfare Ships	33	Includes 11 LHD/LHAs, 11 LPD-s, 11 LSDs
Maritime Prepositioning Force (Future)	9–12	Includes 3 modified LHD/LHAs; 3 LMSRs; 3 Mobile Landing Platforms (MLPs); and 0-3 T-AKEs
Combat Logistics Force	31–30	Includes 15 T-AOs, 4 T-AOEs, and 11-12 T-AKEs
Support Vessels	24	Includes 2 Amphibious Command Ships (LCCs), 2 Submarine Tenders (ASs), 4 Rescue and Salvage Ships (ARSs), 4 Fleet Ocean Tugs (T-ATFs), 5 Ocean Surveillance Ships (T-AGOS), and 7 Joint High Speed Vessels (JHSVs)

> Depending on the MPFF T-AKE analysis, the CLF requirement will be either thirty or thirty-one ships. The CLF will remain within one or two ships of requirement until about FY 2013/2014, after which it stabilizes on requirement—and in the proper mix. The support fleet will reach its 24-ship target in FY 2017.

Note that between now and FY 2020 only three categories of ships remain substantially below their requirements: the MPFF squadron, support ships, and littoral combat ships. However, as the Navy builds the new MPFF squadron, the Navy and Marine Corps can substitute a legacy MPF squadron, albeit with less operational flexibility. Furthermore, the shortfall in support ships occurs only in JHSVs; the other five ship types remain at or over requirement. The shortfall of littoral combat ships, ranging between eight and twenty-one ships between now and 2020 (against a requirement for fifty-five ships), is more problematic. However, in times of crisis, allied navies will often contribute ships that can adequately cover this shortfall.

In a world of naval battle networks, counting ships will never give an adequate picture of the Navy's full range of combat capabilities.

Beyond 2020, the only category of ships that falls well below its TFBN requirement is nuclear-powered attack submarines. The Navy could largely eliminate this shortfall by moving to a build-rate of three SSNs per year between FY 2011 and 2020. However, the Navy has judged the risks of a SSN shortfall in the 2020s to be manageable, and prefers to use the funds that would be used to build a third submarine per year to procure other ships. In summary, despite being below the overall TFBN requirement of 311–317 ships, the current 280-ship fleet is in very solid shape by individual ship category.

OTHER TFBN CAPABILITIES

One must always remember, however, that in a world of naval battle networks, counting ships will never give an adequate picture of the Navy's full range of combat capabilities. Time precludes going over every other non-ship component of the TFBN, but six bear mentioning:

NAVAL SPECIAL WARFARE FORCES. Naval Special Warfare (NSW) forces carry out maritime special operations missions in support of fleet and theater commanders. Current NSW forces include four Navy Special Warfare Groups. Two of the groups consist of four SEa-Air-Land (SEAL) Teams, each with eight 16-man SEAL Platoons. SEAL Teams are highly trained special operations forces, and can perform a variety of demanding missions, with a particular proficiency in aquatic environments. The other two Groups support the SEAL Teams with special delivery and support craft. One Group contains two SEAL Delivery Vehicle Teams, each with three SEAL Delivery Vehicle/Dry Deck Shelter (SDV/DDS) Task Units, which can be assigned to either a SSN or SSGN. The other Group consists of three Special Boat Teams, which operate a variety of small ships and craft and specialize in the clandestine delivery of SEAL units.[92]

NAVAL EXPEDITIONARY COMBAT COMMAND. Created in January 2006, the Naval Expeditionary Combat Command (NECC) is a Navy "type command" responsible for preparing task-organized maritime expeditionary support units in support of joint conventional and irregular warfare campaigns. These maritime support units include capabilities vital to operations on both the seaward and landward sides of the littorals such as: maritime security force units; riverine squadrons; construction battalions; explosive ordnance disposal units; expeditionary logistics support units; maritime civil affairs units; guard units; intelligence-gathering units; and expeditionary training groups. In addition to supporting ongoing operations against radical Islamist extremists, NECC units lead the Navy's efforts to build naval partnership capacities and capabilities in support of the new maritime strategic concept.[93]

P-8A POSEIDON MULTI-MISSION MARITIME AIRCRAFT. The P-8A is the successor to the famous land-based P-3 Orion anti-submarine maritime patrol aircraft. At the height of the Cold War, twenty-four active and thirteen reserve Navy patrol squadrons operated 333 of these four-engine turboprop aircraft from air bases all over the world. Today, 196 P-3s remain in service, but they are nearing the end of their useful lives and are increasingly difficult to maintain. They will be replaced by 108 P-8As, a variant of the Boeing 737 two-engine jet airliner, which will operate at higher cruise speeds and operating altitudes than the propeller-driven P-3, and be able to remain four hours on station at ranges up to 1,200 nm from base. The plane will carry a variety of sensors used for the detection, classification, identification, and targeting of ships and submarines. The plane will also have one hundred antennas for communications and electronic intelligence-gathering and be able to carry up to 126 sonobuoys and eleven weapons, including land-attack cruise missiles and air-dropped torpedoes. To allow the aircraft to "plug into" future naval battle networks, it will have two different network data-links and access to satellite broadcast intelligence. Initial operating capability is expected in FY 2013.[94]

BROAD AREA MARITIME SURVEILLANCE (BAMS) UAS. One reason that 108 P-8As can replace 196 P-3s is that they will operate alongside sixty-eight new

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[92] Two of the boat teams operate the 82-foot long Mk V Special Operations Craft, capable of extremely high-speed (50+ knot), long-range (100-300) mile insertions, and specially modified 11-meter special operations capable rigid hull inflatable boats. The third team is optimized for insertions and support of SEAL Teams in rivers and deltas with light patrol boats, special operations craft-riverine, and assault carriers. See Naval Special Warfare Command website, available online at https://www.navsoc.navy.mil/, accessed on August 6, 2008.

[93] See "Optimized NECC Command Brief," dated October 10, 2007.

[94] Robert Wall, "Priming Poseidon," *Aviation Week and Space Technology*, June 23, 2008, p. 44.

BAMS unmanned aerial systems—modified versions of the proven and successful land-based RQ-4 Global Hawk unmanned aerial vehicle. These large, high-altitude (60,000-feet), land-based UAVs will introduce a brand new capability to the Navy's TFBN. Equipped with an advanced 360-degree maritime surveillance radar, and capable of operating for twenty-four hours at patrol stations located 2,000 nm from their bases, these aircraft will be able to sweep over and monitor thousands of square miles of ocean per day. When co-located with P-8A aircraft at bases around the globe, detachments of five to eight BAMS UASs will thus provide the Navy with persistent airborne surveillance over nearly all the world's highest-density sea-lanes and littoral areas of interest. In addition to their surveillance systems, all BAMS UASs will carry a wideband internet protocol transponder, providing battle network communications relay services for all US naval vessels in their field of view. Initial operating capability for this new maritime surveillance platform is expected in FY 2015.[95]

THE MH-60R/S HELICOPTER PROGRAM. Helicopters have long performed a variety of critical battle network functions: maritime surveillance, anti-surface warfare, anti-submarine warfare, airborne mine countermeasures, logistics support, special operations support, and combat search and rescue (CSAR). The Navy is consolidating all of the legacy helicopters that performed some of these functions into two different versions of the same airframe: the MH-60R Strikehawk and the MH-60S Knighthawk. The Strikehawk is optimized for surveillance, anti-surface and anti-submarine warfare.[96] It carries a dedicated data-link that allows it to share its sensor data with TFBN ships, as well as other battle network data links. The Knighthawk is optimized for logistics support, mine countermeasures, weapons platform, casualty evacuation, and CSAR roles.[97] As mentioned earlier, each Carrier Strike Group will be supported by a nineteen-plane mixed MH-60R/S detachment, with eight of the helicopters normally operating from accompanying carrier surface escorts. Independent surface action groups and LCSs will also operate both aircraft, and CLF and amphibious ships will operate the MH-60S. Reflecting their great operational value to the TFBN, the Navy now plans on buying 569 of the helicopters: 298 MH-60Rs and 271 MH-60Ss.[98]

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95 "See Broad Area Maritime Surveillance (BAMS)," available online at http://www.globalsecurity.org/intell/systems/bams.htm, accessed on August 9, 2008. See also "Navy Restarts BAMS Work," *Aviation Week and Space Technology*, August 18/15 2008. pp. 24–25.

96 The MH-60Rs will carry an EO/IR turret; a multi-mode surveillance radar; a low frequency dipping sonar; twenty-five active and passive sonobuoys; and an electronics support measures system. They can be armed with either Hellfire missiles or air-dropped torpedoes. Graham Warwick, "Double Bill," *Aviation Week and Space Technology*," June 16, 2008, pp. 51–52.

97 The MH-60S has wide cabin doors and can lift a 6,000-pound external load. It can also carry a variety of airborne mine countermeasure systems and weapons. Warwick, "Double Bill," pp. 51–52.

98 Ibid.

THE MQ-9B FIRE SCOUT UNMANNED AERIAL SYSTEM. As previously described, the LCS is a new type of small, modular, battle network combatant. Its sea frame carries three different mission packages that consist largely of different manned and unmanned offboard systems. However, all three packages have one thing in common: a 23-man aviation detachment that will typically operate either an MH-60R or an MH-60S helicopter, and up to three MQ-8B Fire Scout vertical takeoff and landing unmanned aerial systems. The Fire Scouts will be able to land and take off autonomously from their host LCS and fly out to patrol stations located up to 110 nm from their ship, where they can remain for five hours, operating from sea level to altitudes as high as 25,000 feet. The Fire Scouts will initially be ISR platforms, extending an LCS's eyes and ears to ranges well over the horizon.[99] Future versions may carry multi-spectral mine detection sensors, communications/signals intelligence collection systems, synthetic aperture radars, sonobuoy dispensers, and air-to-surface weapons.[100]

Today's active fleet of 280 ships is by far the most powerful naval force in the world, enjoying at least a thirteen-navy standard in combat capability.

One can easily envision, then, a future Global Maritime Surveillance and Response Network, with tiered levels of capability. The first tier would consist of the persistent maritime surveillance provided by the BAMS system, which is ideally suited for long-duration surveillance missions. The second tier would consist of P-8A Poseidons, operating from a series of distributed global bases. With cueing from the BAMS and their high cruise speeds, these aircraft will be able to reach targets of interest relatively quickly. The third tier would consist of forward-deployed Littoral Combat Ships and SSNs, which could sprint to and establish an overt or covert watch over a designated high-value target using either onboard sensors or offboard systems such as the Firescout. If boarding was required, an LCS could launch either a fast surface craft or helicopter with a boarding team. Operating a similar global surveillance and response network using just surface ships and submarines would require hundreds of additional platforms. This simple example helps to explain why counting the number of ships in active commission is no longer the only nor the best way to judge the full capabilities of the evolving Total Force Battle Network.

SUMMING UP

Today's active fleet of 280 ships is by far the most powerful naval force in the world, enjoying at least a thirteen-navy standard in combat capability. When adding the full range of capabilities resident in the Navy's evolving Total Force Battle Network, as well as the support the TFBN receives from the broader Joint Total Force Battle

[99] Fire Scouts will initially have an EO/IR system with an integrated laser range finder that can send full motion video back to its host LCS, and communications relay radios. Warwick, "Double Bill," pp. 51–52. See also "MQ-8B Navy Firescout," available online at http://www.is.northropgrumman.com/systems/mq8bfirescout_navy.html, accessed August 7, 2008.

[100] Ibid.

Network, the Navy most likely enjoys an even greater advantage. As a result, it is in absolutely no danger of losing the number one spot among world naval powers. One would likely have to go back to the end of World War II, right after the combined US and British fleets had destroyed the Imperial Japanese and German Navies, to find a time when the US lead in world-wide naval power was so wide.

However, the Navy no longer judges the adequacy of its fleet by comparing it to foreign navies. It instead makes plans to build its fleet to a two-war standard. Based on classified analyses on likely conflict scenarios, and when factoring in all naval, joint support, and forward-presence requirements, the Navy has concluded that the future TFBN must include between 311 and 317 ships and other supporting capabilities.

The foregoing plans reflect a balancing act among all individual ship categories that contribute to the overall TFBN ship target. If the Navy executes its existing plans, the TFBN will exceed 311 ships sometime between FY 2018 and FY 2020. In the interim, only three ship categories will fall substantially short of their individual targets: the MPFF squadron, JHSVs, and LCSs. However, only one of these shortages—in LCSs—looks to be problematic, and even it can likely be dealt with without incurring excessive risk.

At first glance, then, the US Navy plans for its Total Force Battle Network appear to be on solid footing. Or are they?

CHAPTER 2 > WHAT MUST THE FUTURE TFBN BE ABLE TO DO?

The previous chapter reported the Navy's plans for its future Total Force Battle Network without critique. This chapter aims to establish benchmarks against which these plans can be judged. It does so by posing two fundamental questions. First, given the Navy's new maritime strategic concept and the expected future national security environment, what tasks must the future TFBN be able to perform? Second, are Navy plans consistent with expected future budgets? Only by answering these two questions can policymakers assess the adequacy of Navy plans and judge the size and the makeup of the Navy's future Total Force Battle Network.

The following sections will offer CSBA's answers to these two important questions. They will help shape the recommended changes to the Navy's plans found in the final chapter.

WHAT TASKS WILL THE FUTURE TFBN BE EXPECTED TO PERFORM?

As discussed, recent US national military strategies require the Navy to build and maintain a TFBN large and capable enough to meet all peacetime forward-presence requirements and to fight and win two regional wars in overlapping timeframes. Over a decade's worth of Navy analysis has consistently shown that the combined requirements for presence and war call for an active fleet of somewhere between 300 and 346 warships of all types. The current planning target is for 311–317 ships.

Lacking access to the classified campaign and presence models used to derive naval force requirements, it is very difficult to tell what assumptions the Navy is making about future requirements for forward presence, potential future adversaries, or the specific types of operational challenges that it will face. However, it bears noting that since the Korean War, the entire body of US Navy combat experience consists of supporting joint campaigns ashore against adversaries who have lacked either a navy of their own, or any means to contest naval forces operating off of their coasts. During the latter stages of the Cold War, the Navy did grapple with the problem of projecting power against a Soviet adversary with both powerful naval forces as well as formidable land-based anti-carrier forces. Since 1989, however, with the implosion of the Soviet Union and the demise of its powerful blue-water fleet, the US Navy has been able to use high-capacity missile and air strikes to support joint forces ashore with relative impunity.[101] Moreover, in light of the fact that all US campaigns since Korea have benefited from access to ports and air bases in the theaters of operations, the demand for naval maneuver has not been high. As a result, it seems safe to say that the current battle force is optimized for joint power-projection operations in theaters with accessible ports and land bases against adversaries with weak navies and minimal land-based anti-navy capabilities.

The stability of fleet plans suggests that the Navy's planning process assumes that the capabilities of potential adversaries will remain relatively static over time.

Moreover, the very consistency of the Navy's analytical results over the past decade and a half suggests that the Navy's force planning process may have a decidedly short-term focus. As outlined in the preface, and as will soon be discussed in detail, the Navy must be able to address three major existing or emerging future national security challenges: supporting the ongoing struggle against violent radical Islamist extremists and their terrorist networks, hedging against a more openly confrontational China (or Russia), and preparing to face regional adversaries armed with nuclear weapons. These three challenges will present the Navy with operational challenges far different from the ones it has traditionally faced, particularly since the end of the Cold War. Despite this, Navy ship plans have changed only on the margins since 1993, and especially since 1997. For example, since the 1997 QDR, carrier force levels have remained locked at eleven to twelve ships, the requirement for Aegis/VLS combatants has varied slightly between eighty-four and eighty-eight ships, and the target for tactical submarines has varied from fifty to fifty-five boats. Fifty-five Littoral Combat Ships will replace fifty-six frigates and mine warfare ships, and three amphibious warships have been traded for ten MPFF ships. The only ship program that has seen substantial change over this time period is the DD-21/DD(X)/DDG-1000—and these changes have had as much to do with to the ship's ever-rising cost as anything else. The stability of fleet plans suggests that the Navy's planning process assumes that the capabilities of potential adversaries will remain relatively static over time.

Finally, it is important to note that all of the Navy's plans and numbers were developed before the writing and publication of the new *Cooperative Strategy for 21st Century Seapower*, which one might presume will have some impact on the size, shape, and character of the future TFBN. As a result, one has to question if current Navy plans fully portray projected future requirements for both presence and wartime tasks. The following sections attempt to discern these requirements, first by

[101] The post-World War II history of naval operations and the operational bias toward operating in uncontested naval environments is discussed in detail in Ehrhard and Work, *Range, Persistence, Stealth, and Networking: the Case for a Carrier-Based Unmanned Combat Air System.*

reviewing the Navy's strategic concept, and then by considering both the tasks associated with the three big US national security challenges and several evident trends in naval warfare.

A New Strategic Concept: Preventing Wars

The armed forces of the United States exist to support national security objectives, and the most fundamental of these (defend the homeland and overseas territories; promote security; deter conflict; and win the nation's wars) change little over time. Ultimately, any future TFBN must help achieve these vital objectives.

As discussed, the three Sea Services—the US Navy, US Marine Corps, and US Coast Guard—recently published a new joint maritime strategy that aims to explain their expected national security roles. In reality, this "strategy" is more accurately a *strategic concept*, defined by Samuel P. Huntington as a Service's collective purpose or role in implementing national policy.[102] As he said, "This concept is a description of how, when, and where the military service expects to protect the nation against some threat to its security."[103]

A good strategic concept garners public approval and support for the Services and helps to shape the character of each Service.

In Huntington's formulation, the strategic concept is the most "fundamental" of three different elements associated with any military Service, because, "If a military service does not possess such a concept, it becomes purposeless, it wallows about amid a variety of conflicting and confusing goals, and ultimately it suffers both physical and moral degeneration." The second element is the "resources, human and material," which are required to implement a Service's strategic concept. This element depends heavily on public understanding and support for the strategic concept. The third and final element is the Service's organizational structure—including overall size, capabilities, and capacities—best suited to implement the strategic concept. As is evident, then, a good strategic concept garners public approval and support for the Services (and therefore resources), and helps to shape the character of each Service.[104]

Within this context, how well does the recently published *Cooperative Strategy for 21st Century Seapower* do as a strategic concept? On the positive side, it fully embraces the indirect strategic approach first outlined in the 2005 National Defense Strategy and 2006 Quadrennial Defense Review. Indeed, it takes this approach one step further by declaring, "Preventing wars is as important as winning wars." It therefore emphasizes building the maritime capabilities and capacities of friendly and allied nations and working with "navies and coast guards around the world to police

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[102] This thought is more fully explored in Robert O. Work and Jan van Tol, *A Cooperative Strategy for 21st Century Seapower: An Assessment*, Center for Strategic and Budgetary Assessments Backgrounder, dated March 26, 2008. This backgrounder can be accessed at the CSBA website, located at http://www.csbaonline.org/2006-1/recent.shtml.

[103] Samuel P. Huntington, "National Policy and the Transoceanic Navy," *United States Naval Institute Proceedings,* May 1954, p. 483.

[104] Ibid.

Routine forward deployments and steady partnership-building activities give the joint force the ability to conduct proactive humanitarian assistance and rapid disaster-relief operations, to gain regional cultural awareness and intelligence, and to provide immediate operational access to distant littorals.

the global commons and suppress common threats." Suppressing these threats helps enhance global security, create the conditions for an enduring peace, and protect the American homeland. Additionally, "By participating routinely and predictably in cooperative activities, maritime forces will be postured to support other joint or combined forces to mitigate or localize [regional] disruptions" before they can impact the "global system."[105]

This is a clever expansion of arguments long made by the Sea Services on the value of persistent forward presence in overseas theaters. These arguments bore fruit when, during the 1993 Bottom-Up Review, the Office of the Secretary of Defense agreed with the Navy and Marine Corps that US "aircraft carriers, amphibious ships, and other naval combatants [will be] sized to reflect the exigencies of overseas presence, as well as the warfighting requirements of [major regional wars]."[106] However, the new maritime concept skillfully advances the broader benefits of forward presence in a globalized world. It does so by emphasizing how routine forward deployments and steady partnership-building activities give the joint force the ability to conduct proactive humanitarian assistance and rapid disaster-relief operations (and thereby establish favorable security conditions), to gain regional cultural awareness and intelligence, and to provide immediate operational access to distant littorals, if necessary.

Consistent with the theme of protecting the global system and preventing war, this strategic concept calls for "combat-credible," mission-tailored, and networked forces to be continuously deployed in the Western Pacific and Arabian/Persian Gulf, and for "increased peacetime activities" in Africa and the Western Hemisphere (Central and South America). Although the bulk of "combat-credible" naval power is concentrated in just two theaters, the concept makes plain that naval forces can be "selectively and rapidly repositioned to meet contingencies that may arise elsewhere."[107]

Importantly, the only way to implement this vision on a global scale is to pursue "an unprecedented level of integration among [US] maritime forces." The concept therefore strongly endorses the aforementioned idea of a National Fleet consisting of Navy and Coast Guard capabilities, and mentions that marines will once again be deployed on a variety of different ship types. In addition, it states that the United States will "maintain a robust strategic sealift capability to rapidly concentrate and sustain forces, and to enable joint and/or combined campaigns."[108]

Navy officials have implied that this new maritime concept of sustained forward presence and proactive maritime security, partnership capacity building, and humanitarian relief operations will require a larger fleet than that suggested by recent analyses. For example, as Admiral Roughead, the current Chief of Naval Operations,

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[105] Work and van Tol, *A Cooperative Strategy for 21st Century Seapower*, pp. 9–10.

[106] Les Aspin, Secretary of Defense, Report on the Bottom-Up Review, October 1993, available online at http://www.fas.org/man/docs/bur/index.html, accessed on August 10, 2008.

[107] Work and van Tol, *A Cooperative Strategy for 21st Century Seapower*, pp. 5–9.

[108] Ibid., pp. 2, 12.

recently commented, "the 313-ship Navy will not be enough for the missions that we're going to be tasked with in the coming years."[109] However, the Navy has not been explicit in outlining expected future tasks, or the number or types of ships and supporting capabilities needed to accomplish them.

Winning Wars

One fundamental theme of the *Cooperative Strategy for 21st Century Seapower* is that preventing wars is as important as winning them, and the report explains in a general sense how the three Sea Services will work toward that end. However, it provides little guidance regarding the converse premise, namely that winning wars, tautologically, is as important as preventing wars. Indeed, the concept is largely silent on how the three Sea Services will help win the war we are in (the ongoing struggle against violent Islamic extremists), which specific wars the three Sea Services are most interested in preventing, and the unique contributions the Services might make in future joint campaigns. Neither does it highlight what capabilities and capacities it will need from the other Services to accomplish its own missions.

These omissions are problematic. As Huntington explained, the fundamental aim of any strategic concept is to describe "how, when, and where the military service expects to protect the nation *against the most pressing threats to its security*" (emphasis added).[110] By failing to discuss what the Sea Services believe to be the most pressing national security threats or the most stressing future operational challenges, the report falls short as a guide for the developing the future fleet. Indeed, the concept is so broad as to justify almost any future TFBN fleet number the Navy might announce. Therefore, before judging the adequacy of Navy plans, it is necessary to identify the most consequential threats and challenges the future TFBN might face.

As outlined in the preface, the first of fifteen monographs associated with CSBA's *Strategy for the Long Haul* argues that the future joint force must, first and foremost, be able to meet the military demands associated with three key long-term strategic challenges: defeating radical Islamist extremists and their terrorist networks; countering the rise of authoritarian capitalist states, particularly a more openly confrontational China (or Russia); and hedging against the specter of a world in which weapons of mass destruction—particularly nuclear weapons—are more widely proliferated.[111]

One fundamental theme of the *Cooperative Strategy for 21st Century Seapower* is that preventing wars is as important as winning them; however, it provides little guidance regarding the converse premise, namely that winning wars, tautologically, is as important as preventing wars.

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[109] "CNO: 313-ship Fleet Represents a Minimum," *Associated Press*, January 8, 2008.

[110] Huntington, "National Policy and the Transoceanic Navy," p. 483.

[111] The joint force will also be tasked to defend the homeland, a core aim of any US national defense strategy. However, for the purposes of this report, this mission is considered to be an integral component of each of the three sub-strategies needed to deal with the above three major challenges.

The TFBN must be sized and configured to support future joint power-projection networks under conditions of uncertain access.

Clearly, the Navy's TFBN will have important roles to play when responding to each of these three challenges.[112]

At a minimum, the Navy's TFBN will normally be in the leading echelon of joint power-projection operations associated with any of these three key national security challenges. Unfortunately, while securing access to key regions, lines of communication, and the global commons is central to US strategic aims,[113] the recent strategic concept makes short shrift of the importance of maintaining US command of the seas, or of exploiting command of the seas through seabasing. Indeed, the idea of seabasing—defined herein as leveraging command of the seas by using the world's oceans and littoral waters as a secure base of operations for global power-projection operations—is hardly mentioned in the concept. The Navy explains this omission by referring to seabasing as a program (e.g., MPFF ships) rather than a fundamental maritime concept. This is a shortsighted view, and one that undercuts the importance of the Sea Services in an international environment in which the number of overseas US bases is declining. Under these circumstances, the TFBN must be sized and configured to support future joint power-projection networks under conditions of uncertain access. In turn, this implies a greater need for naval maneuver; seaborne movement of troops, vehicles, and equipment; and defensive and offensive fires and logistical sustainment from the sea.[114]

In addition to meeting the joint requirements demanded by these three strategic challenges and a future with less certain access in forward theaters, the TFBN must also be prepared to deal with three emerging trends in naval warfare. The first is the rise of powerful new land-based maritime reconnaissance-strike networks. As discussed earlier, since the end of World War II, and particularly since the fall of the Soviet Union, US naval operations both on the high seas and in littoral waters have been largely uncontested by foreign navies or shore-based forces. As a result, the fleet is now optimized to support joint operations ashore with high-capacity air and missile strikes and naval maneuver from operating areas located relatively close to an enemy's coast. However, the steadily maturing guided weapons/battle network revolution will soon allow land powers to exert control over ever-increasing swaths of contiguous waters. For example, in addition to long-range strike aircraft and submarines armed

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112 For a complete overview of these strategic challenges, see Andrew Krepinevich, Robert Martinage, and Robert Work, *The Challenges to US National Security*, the first monograph of the Center for Strategic and Budgetary Assessments' series that presents a "Strategy for the Long Haul."

113 For example, the 2005 National Defense Strategy said: "Our ability to operate in and from the global commons—space, international waters and airspace, and cyberspace—is important. It enables us to project power anywhere in the world from secure bases of operation. Our capacity to operate in and from the strategic commons is critical to the direct defense of the United States and its partners and provides a stabilizing influence in key regions. Such capacity provides our forces operational freedom of action. *Ceding our historic maritime advantage would unacceptably limit our global reach"* (emphasis added)." See Donald H. Rumsfeld, *National Defense Strategy of the United States* (Washington, DC: Office of the Secretary of Defense, March 2005), p. 13.

114 Work and van Tol, *A Cooperative Strategy for 21st Century Seapower: An Assessment*, p. 21.

with deadly long-range anti-ship cruise missiles, the Chinese are developing anti-ship ballistic missiles with effective ranges beyond 1,000 nm as well as the targeting networks to employ them.[115] As a result, the contested zone along the world's littorals is expanding, and the risk for surface naval forces operating in these zones is rising.

The Navy must shape and prepare its future TFBN to operate in the face of these deadly new maritime reconnaissance-strike networks. This will require a minimum of four things:

> First, the Navy must perfect coordinated battle network operations involving its own air, surface, and undersea forces, as well as US Air Force and US Special Operations Forces. Indeed, the Navy, Air Force, and special operations community would do well to collaborate in the development of new a *AirSea Battle doctrine* against emerging maritime recon-strike networks, which threaten not only ships at sea but all operating bases in forward theaters. Like AirLand Battle doctrine in the 1980s, this new doctrinal framework would help guide the development and integration of future Navy and Air Force operational concepts, tactics, and platforms.

> Second, the TFBN will need to become adept at operating in an opposed network environment, in which actions taken to blind or collapse an adversary's network will often determine the ultimate outcome of battle. This will require the Navy to develop the tactics, techniques, and procedures for future *Outer Network Battle*—operations designed to deny an enemy network the ability to reliably target and attack US naval forces, and to enable continued US strikes and operations.

> Third, future US Carrier Strike Groups and surface action groups must be able to operate and fight from much longer ranges than they do today. In the guided weapons/battle network regime, offensive weapons have an inherent advantage in naval warfare. If only one missile per incoming salvo gets through, one ship will likely be destroyed or put out of action. This puts an extremely high burden on fleet air and missile defenses. On the other hand, since missile range is dependent on cost, salvo density is a function of range. By operating from greater ranges, the future TFBN will take many enemy missiles completely out of the fight, and at the same time maximize the effectiveness of fleet air, cruise missile, and ballistic missile defenses.

> Fourth, the Navy's approach to missile defense must include much more than ballistic missile defense interceptors. The surface Navy would likely lose a missile duel between inbound anti-ship ballistic missiles launched from shore and anti-ballistic missile interceptors launched from ships. Offensive guided missiles generally have an advantage over defensive guided missiles, especially when fired in

The contested zone along the world's littorals is expanding, and the risk for surface naval forces operating in these zones is rising.

[115] See for example Roger Cliff, et al, *Entering the Dragon's Lair: Chinese Anti-Access Strategies and Their Implications for the United States* (Santa Monica, CA: RAND Corporation, 2007).

salvos. Naval forces normally fire two interceptors at each inbound missile. Since land-based missile forces are largely unconstrained by space, they will enjoy an inherent advantage in "depth of magazine" over naval forces. In a prolonged missile duel, this advantage will likely be decisive. One way to offset this advantage would be to develop shipboard directed energy anti-missile weapons with "infinite magazines." However, it is unlikely that such weapons will be ready for fleet service any time soon. As a result, naval task forces will need means to blind the ballistic missiles' targeting systems, and to spoof, deceive, or lure inbound missiles away from their intended targets. As a hedge against these "soft-kill" methods working less effectively than planned, the Navy will also need to develop other "hard-kill" solutions. For example, a stealthy N-UCAS armed with interceptors capable of destroying ballistic missiles during their most vulnerable boost phase might prove to be a particularly useful defensive system. The point here is that ballistic missile defense will likely become an increasingly important TFBN requirement, and will require a layered and integrated "system-of-systems" approach.

Since the demise of the Soviet navy US naval operations have been based on an assumption of assured undersea superiority.

The second major naval challenge is occurring in the undersea environment. Command of the seas depends heavily on achieving and maintaining undersea superiority. In littoral waters and maritime chokepoints, this requires an ability to counter underwater mines, while in deeper waters the ability to counter submarines is paramount. With the advent of nuclear power, the air-independent submarine became the most dangerous naval predator. Accordingly, during the Cold War, the US Navy waged a long struggle for undersea superiority against a formidable Soviet submarine fleet. Since the demise of the Soviet navy, however, US naval operations have been based on an assumption of assured undersea superiority. As a result, US submariners now concentrate far more on intelligence-gathering, special operations support, and covert land attacks than on anti-submarine warfare. Now, however, the nature of the undersea competition is changing:[116]

> New diesel-electric submarines augmented with non-nuclear air independent propulsion systems can patrol in their operating areas for weeks at a time without having to come to the surface to recharge their batteries (the most vulnerable operation for diesel-electric boats while on patrol). Moreover, they are extremely quiet when submerged. As a result, it takes far more time to "sanitize" an operating area for surface ships, and it is more difficult to prevent subsequent penetrations of supposedly safe areas by adversary submarines. To further complicate the US submariner's task, the greatly improved acoustic stealth of diesel-electric submarines reduces undersea detection and engagement ranges, making sub-on-sub encounters far more risky. The prospect of trading a $2+ billion nuclear submarine

116 The following paragraphs reflect conclusions based on an ongoing comprehensive undersea warfare assessment conducted by the Office of Net Assessment, Office of the Secretary of Defense. The author has supported this assessment since 2002.

for a $500 million diesel-electric boat in an undersea fight is not a happy one for the US submarine force.

> Future coastal powers may soon be able to erect multi-dimensional undersea combat networks as part of their broader maritime recon-strike networks, consisting of ubiquitous bottom and water column sensors, submarines, unmanned underwater vehicles, anti-submarine warfare ships and aircraft. To defeat these undersea networks, the US Navy will likely need to assemble undersea combat networks of its own, with new unmanned underwater vehicles and deployable sensors, and perhaps small manned submersibles. The collision of these undersea combat networks is likely to increasingly define the future of undersea warfare, at least in littoral waters. Under these circumstances, any coastal adversary able to repopulate destroyed network sensors and systems will accrue a decided "home field advantage" against a US TFBN that must bring its combat network with it.

> The undersea environment is itself undergoing substantive change, primarily because of the appearance of two new strategic undersea target sets: offshore and subsea energy infrastructure, and undersea fiber-optic telecommunications cables. At the turn of the twentieth century, naval operations routinely included plans to cut undersea telegraphic cables to deny an enemy strategic and operational communications. With the advent of high-frequency radio telegraphy and telephony, the need for such planning waned. Now naval planners must once again consider how to attack and defend the undersea energy platforms and telecommunications cables that fuel and enable globalization and factor this mission into force-sizing calculations.[117]

The above trends may suggest that the relative degree of US undersea advantage is eroding.

As a result of these three relatively recent occurrences, the United States must now review its assumptions about assured undersea superiority. For example, despite the fact that the current two-navy force ratio between US and the combined Russian and Chinese submarine fleets is better than the one-navy force ratio between the US and Soviet submarine fleets in the Cold War, the above trends may suggest that the relative degree of US undersea advantage is eroding.

Finally, the United States may be on the leading edge of a broader, longer-term global naval competition, with either China or Russia, or perhaps both. In this regard, China is now the largest builder of merchant ships in the world, and it has embarked on an impressive buildup of naval warfighting capabilities—many of them directly targeting the US fleet. Meanwhile, the US naval design and industrial base is under significant pressure due to limited ship design opportunities and relatively small production runs. This is the first time since 1890 that the US Navy is faced

[117] At least one navy is already factoring in defense of offshore infrastructure in its force structure calculations. See "Full-scale Military Exercise to Defend Brazil's Offshore Oil," *Merco Press*, August 16, 2008.

with the prospect of competing against a potentially hostile naval power possessing a shipbuilding capacity that is equal to, if not superior, to its own. To hedge against an intensification of global maritime competition, the Navy must shape its shipbuilding plans to ensure the long-term viability of the US shipbuilding industry.

Thus, as is readily evident, the Navy's future TFBN must be able to respond to an extremely broad and demanding array of challenges. These challenges can be described in terms of specific missions and tasks. The next section attempts to spell them out as concretely as possible.

Future Missions and Tasks

The Navy's future TFBN must be able to respond to an extremely broad and demanding array of challenges.

Based on the foregoing discussion, the future TFBN must have the capability and capacity to:

> MAINTAIN "COMBAT-CREDIBLE" FORWARD PRESENCE IN THE INDIAN OCEAN AND WESTERN PACIFIC. In practical terms, this means maintaining a Carrier Strike Group, an Expeditionary Strike Group, several tactical submarines (SSNs or SSGNs), and Theater Air and Missile Defense (TAMD) surface action groups (SAGs) on continuous patrol in both of these high-priority regions. As they have since the late 1940s, these forward-deployed naval forces will help to deter foreign aggression and often form the leading echelon of any joint crisis response operation.[118]

> CREATE FAVORABLE REGIONAL SECURITY CONDITIONS AND HELP WIN THE STRUGGLE AGAINST VIOLENT RADICAL ISLAMIST EXTREMISTS AND THEIR TERRORIST NETWORKS. One of the Navy's top priorities should be to help defeat both the Sunni Takfiri and Shia Khomeinist strains of radical Islam, and contribute to an evolving Joint Global Counterterrorism Network designed to suppress future extremist and terrorist activities and attacks. This involves supporting ongoing US campaigns in Iraq and Afghanistan in the near- to mid-term. Over the longer term, and consistent with a move toward a more indirect national security strategy that emphasizes fighting terrorists by, with and through others, Navy capabilities and capacities—particularly those of the Naval Special Warfare Command and the Naval Expeditionary Combat Command—should be expanded to support several Global Fleet Stations.[119] Forces assigned to these stations would operate with

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[118] The Navy started referring to "combat credible" forward presence soon after World War II, and it has been a hallmark of US naval forward presence operations since then. See Peter M. Swartz, *Sea Changes: Transforming U.S. Navy Deployment Strategy, 1775–2002* (Alexandria, VA: Center for Naval Analysis, July 31, 2002).

[119] The Navy began referring to "Global Fleet Stations" in 2005-2006, under then Chief of Naval Operations Admiral Mike Mullen. These were to provide persistent presence in littoral regions around the world. More recently, since the publication of the *Cooperative Strategy for 21st Century Seapower*, the Navy has also referred to Global Fleet stations as Regional Partnership Stations.

foreign navies and help build their ability to operate on the brown waters of rivers and deltas, green waters close to shore, and blue waters of their exclusive economic zones. They would also support Marine Corps security assistance teams operating ashore. In the process, they would help to improve the overall global security environment. Furthermore, while performing their day-to-day missions, forces assigned to Global Fleet Stations could gather intelligence about local threats and feed information directly into the broader Joint Global Counterterrorist Network. In areas where terrorists are active, these forces could also support Navy SEAL Teams and other SOF, as well as conventional joint forces operating ashore.[120]

> PREPARE TO FIGHT AND WIN TWO CONFLICTS IN OVERLAPPING TIMEFRAMES. For force sizing and shaping, the TFBN should concentrate on two specific contingencies:

- FIGHTING AGAINST A CONTINENTAL-SIZED REGIONAL ADVERSARY WITH AN ADVANCED MARITIME RECONNAISSANCE-STRIKE NETWORK. US grand strategy seeks to avoid/deter war with other great powers, and to defeat them if deterrence fails. As discussed above, this means the future TFBN must be prepared to operate in the face of deadly new multidimensional maritime battle networks. Only the most powerful states, such as China or perhaps Russia, will be able to build battle networks on a scale comparable with the United States. Moreover, many of their supporting capabilities will be arrayed throughout the depth and breadth of their large territories. The Navy and the joint force must therefore be prepared to conduct counter-network operations over continent-size landmasses. At the moment, the pacing threat for this preparation is the burgeoning maritime recon-strike network that China is building in the Western Pacific.

- FIGHTING AGAINST A MID-SIZED NUCLEAR-ARMED ADVERSARY. US grand strategy aims to forestall the proliferation of weapons of mass destruction (WMD), especially nuclear weapons, through a variety of means. Indeed, a key aim of the evolving Joint Global Counterterrorism Network will be to keep these destructive weapons from falling into the hands of non-state actors. However, the joint force must hedge against the possibility that a rogue state will acquire nuclear weapons and threaten to use them. Accordingly, the Navy must be prepared to support a large-scale joint WMD elimination operation. Additionally, the fleet must be prepared to support consequence management operations in the event of a nuclear attack or explosion. The pacing threat for this requirement is a nuclear-armed Iran or North Korea. However, as the most stressing

[120] For a thorough explanation of the Global Fleet Station Concept, see "Global Fleet Stations Concept of Operations (CONOPS)," United States Fleet Forces Command, March 10, 2008.

condition would be overlapping wars in distant theaters, Iran would be a better choice for force planning purposes.

- HEDGE AGAINST POTENTIAL RADICAL CHANGES IN UNDERSEA WARFARE. The Navy must be ready to fight for control of the undersea realm in ways it has not had to since the end of the Cold War. As discussed above, future multidimensional maritime battle networks will likely include undersea combat networks. This will require that the TFBN develop deployable undersea combat networks of its own, consisting of submarines, small manned and unmanned underwater vehicles, autonomous underwater vehicles (AUVs), and deployable sensors, all operating in conjunction with P-8A Multi-mission Maritime Aircraft, Broad Area Maritime Surveillance systems, shipborne ASW helicopters and aircraft, as well as surface ships. The Navy must also once again consider how the missions of attacking and defending undersea infrastructure might change future TFBN requirements. These new requirements call for a robust and sustained undersea warfare research and development effort.
- MAINTAIN A RESEARCH AND DEVELOPMENT PROGRAM AND A DESIGN AND INDUSTRIAL BASE CAPABLE OF RESPONDING TO A MORE CONCERTED FUTURE GLOBAL MARITIME CHALLENGE. There is no guarantee that such a challenge will materialize. However, having a robust research and development program and a healthy shipbuilding base with a prudent level of spare capacity will ensure that the Navy will be able to respond to the challenge if and when it does arrive. This means that shipbuilding plans should be made with an eye toward maintaining a healthy national shipbuilding capability.

ARE NAVY PLANS AFFORDABLE?

Having derived the tasks that the future TFBN will be expected to do, this section addresses the second of the fundamental questions posed at the beginning of this chapter: are Navy plans consistent with expected future budgets? The Navy's desired TFBN could match up perfectly against the operational requirements, but unless the plans to build its associated ships and aircraft are affordable, the desired TFBN will be more dream than achievable reality. In this regard, the signs are that the Navy's plans are far too ambitious given likely future resource allocations.

The first problem is that the Navy has, until very recently, dramatically underestimated the costs associated with its plans. In FY 2007, the Navy estimated that the thirty-year shipbuilding plan needed to expand the fleet to 313 ships would cost approximately $15 billion a year. However, the Congressional Budget Office (CBO) estimated the true costs to be closer to $22 billion a year. Last year, the CBO estimated that the FY 2008 version of the Navy's thirty-year shipbuilding plan was underfunded, on average, by 35 percent per year. The Navy dismissed the CBO projections, referring to them as either "worst-case" or "extremely conservative" estimates. Tellingly, despite having only slightly deviated from their earlier plans, the Navy recently raised the total projected cost for its new FY 2009 plan by 44 percent in inflation-adjusted dollars. As a result, its estimates are now only 7 percent less than the new CBO estimates.[121] While it is perhaps heartening that the Navy's and CBO's estimates now roughly match, they both outline the need for a dramatic expansion in resources dedicated to US Navy shipbuilding.

The numbers are sobering. Between FY 2003 and FY 2008, the Navy spent an average of $11.1 billion a year for new-ship construction (in constant FY 2009 dollars). When including the costs for refueling and overhauling submarines and aircraft carriers, mission packages for LCSs, and other similar costs, the Navy spent an average of $12.6 billion a year in "total shipbuilding costs." In comparison, the Navy and CBO now project the average annual cost for new-ship construction alone will be $20.4 and $22.4 billion, respectively. Moreover, these costs do *not* include the substantial resources necessary to build the twelve replacements for the current strategic ballistic missile submarine boats. Adding in costs for SSBN(X) and other costs would increase the total yearly shipbuilding bill to somewhere between $25.2 and $26.9 billion. In other words, the Navy will need to double the historical average annual shipbuilding expenditures of the last five years if it has any hope of executing its current plans.[122]

While it is perhaps heartening that the Navy's and CBO's estimates now roughly match, they both outline the need for a dramatic expansion in resources dedicated to US Navy shipbuilding.

Since 2006, the Navy has maintained that it would be able to sustain higher expected shipbuilding costs by creating internal savings within its own overall budget "topline." For example, it hoped to: limit expenditures on research and development; hold spending on fleet operations and support to no more than the rate of inflation; hold spending on personnel to no more than the rate of inflation; eliminate any cost overruns on ship construction; and "fence" the shipbuilding accounts (i.e., maintain them at planned levels even if the overall Navy budget decreased). Since then, however, achieving any of these laudable goals has proven to be elusive. In addition, even if the Navy achieved every one of them, it could free up no more than $3-4 billion per year. This would be enough if the shipbuilding plan actually came in at the FY 2007 estimate of $15 billion a year; it would fall far short if the plan were to cost between $25 and $27 billion a year. As a result, Ronald O'Rourke recently concluded that:

> The new increase in the Navy's estimated cost for implementing the 30-year plan is so large that the Navy no longer appears to have a clearly identifiable, announced strategy for generating the funds needed to implement the 30-year plan, at least not without

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121 O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," p. 12.

122 Dr. Eric Labs, Congressional Budget Office, "Resource Implication of the Navy's FY 2009 Shipbuilding Plan, dated June 9, 2009, available online at http://www.cbo.gov/ftpdocs/93xx/doc9318/06-09-Shipbuilding_Letter.pdf, accessed on September 1, 2008, pp. 2–10.

significantly reducing funding for other Navy programs or increasing the Navy's programmed budget in coming years by billions of dollars per year.[123]

Some counter that simply by maintaining the defense budget at a constant 4 percent share of the gross domestic product (GDP) — a historically low and seemingly affordable figure — the additional money needed to fully fund the Navy's $25–27 billion plan would be readily available. On the surface, this is an attractive argument. A defense budget pegged at 4 percent GDP would increase the size of the overall base defense budget from its current level of about $541 billion (including DoD, Department of Energy and other defense activities) to some $725 billion by 2013 (about $670 billion in 2009 dollars). Put differently, moving the base defense budget to 4 percent of GDP and maintaining it at that level over the coming decade would add some $1.6 trillion in budget authority to the current defense plan through FY 2018 — more than enough to pay for the Navy's expanded plans, as well as those of the other Services.[124] However, over this same time frame, mandatory entitlement spending is also expected to rise. As a result, a commitment to spending 4 percent of GDP on defense would inevitably crowd out spending on domestic, diplomatic, foreign aid and homeland security programs. It is not at all clear that future administrations or the Congress would, or could, tolerate this. Making future plans based on more modest overall DoD budget therefore seems warranted.[125]

The Navy appears to be taking steps to make its plans more affordable, as reflected by its recent decision to truncate the DDG-1000 program at three ships, continue producing less expensive Arleigh Burke-class DDGs, and delay the FY 2011 start of the CG(X). Although the Navy justified these moves in terms of capability, concerns about affordability were clearly a factor. While these specific steps help alleviate near-term affordability worries, concerns over the plan's long-term fiscal viability remain.

These concerns multiply when considering that the projected yearly total shipbuilding costs of $25–27 billion do *not* include the replacement costs for those ships excluded from the current TFBN ship count. For example, as explained above, the thirty-one maritime prepositioning ships, including those found in the aforementioned Maritime Prepositioning Force, are considered "sealift" ships and do not contribute to the current count of 280 ships, despite their great contributions to power projection operations. Nor do the Navy's two hospital ships, which now support the new *Cooperative Strategic Concept for 21st Century Seapower* by embarking on proactive humanitarian relief missions; its eight Coastal Patrol ships (PCs), which

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[123] O'Rourke, "Navy Force Structure and Shipbuilding Plans: Background and Issues for Congress," p. 12.

[124] Steven M. Kosiak, "Analysis of Proposals to Allocate Four Percent of GDP to Defense," Center for Strategic and Budgetary Assessments Background, September 9, 2008, pp. 4–5.

[125] For a thorough discussion on future defense budgets, see Steven M. Kosiak, *US Defense Budget: Options and Choices for the Long Haul* (Washington, DC: Center for Strategic and Budgetary Assessments, 2008). Mr Kosiak projects that the overall defense budget will remain relatively flat over the next two decades.

are manned by active-duty Navy personnel and are invaluable for counterterrorism, maritime security, and partnership-building missions in the littorals; or the sixty-seven ships in the Navy's strategic sealift fleet.

By including these ships, and accurately counting all ships and deployable boat/vessel units that contribute to the Navy's and the nation's overall naval combat capability, as of August 1, 2008, the true TFBN ship count included 423 ships and deployable boat/vessel detachments—which together operate an additional 250 smaller boats and craft not reflected in the overall count (see Figure Four). This means the $25–27 billion needed to build the fleet underestimates the true scope of the Navy's shipbuilding problem. It seems clear, then, that the Navy needs to scale back its current plans; they are simply too ambitious for expected future budgets.[126]

[126] See for example Anthony H. Cordesman, *Abandon Ship: the Costly Illusion of Unaffordable Transformation*, Center for Strategic and International Studies, draft monograph dated August 4, 2008.

FIGURE 4. **TRUE TFBN SHIP COUNT AS OF 1 AUGUST, 2008**

Type/Class	Count	Description
Strategic Deterrent Fleet	14	Ohio-class SSBNs
Large Undersea Combat Systems (SSNs and SSGNs)	56	Includes 45 Los Angeles/Improved Los Angeles-class, 4 Virginia-class, and 3 Seawolf-class SSNs and 4 Ohio-class SSGNs
Large Tactical Aviation Seabases	11	10 CVNs, 1 CV, and 10 active air wings each with 75 fixed and rotary wing aircraft each
Large Battle Network Combatants	75	Includes 22 CGs and 53 DDGs, 47 with hangar facilities for Battle Network helicopters and UAVs
Small Battle Network Combatants	44	Includes 30 FF, 14 MCM and 0 LCSs
NSW/NECC Ships and Craft	50*	**Includes 8 PCs; 29 active and reserve boat detachments; 3 Riverine squadrons; 3 Special Boat Teams; 6 SEAL Delivery Vehicle/Dry Deck Shelter task units; and 1 Advanced SEAL Delivery System (ASDS)**
Naval Maneuver Ships	31	Includes 10 LHD/LHA(R), 12 LSD and 9 LPD
Naval Maneuver Support (Prepositioning) Ships	31	Includes **14 MPF ships** carrying Marine equipment; **10 prepositioning ships** carrying Army equipment; and **7 prepositioning ships** carrying other service/agency equipment
Joint Sealift Ships	68	Includes **8 Fast Sealift Ships (FSS), 11 LMSR, 27 RO/ROs, 2 LASH, 2 Heavy Lift, 2 Modular Cargo Delivery System Ships, 6 Transport Tankers, 6 Auxiliary Crane Ships; 4 Dry Cargo Ships**
Combat Logistics Force Ships	32	Includes 4 T-AOEs, 4 T-AFSs, 5 T-AEs, 5 T-AKEs and 14 T-AOs
Support Vessels	21	Includes 2 Command Ships (LCC), 2 Submarine Tenders (AS), **2 Hospital ships** (AH), 4 Salvage Ships (ARS), 4 Fleet Ocean Tugs (T-ATF), 5 Ocean Surveillance Ships (T-AGOS) and **2 High Speed Vessels**
Total Count	423	**Figures in bold are not now included in the Total Ship Battle Force count** * Except for the PCs and ASDS, these numbers denote deployable units with over 250 small craft

Thus, any recommended changes to the Navy's current plans must strive to both improve future TFBN capabilities and capacities while simultaneously lowering overall shipbuilding costs. Given the range of tasks the future TFBN must accomplish, this is far easier said than done. That said, the next chapter will outline some steps to achieve these two conflicting goals.

RETHINKING THE NATIONAL FLEET

Before presenting any alternative plans, however, one final point bears mentioning. As Figure 4 suggests, the current ship-counting rules are artifacts from the sea-control century, and need to be updated. Secretary John Lehman last modified them in the early 1980s as he strove to build the "600-ship Navy." In essence, he decided that only ships that would contribute toward the 600-ship goal would be those immediately available for *fleet action* against the Soviet Union and the Soviet Navy. These counting rules are a poor fit for the new, post-Cold War, two-war standard, which requires the Navy to support the entire joint force in addition to performing naval fire and maneuver. With the publication of the new maritime strategic concept, these rules are even more anachronistic. Under this concept, a Coastal Patrol ship building partnership capacity in the Gulf of Guinea or a hospital ship on a mission of peace are as important as an aircraft carrier launching strikes against a rogue state. Since all these ships contribute to overall Navy capability and capacity, they should now be included in any TFBN ship count.

However, even if the Navy adopted a new TFBN-ship-counting standard that included all ships and vessels that support the new maritime strategic concept or contribute to a joint power-projection campaign, that number would still under-represent the full maritime power of the United States. While such a count would provide a more accurate depiction of TFBN capabilities, it would continue to exclude the cutters, boats, and other craft of the US Coast Guard.

There is a simple way to remedy these accounting errors: keep track of the ship target for a truly integrated and interoperable National Fleet, to include the maritime capabilities and capacities of the US Navy, US Marine Corps, US Coast Guard, Military Sealift Command, and the nation's Ready Reserve Force of sealift ships. The overall National Fleet ship count would include the TFBN ship count in Figure Four, augmented by any Coast Guard vessel capable of deploying overseas in support of US objectives or a joint campaign. At a minimum, this would include all forty Coast Guard high and medium-endurance cutters, as well as 120 coastal patrol cutters and boats able to conduct maritime security operations in forward theaters. This would result in a National Fleet of 583 ships/units. If including smaller Navy and Coast Guard vessels that contribute to US homeland defense and forward security missions, the National Fleet would easily number over one thousand ships, boats, and craft.

CHAPTER 3 > **ASSESSMENT AND RECOMMENDATIONS**

ASSESSMENT

Based on the foregoing discussions, this chapter assesses the adequacy of the Navy's plans and suggests possible changes to them. These recommendations are shaped by the following assessments:

> The United States need not worry about losing global maritime superiority any time soon. Even with "only" 280 warships, the Navy's current Total Force Battle Network it still the most powerful naval force in the world by a wide margin. When considering the combined capabilities of the 583-ship National Fleet, as well as the support the Navy's TFBN receives from the broader Joint Total Force Battle Network, the margin of US naval superiority is even wider.

> The future TFBN should continue to be a two war-plus force, but with a more specific orientation. It must first be large and capable enough to support overlapping joint fights against a large, continental-sized adversary with advanced maritime recon-strike and undersea combat networks, and a mid-sized, nuclear-armed, regional adversary. The future TFBN should also be able to support operations against radical Islamist extremists and the evolving Joint Global Counterterrorist/Counterproliferation Network, as well as maintain persistent forward presence requirements for both combat-credible forces and proactive maritime security and partnership-building operations.

> Meeting the foregoing warfighting requirements is less about increasing ship numbers, and more about getting the right mix of TFBN capabilities and capacities. Moreover, while creating favorable security conditions and supporting the Joint Global Counterterrorist/Counterproliferation Network may require new thinking about naval forward presence, it will not require a major expansion of ships. The idea is to build partnership maritime capacity in the world's littorals, not to flood the world's littorals with US ships.

- To support persistent global maritime security operations as well as the Joint Global Counterterrorist/Counterproliferation Network, the Navy will need to establish a minimum of seven Global Fleet Stations: Caribbean and East Coast of South America (forward operating base in Florida); West Coast of Africa (forward operating site in Rota, Spain); East Coast of Africa (forward operating site in Djibouti); Southwest/South Asia (forward operating sites in Bahrain and Oman); Southeast Asia (forward operating site in Singapore); East Asia (forward operating site in Peleliu); and Western Pacific/Oceania (forward operating base in Guam). [Note: While these seven Global Fleet Stations are consistent with the new maritime strategic concept, they are not prescriptive. They represent a notional target for the force structure recommendations outlined later in this chapter. The final number of stations would depend upon operational experience.]
- Fighting against advanced multidimensional maritime recon-strike networks and against regional nuclear-armed adversaries will require the future aircraft carrier and surface combatant fleets to operate and fight from greater ranges than they do today.
- Future multidimensional maritime recon-strike networks will likely include increasingly sophisticated undersea combat networks. As a result, the tactical submarine fleet must develop a whole new generation of undersea weapons and capabilities including smaller multipurpose submarines (both manned and unmanned), vehicles and weapons.
- Seabasing is *not* about replacing land bases. In the context of a two-war standard, seabasing is about exploiting command of the seas to enable the rapid transoceanic expeditionary maneuver of *ready-to-fight* combat units and the rapid movement of personnel, goods, and services, thereby providing an interdependent joint force with a high degree of global freedom of action and *initial* operational independence from forward land bases.
- The idea of an integrated and interoperable National Fleet—incorporating the combined capabilities of the Navy, Marine Corps, Coast Guard, Military Sealift Command, and the strategic sealift fleet—is a powerful one that should be realized to the greatest possible degree.
- As a result of its great margin of maritime superiority, the United States can patiently and carefully assess the direction of the long-term global naval competition before making any dramatic changes to its force structure or organization. In the meantime, to strengthen its long-term competitiveness, the US Navy must invest in robust research and development while sustaining the country's naval design and industrial base. It must also work to reduce both costs for individual ships and projected expenditures for building and sustaining the fleet.

> The four best ways to reduce shipbuilding costs and conserve resources are: exploit ship and aircraft designs now in production to the fullest extent possible in order to benefit from learning curve efficiencies; reduce the total number of different ship types to accrue savings in training, maintenance, and logistics; reduce crew sizes, which are the largest driver of a ship's life cycle costs; and aggressively pursue improved networking capabilities, which provide added combat power well beyond mere numbers of platforms.

> Given expected future defense budgets, the levels of resources needed to support the Navy's current plan are unrealistic. Using the most conservative estimates (those of the Congressional Budget Office), the current Navy shipbuilding plan will require an average total shipbuilding budget of $26.9 billion a year, including the costs to replace the SSBN force. A more plausible total yearly shipbuilding target might be in the vicinity of $20 billion—a 25 percent reduction over the Navy's plan. Given the uncertainty over future defense budgets, assuming the Navy will receive even $20 billion a year for shipbuilding may be too optimistic. However, using this lower planning figure to guide the following recommendations will help demonstrate the difficult choices now facing the Navy.

RECOMMENDATIONS

Based on these assumptions, the Navy should consider making the following changes to the plan outlined in Chapter 2. These recommended changes use the true TFBN ship count in Figure 4 as their reference point, and this number should become the basis for future discussions on Navy capability and capacities. Unless indicated, all costs are expressed in FY 2009 constant dollars.

Although these recommendations are detailed, they are meant to be illustrative, not prescriptive. However, they are consistent with both the new maritime strategic concept, and would result in a more affordable TFBN that is better able to meet the tasks outlined in the previous chapter.

Strategic Deterrent Fleet

After completing the ongoing mid-life refueling cycle for the first twelve of fourteen Ohio-class SSBNs, the Navy should immediately reduce the strategic deterrent fleet to its final TFBN target of twelve boats. The first of these boats to leave commissioned service will be the USS *Henry M. Jackson*, in FY 2027 (October 2026). In order to maintain the fleet at twelve boats, Congress must authorize the first of the new next-generation SSBN(X)s no later than FY 2019. Therefore, work on the SSBN(X)'s design should commence immediately. This will also help to maintain the nation's submarine design base.

The argument that the SSBN(X) is a national asset and should be paid for with a defense-wide "tax" is not likely to be persuasive; similar arguments could be made by the Air Force for its space systems, intercontinental ballistic missiles, and strategic bombers. The Navy's share of a tax for these Air Force systems would likely offset any Navy receipts from a defense-wide tax for SSBN(X)s. Accordingly, the Navy should plan on having to pay for the new submarine out of its own budget. For planning purposes, the Navy should expect the new SSBN(X) to cost at least $6 billion, the CBO planning figure.

To help defray these considerable costs, the Navy should make every effort to collaborate with the British, who are also seeking to recapitalize their own strategic undersea deterrent fleet. The tie between the US and British submarine fleets is already strong. For example, the British SSBNs utilize the American-designed Trident submarine-launched ballistic missile, and US engineers helped to design the new British Astute-class SSN. Designing and building a common modular SSBN(X) would help reduce costs for both nations and navies.

The Navy should make every effort to collaborate with the British, who are also seeking to recapitalize their own strategic undersea deterrent fleet.

Holding the SSBN fleet at its target of twelve boats will free up two additional Ohio-class SSBNs for conversion into SSGNs. The next section will discuss the advantages of doing so.

Large Undersea Combat Systems

Maintaining undersea superiority is the key for enduring US naval superiority. Given the changing nature of undersea warfare and the emerging character of undersea combat networks, a TFBN target of fifty-two large undersea combat systems (forty-eight SSNs and four SSGNs) is a reasonable one at this time. The ultimate size and character of the battle network's future undersea force will depend entirely on the course of future undersea competition. The best thing to do now is to assume these large, expensive manned systems will be augmented in the future with many more smaller adjunct vehicles, including small manned undersea vehicles, autonomous underwater vehicles and other unmanned underwater systems, including distributed sensors and weapons pods. Accordingly, the Navy should begin a concerted research and development program for these types of systems, as well as a new generation of littoral anti-submarine weapons.

This effort is likely to pay far more dividends than increasing the submarine build rate to three boats per year in an effort to eliminate the future SSN/SSGN deficit that will occur between FY 2022 and FY 2036.[127] By building two submarines per year in two different yards, the Navy could, over time, easily increase the size of its SSN fleet to 66 simply by maintaining a building rate of two boats per year. If the future

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[127] An alternate way to close this gap would be to conduct a Service Life Extension Program on nine Los Angeles or Seawolf-class SSNs. However, the Navy has no experience in maintaining a nuclear attack boat well past its designed service life. Thorough engineering studies would be required before such a program could be initiated.

competition required even more boats, it would have the ready capacity to go to four boats per year (two in each yard). In the meantime, concentrating on undersea systems that can augment large manned undersea combat systems appears to be a better expenditure of scarce resources.

Guided by this reasoning, the Navy should do the following:

> Increase the build rate for Virginia-class SSNs to two per year no later than FY 2011, at an approximate cost of $2.6 billion per boat.

> Continue to upgrade the Virginia-class in successive blocks. As discussed earlier, the current Block III flight of boats have two new multipurpose payload tubes in their bow area. With these tubes, most new undersea weapons and payloads will be interchangeable between the SSGN and SSN force, introducing a high degree of flexibility into the undersea combat system fleet. In the next flight of boats, the Navy should strive to introduce a bottom-drop capability for the two forward payload tubes. This will allow the efficient covert seeding of undersea combat network sensors and encapsulated weapon pods in littoral waters. In addition, the Navy should develop a payload tube storage, launch, and recovery system for unmanned underwater vehicles, which will allow both SSNs and SSGNs to remotely employ these systems from their payload tubes while submerged and underway. Future Virginias might be lengthened by inserting a new payload module aft of the sail, with four more payload tubes, giving the boats an internal torpedo capacity of twenty-seven weapons, and up to thirty-six payload tube-launched TLAMs (or other weapons). These boats would be the first step toward a hybrid SSN/SSGN force capable of employing a wide variety of undersea weapons.

> In the meantime, the Navy should convert the last two Ohio-class SSBNs to SSGNs at their regularly scheduled mid-life overhauls. If possible, some of the payload tubes on these boats should also have a bottom drop capability and a payload tube UUV storage, launch, and recovery system. With these new capabilities, the modified SSGNs could also operate as either high-capacity motherships for unmanned underwater vehicles (akin to an undersea aircraft carrier) or as command ships for an undersea combat network. This move would have three additional salutary effects. First, it would allow the TFBN to maintain four SSGNs forward—two in the Western Pacific and two in the Indian Ocean/Persian Gulf—through the mid-2020s. Second, the TFBN would have a minimum of two SSGNs through at least FY 2036. Third, it would cut the FY 2028 deficit in TFBN tactical undersea combat systems from eleven to nine boats.

The Navy should also develop new types of smaller, manned, multipurpose, underwater vehicles designed for parasite operations from both SSGNs and SSNs.

In conjunction with these moves, the Navy should also develop new types of smaller, manned, multipurpose, underwater vehicles designed for parasite operations from both SSGNs and SSNs. The Naval Special Warfare Command had planned to build six Advanced SEAL Delivery Systems (see below). However, due to technical difficulties and cost overruns, the Navy only built one. It is pursuing an ASDS replacement, now tentatively referred to as the Joint Multi-Mission Submersible (JMMS).[128] In addition to supporting SEAL Teams and joint special operations forces, the JMMS should be specifically designed to perform likely undersea combat network missions, such as submarine ambush operations near an enemy submarine base, or the covert delivery of undersea combat network components. The Navy should also consider designing a much smaller manned underwater vehicle for the multipurpose payload tubes of SSGNs and SSNs. This would require some sort of access tube from the interior of the host submarines.

Over the longer term, the Virginia-class follow-on should probably be a combination SSN/SSGN, with a large payload capacity for smaller manned submarines and vehicles and unmanned underwater vehicles. Although the total number of large manned undersea combat systems will likely continue to be important in the future, overall undersea combat capability will probably be increasingly defined by a mix of manned and unmanned undersea combat systems. A robust experimentation program to determine the optimal mix of systems and capabilities will be a must. Pending the outcome of these experiments, long-range plans should be designed to maintain a large undersea combat system force of approximately fifty-two boats.

Overall undersea combat capability will probably be increasingly defined by a mix of manned and unmanned undersea combat systems.

Large Tactical Aviation Seabases

Nuclear-powered aircraft carriers have long provided the United States with enormous freedom of action, and with the number of overseas bases declining, their value is rising. However, their importance increases even more when considering joint operations against future multidimensional recon-strike networks and nuclear-armed regional adversaries. In both cases, forward land bases will almost certainly be at great risk, and the ability to operate an air wing of seventy-five fixed and rotary wing aircraft from a self-contained base at sea will provide a good hedge against their loss. Moreover, although there is no clear evidence to support their claims, the Russians and Chinese have announced plans for a total of nine carriers. Under these circumstances, it is far too premature for the Navy to get out of the large-deck carrier business.

That said, the United States already enjoys an enormous lead in sea-based tactical aviation, and CVNs are extremely expensive. At a projected per-unit cost of nearly $11.3 billion and at a production rate of one every four years, the amortized cost for the first three CVN-21s will amount to $2.825 billion a year (not counting non-recurring design costs). Shifting to a production schedule of one every five years will save $565 million in shipbuilding costs each year. Moreover, even if such a move is made, because of the building pattern for the earlier ten Nimitz class carriers, and assuming all Nimitz-class carriers remain in service for fifty years, the US carrier fleet will

[128] "ASDS Mini-Sub Program Taking on Water," *Defense Industry Daily*, April 29, 2008.

remain at eleven or twelve CVNs through FY 2038 (except when it drops to ten CVNs for FY 2013 and 2014). At that point, the requirement for active air wings would drop from ten to nine, freeing up additional resources. Of course, if necessary, in the event of a major global naval challenge, the production rate for future carriers could be accelerated, and the size of the carrier fleet expanded.

A force of ten carriers would allow the Navy to maintain Carrier Strike Groups in both the Pacific and Indian Oceans, meeting the minimum standards for "combat credible" forward presence in these two theaters.[129] During wartime, a ten-carrier force will generate only six CSGs in ninety days (compared to the seven generated by an eleven-carrier force). Provided the Navy adds aircraft with longer range and higher endurance to its carrier air wings, six CSGs should be sufficient for warfighting requirements, since such aircraft would allow a fewer number of carriers to cover much larger areas of operation.

Unless future Carrier Strike Groups can fight from much longer ranges, the entire carrier fleet may become a wasting asset. Getting longer-range aircraft onto the carrier decks should therefore be among the highest TFBN priorities.

Dropping the number of active carriers from eleven to ten is not the sole reason to pursue longer-range carrier aircraft. As has been discussed, unless future Carrier Strike Groups can fight from much longer ranges, the entire carrier fleet may become a wasting asset. Getting longer-range aircraft onto the carrier decks should therefore be among the highest TFBN priorities. An interim step is to add two F-35C Lightning II Joint Strike Fighter squadrons to the carrier air wing—one Navy and one Marine. The Marine Corps wants to operate a common fleet of F-35B short take-off and landing JSFs, and use them to fulfill its requirement for one strike-fighter squadron in every carrier air wing. In terms of simplifying air and ground crew training, logistics and personnel, this position makes perfect sense. However, the F-35B's 500 nm unrefueled strike radius offers no improvement over the current F-18E/F Super Hornets that now equip Navy strike-fighter squadrons. Adding the F-35B to the carrier air wing therefore makes no sense where it counts most: in carrier operational capability. Adding two F-35C squadrons to the carrier air wing will allow roughly half the 2020 air wing to launch unrefueled air strikes into defended airspace from ranges beyond 600 nm.

While a good first step, this will not likely be enough. The Chinese are already testing anti-ship ballistic missiles with ranges greater than 600 nm. Moreover, operations from 600 nm would put any carrier within potential range of enemy strike-fighter attacks—something that US carrier forces have not had to deal with since World War II. To remain relevant, future carriers will likely have to fight, at least initially, from ranges up to 1,000 to 1,500 nm from a coast. The F-35C can theoretically operate from such ranges with aerial refueling. However, because of the physical demands on their pilots, their airborne endurance is limited to approximately ten hours, which makes sustained long-range operations practically impossible.

129 One carrier will normally be in long-term overhaul. The CVN based in Japan provides a permanent presence in the Western Pacific. The eight remaining carriers can maintain a Carrier Strike Group in the Indian Ocean/Persian Gulf.

The next step is therefore likely to be the aforementioned naval unmanned combat air system: a stealthy, air-refuelable, unmanned combat air system with an unrefueled combat radius of 1,500 nm or more, and a maximum airborne endurance of fifty to one hundred hours. With a modular payload bay, this aircraft could perform a variety of TFBN roles. When armed with air-to-air interceptors, an N-UCAS could serve as a stealthy, offboard missile magazine for fleet air superiority aircraft. When equipped with onboard sensors and armed with guided weapons, an N-UCAS could strike both fixed and mobile targets over great ranges. When armed with boost-phase interceptors, N-UCASs could establish persistent ballistic missile defense orbits over an enemy's home territory. Because of its great range, endurance, and flexibility, the N-UCAS would help transform a US aircraft carrier from a system with unlimited global mobility but relatively short tactical reach into a multipurpose global reconnaissance-strike platform.[130]

The N-UCAS would help transform a US aircraft carrier from a system with unlimited global mobility but relatively short tactical reach into a multipurpose global reconnaissance-strike platform.

Despite the N-UCAS's great promise, it is a classic disruptive technology. As a result, the close-knit Navy carrier community is not enthusiastically embracing it. Under current plans, carrier air wings will not see the aircraft until FY 2025 at the earliest. Given the rapid development of Chinese maritime reconnaissance and strike capabilities, this schedule is likely to be far too slow. To ensure the continued operational relevance of the future carrier fleet, the Secretary of Defense should consider accelerating both the current UCAS demonstration program and the planned operational debut of the N-UCAS. Indeed, given that the carrier fleet will number eleven to twelve carriers between FY 2015 and FY 2038, the Secretary might consider ordering the Navy to maintain one or two N-UCAS-equipped "surge" carriers to augment TFBN's nine deployable CSGs, and ordering the Marine Corps to trade its ten F-35C squadrons for ten N-UCAS squadrons. A fleet of deployable and surge aircraft carriers with large numbers of embarked N-UCASs, backed up by a mixed Marine Corps force of STOVL F-35Bs and N-UCASs, would provide the TFBN with an exceptionally flexible tactical air force that could operate at long ranges from either sea or land bases.

In an era of opposed battle network operations, there are two other high priority carrier air wing systems: the E-2D airborne early warning and battle management aircraft and the E/A-18G electronic attack aircraft (or comparable electronic attack versions of the JSF). The former, with its advanced active electronically scanned airborne radar array and cooperative engagement capabilities, will serve as the electronic quarterback for future US naval battle networks, especially in defensive operations. The latter will be central to Outer Network Battle operations, especially those operations designed to spoof, deceive, or deny enemy targeting systems. Both of these systems should receive high priority in yearly naval aviation budgets.

130 For a thorough argument in support of the N-UCAS, see Thomas P. Ehrhard, PhD and Robert O. Work, *Range, Persistence, Stealth, and Networking: The Case for a Carrier-based Unmanned Combat Air System* (Washington, DC: Center for Strategic and Budgetary Assessments, 2008).

Large Battle Network Combatants

The Navy's plans for its large battle network combatants—guided missile cruisers and destroyers—have been more unsettled than those for any other TFBN ship category. As discussed earlier, the centerpiece of the Navy's future surface combatant plans for the past decade—the DD-21/DD(X)/DDG-1000—has seen a number of ups and downs. The initial planned production run of thirty-two ships was dropped to sixteen; then raised to twenty-four; and then cut to just seven. Recently, the Navy announced that it wanted to halt production of the DDG-1000 after just three ships, and restart the Arleigh Burke-class DDG production line. The final decision over the Navy's plan will not be made until the FY 2010 budget submission, or during the calendar year 2009 Quadrennial Defense Review.

What explains the Navy's decision? While the rising costs for the DDG-1000 were certainly a factor, Navy officials prefer to explain it in terms of changing TFBN requirements. The DDG-1000's design assumed that the ship would operate extremely close to a defended coast (within 25 nm). It would therefore require a high degree of stealth, which demanded an exotic tumblehome hull and a composite deckhouse. This new hull, while providing an extremely low radar cross section, carries 10 to 15 percent less payload than a standard hull of comparable displacement. As a result, the nearly 15,000-ton DDG-1000 carries just eighty VLS cells—one-third fewer than a 10,000-ton Ticonderoga-class cruiser. Indeed, although the Navy has not officially said so, it appears as though the CG(X) combat system will not fit comfortably inside the DDG-1000 hull.

More importantly, the rapid development of maritime reconnaissance-strike networks and the prospect of facing a nuclear-armed regional power are both forcing US fleet planners to think about fighting far from an enemy's coast and about protecting naval, joint, and allied forces and territory from long-range cruise and ballistic missile attack. Under these conditions, surface combatant stealth is less important than having robust open ocean anti-submarine, anti-air, anti-cruise missile, and anti-ballistic missile defense capabilities. Indeed, Navy planners are so concerned about new anti-ship ballistic missiles that they have articulated the need for about ninety fleet ballistic missile defense ships.

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The Navy's reasoning is consistent with both emerging TFBN missions and evident trends in naval warfare. Guided by the assumptions at the beginning of this chapter, the following recommended steps would translate this reasoning into reality:[131]

> The Navy should halt production of the DDG-1000 after three ships, restart the Burke production line in FY 2010, and delay the start of the CG(X), now planned for FY 2011. The Navy should build eleven of the Burke DDGs between FY 2010 and

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[131] These recommendations are variations of the ones developed in Robert O. Work, *Know When to Hold 'Em, Know When to Fold 'Em: A New Transformation Plan for the Navy's Surface Battle Line* (Washington, DC: Center for Strategic and Budgetary Assessments, 2007).

FY 2017, at an average cost of approximately $2 billion per ship.[132] The first seven should replace the oldest seven Ticonderoga-class CGs, which, because they cannot be brought up to the planned common TFBN configuration, would be retired. This would save approximately $1.5 billion in mid-life modernization costs. The next four DDGs would bring the surface combatant force up to the TFBN requirement of eighty-eight ships.

> The Navy should commence and complete its planned mid-life modernizations for fifteen of the twenty-two Ticonderoga-class cruisers, and all sixty-two of the authorized Burke-class destroyers. All should be brought up to a common TFBN standard, with the same commercial-off-the-shelf/open architecture computing environment combat system configuration and ballistic missile defense capability. As planned, the Navy should extend the planned service lives of the Burkes from thirty-five to forty years.

> The Navy should immediately begin designing a new modular large battle network combatant (LBNC). The new combatant should have a spacious hull, with plenty of installed electric power (so as to employ future weapons such as electromagnetic rail guns and lasers), a modular combat system suite, room for a substantial VLS battery, and an ability to employ a variety of offboard systems. Most importantly, it should be designed-to-cost, so that a ship with a cruiser-like combat system can be procured and built for a not-to-exceed cost of $2.5 billion. LBNCs with less capable guided-missile destroyer and destroyer-like combat systems should cost less. Although Congress has mandated that the next-generation cruiser be nuclear-powered, the added construction costs for such a ship would most certainly raise its cost to over $2.5 billion per ship. Moreover, any fuel savings gained over the life of the ship would not likely offset the higher costs to recruit, train, and retain nuclear personnel, the increased maintenance costs, and the end-of-life disposal costs.[133] Therefore, the new LBNC should have a conventionally-powered, integrated electric propulsion and power system similar to the system designed for the DDG-1000, but with more advanced electric motors. To achieve the aggressive cost targets for the future LBNC, the Navy should give consideration to new distributed TFBN surface combatant architectures, such as having specialized long-range radar ships and purpose-built missile shooters, rather than building all multipurpose platforms with both radars and missiles.

> Under any circumstances, while designing the new large battle network combatant, the Navy should conduct a thorough review of its overall LBNC requirement.

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132 The Congressional Budget Office believes that the cost for a Burke-class DDG is $2.35 billion per year when procured at the rate of one per year, and $1.85 billion when procured at the rate of two per year. The Navy's desired build rate of 1-2-1-2-1-1-2-1 between the years of FY 2020 and FY 2017 results in an average cost of $2.07 billion per ship.

133 Norman Polmar, "To Be or Not to Be . . . The New DDG," *Proceedings*, July 2008. P. 89.

This is one area where the TFBN appears to have an abundance of capacity. Even assuming an availability rate of 85 percent due to maintenance, and as many as twenty ships being assigned to *national* ballistic missile defense missions, the Navy would have fifty-five of these powerful combatants on hand for fleet assignments—seemingly more than enough to cover both peacetime presence and wartime requirements. Consequently, this report assumes the LBNC requirement could be dropped by at least 10 percent to eighty ships. By designing a modular hull with a design life of forty years, the Navy could completely replace the existing fleet with a sustained (and fiscally sustainable) LBNC construction rate of two ships per year.

Small Battle Network Combatants

The TFBN count for small battle network combatants now includes thirty frigates and fourteen mine countermeasure ships. As previously discussed, the Navy plans to replace these ships with fifty-five Littoral Combat Ships of one or two different types. After FY 2010, the Navy intends to ramp up to a build rate of six ships per year, completing the 55-ship production run in FY 2019. It then suspends construction on small combatants for twelve years before starting construction on an LCS replacement in FY 2032.

Assuming the LCSs perform as expected, the Navy should instead consider ramping up to a maximum of four LCSs per year, and sustaining that rate even after reaching the 55-ship TFBN target. Doing so would have several benefits:

> First, this plan makes better sense from an industrial-base perspective. After building the capacity to produce up to six LCSs per year, closing it down for over a decade will make future start-up costs quite high.

> Second, this plan will help build partner maritime capacity. US "hand-me-down" frigates and guided missile frigates have been a popular choice for small navies the world over since the 1950s and 1960s. As a result, it seems likely that used LCSs will be highly sought out by allied and friendly navies as the US Navy retires them. By continuing to produce four LCSs per year after reaching the TFBN requirement of fifty-five ships, replacing the oldest four LCSs on a one-for-one basis, and then selling or transferring the decommissioned ships to US allies, the Navy will have a small combatant shipbuilding plan that is perfectly suited for its new maritime strategy. Moreover, such a plan would allow constant capability upgrades for the TFBN small battle network combatants.

> Third, this plan would hedge against the need to get back in the open-ocean convoy business. Foreign navies have already explored modifying LCS sea frames for use as general purpose frigates or corvettes. For example, the Israeli Navy recently signed a letter of intent to buy a Lockheed Martin LCS equipped with the small

SPY-1F Aegis radar, sixteen VLS cells capable of carrying up to sixty-four short-range surface-to-air missiles, eight to sixteen anti-ship cruise missiles, and a helicopter. By keeping the LCS production line open, the US will be well situated to respond to a future threat to the sea lanes or a broader, global maritime competition with a capable protection of shipping combatant.

> Finally, assuming a very conservative recurring cost of $550 million for each LCS sea frame, reducing the maximum production rate by two ships will save $1.1 billion per year in recurring shipbuilding costs.

On the downside, this plan will delay the year that the TFBN achieves its 55-ship LCS target by several years. The Navy could ameliorate this delay by keeping the fourteen mine countermeasure ships in service for thirty-five to forty years rather than retiring them at thirty years, and by increasing the number of Naval Special Warfare and Naval Expeditionary Combat Command ships.

This paper assumes the Navy will buy its planned mix of twenty-four anti-submarine, twenty-four countermine, and sixteen anti-surface (i.e., anti-small boat) mission packages. However, it also anticipates that the Navy will develop additional TFBN mission packages as the LCS proves itself. Some that come immediately to mind are humanitarian/disaster relief packages, special operations support packages, and maneuver support packages.

NSW/NECC Ships and Craft

These ships and craft are often the forgotten elements of a balanced TFBN fleet, despite being the Navy's primary platforms for waging war against Islamist terrorist networks. Naval Special Warfare Command assets are the offensive arm, providing direct support to SEAL Teams and the evolving Joint Global Counterterrorism/Counterproliferation Network. Naval Expeditionary Combat Command assets are the preventive arm, conducting proactive engagement and partnership-building activities that aim to improve global security conditions and to forestall extremist incursions into the littorals. Of course, both also support conventional joint campaigns.

Naval Special Warfare assets now include one Advanced SEAL Delivery System and six SEAL Delivery Vehicle/Dry Deck Shelter task units for the underwater insertion of special operations forces, and three Special Boat Teams for the clandestine surface delivery of SEAL personnel. While the Navy is exploring new boats for its Special Boat Teams, it appears as though the overall force structure for clandestine surface delivery is sufficient for NSW requirements. The same is not true of the underwater insertion force. Current SEAL Delivery Vehicles are "wet" submersibles in which special operations swimmers are exposed to ocean conditions throughout their insertion and extraction. As a result, these small vehicles are inherently limited in range and utility. The goal should be to eliminate these types of open swimmer delivery vehicles entirely. Furthermore, as mentioned previously, because of technical problems and cost overruns, the Navy only built one ASDS, well below the stated requirement for four to six systems.[134] Improving the NSW underwater delivery force should therefore be a high TFBN priority.

Accordingly, the Navy should build six of the aforementioned Joint Multi-Mission Submersibles as rapidly as possible. As discussed above, these new mini-subs should be multipurpose platforms designed for both NSW support and undersea combat network duties. The Navy should also develop an even smaller multipurpose manned underwater vehicle designed to fit vertically inside an SSGN or SSN payload tube. These "dry" small manned vehicles would replace the "wet" swimmer delivery vehicles. However, they would also be used to support undersea combat networks. The interim force structure target should be for two SEAL Delivery Vehicle Teams, each with two Joint Multi-Mission Submersibles and three SDV/Dry Deck Shelter task units. Over the longer term, the SDV/DDS units would shift over to the new multipurpose manned underwater vehicles, perhaps doing away entirely with the need for Dry Deck Shelters. These numbers would cover only Naval Special Warfare requirements. The two additional Joint Multi-Mission Submersibles would be used to develop the tactics, techniques, and procedures for undersea combat network operations. Depending on the outcome of these efforts, many more of both types of vehicles might be required to support the TFBN fleet of large undersea combat systems.

Although the Navy is buying 569 MH-60R/S helicopters, none will be specially configured for special operations support. Furthermore, the Navy helicopter community does not routinely train for low-level, nighttime insertion of special operations units. The Navy should stand up a dedicated special warfare helicopter squadron with MH-60S helicopters, modified as necessary to support the clandestine insertion of SEAL Teams and other special operations personnel. This would require no additional helicopters; the squadron would be equipped from the currently programmed buy for 271 MH-60Ss.[135]

In the 1990s, the Navy bought thirteen coastal patrol ships (PCs) to support Naval Special Warfare requirements. However, the Navy never truly supported the ships, and by 2000 it planned to either retire them or transfer them to foreign navies. On September 11, 2001, those plans changed. The Navy transferred five of them to the Coast Guard and kept eight in active service. The former now operate in the Caribbean in support of counter-drug operations while the latter have proven invaluable for littoral maritime security and engagement operations in forward theaters. Indeed, because these ships are so well suited for engagement and partnership capacity building missions, these ships should be transferred to the Naval Expeditionary Combat

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[134] "ASDS Mini-Sub Program Taking on Water."

[135] This idea was drawn from Ensign Jaden J. Risner, "Fish or Cut Bait," Proceedings, September 2008, pp. 38–41.

Command. While performing engagement and maritime security missions in forward theaters, these ships could continue to support Navy Special Warfare operations.

The PCs could also augment the operations of boat detachments associated with the NECC's Mobile Expeditionary Security Force. This force consists of ten Mobile Security Squadrons that can be task-organized to protect high-value naval units or critical littoral infrastructure, such as port facilities or offshore energy platforms. The Navy is in the process of consolidating these ten squadrons into eight more robust units. When deployed, the squadrons have command and control, communications, sensor, and security detachments, as well as one or more boat detachments, all tailored for a specific maritime security mission. The Navy currently has a total of twenty-nine active and reserve armed boat detachments, each with four boats, to support its Mobile Security Squadrons.[136] These craft are small and maneuverable, but generally limited to operations inside a breakwater. The PCs would expand the squadrons' capability beyond the breakwater, securing the approaches to a port, harbor, or offshore energy platform.

These small craft will need a mothership when deployed. The best solution for this role appears to be the Joint High Speed Vessel, which could both deploy and support a riverine squadron.

The Naval Expeditionary Combat Command also has three active riverine squadrons, with twelve riverine boats apiece. NECC planners hope to add a thirteenth command and control boat—with upgraded communications systems and an ability to employ unmanned aerial vehicles—to each squadron. Given the Navy's new maritime concept, this force structure appears to be deficient. Moreover, these small craft will need a mothership when deployed. The best solution for this role appears to be the Joint High Speed Vessel, which could both deploy and support a riverine squadron.

Given the importance that the new maritime concept gives to engagement, maritime security, and partnership building capacity, the NECC's force structure should be substantially expanded. As a interim planning target, which would be modified based on operational experience, the Navy would staff and organize the NECC to support the seven aforementioned Global Fleet Stations: Caribbean and East Coast of South America, West Coast of Africa, East Coast of Africa, Southwest/South Asia, Southeast Asia, East Asia, and Western Pacific/Oceania. The initial planning target for each Global Fleet Station would be one Joint High Speed Vessel, one riverine squadron of thirteen boats, and four PCs.[137]

Each Fleet Station would also benefit from two additional assets: a station command ship and a Maritime Security Frigate. The former would be a retired amphibious landing ship manned and crewed by the Military Sealift Command, which would ensure their high operational availability. With their command and control suites, flight decks, boat wells, cranes, and spaces, such ships would be excellent sea-based

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[136] Telephone interview with Commander Dennis Garth, US Navy, Naval Expeditionary Combat Command, N3/5, on August 21, 2008.

[137] Obviously, one might expect the force planning requirements for each Global Fleet Station to vary, based on regional demands. Again, this planning target is illustrative, used to develop an alternative TFBN planning target.

command ships for Global Fleet Stations, suitable for a variety of engagement and humanitarian/disaster relief operations. The Maritime Security Frigates would be ideal for engaging with smaller navies and performing a variety of maritime security tasks in littoral waters. The new Legend-class National Security Cutter being built for the US Coast Guard might be a good ship to fill this role. Nine of these ships, manned with combined Navy and Coast Guard crews, would replace the nine frigates that now serve in the active Naval Reserve Force.[138] These ships would operate forward in support of the Fleet Stations, conduct global maritime security operations, or augment Coast Guard homeland security operations. They would be true *National Fleet* ships. They would be built at a rate of one per year, starting near the end of the Coast Guard production run of eight National Security Cutters.

Naval Maneuver and Maneuver Support (Prepositioning) Ships

In a world in which forward access is less certain than in the recent past, having a capability to conduct naval maneuver—defined as the insertion of *ready-to-fight* combat forces from the sea—will remain an important TFBN capability. The best platforms to support naval maneuver in contested littorals, or joint WMD elimination operations against coastal powers, remain purpose-built amphibious ships. Amphibious warships are also perfectly suited for a maritime strategic concept that emphasizes distributed forward presence, engagement, and persistent maritime security operations on both the landward and seaward sides of the littoral. Among the most versatile of these ships are large-deck amphibious assault ships, which can be configured as escort carriers with short takeoff and vertical landing versions of the JSF, as seabases for aerial maneuver forces, or as large-scale disaster relief platforms.

Amphibious warships are also perfectly suited for a maritime strategic concept that emphasizes distributed forward presence, engagement, and persistent maritime security operations on both the landward and seaward sides of the littoral.

The TFBN should size its naval maneuver fleet to support a two-MEB landing. This fleet would consist of thirty-three ships: eleven LHDs/LHAs, eleven LPD-17s, and eleven LSDs. However, the economical building rate for big-deck amphibious assault ships is one every three years. If the ships' design lives could be extended from forty to forty-five years, sustaining this build rate would result in a steady-state force of fifteen ships, without appreciably increasing the associated yearly amortized cost of $1.2 billion per ship.[139] This provides an intriguing TFBN option. The four "extra" ships could be easily configured into escort carriers (CVEs), designed to carry Marine F-35B aircraft. In effect, when combined with the earlier recommendation to reduce the aircraft carrier force to a steady-state level of ten ships, this plan substitutes four CVEs for one CVN, resulting in a TFBN tactical aviation sea-base force of fourteen

[138] The Naval Reserve Force currently operates nine frigates. Operating eight Maritime Security Cutters seems a natural fit for the Naval Reserve, and would be an important step toward an integrated National Fleet.

[139] This assumes a planning cost of $3.6 billion per ship in constant FY 2009 dollars. Congress has approved funding large aviations across multiple fiscal years.

ships.[140] Such a force would give TFBN planners greater flexibility in matching sea-based aviation capabilities to specific missions, and provide for greater peacetime forward presence of tactical aviation platforms.

After a troubled start, the LPD-17 program appears to have finally found its sea legs. With a beam of 105 feet (as large as that found on big-deck amphibious assault ships), these are exceptionally spacious and versatile hulls. The Navy requested a ninth LPD-17 in FY 2008, which it had planned to be the last. However, it appears that Congress will authorize a tenth ship in the class in FY 2009. Against this backdrop, the Marine Corps is arguing forcefully for an eleventh LPD-17. In the meantime, the Navy hopes to replace its two command ships in FY 2012 and FY 2014, and plans to begin replacing its twelve active LSDs with eleven new LSD(X)s starting in FY 2016, at a rate of one ship every two years. Navy officials have said they hope to combine amphibious ship classes to save money.

After a troubled start, the LPD-17 program appears to have finally found its sea legs.

Given these circumstances, the Navy should build an eleventh LPD-17 in FY 2010, and then build eleven LSD replacements based on the LPD-17 hull. These ships would be built at a rate of one per year between FY 2011 and FY 2021, with an average planned cost of no more than $1.75 billion per ship. In addition, and as now planned, the Navy should build two new command ships in FY 2012 and 2014, and two submarine tender replacements in FY 2023 and FY 2025, using the LPD-17 hull form. This would result in twenty-five common hulls in the TFBN maneuver and support fleets.

This plan would see the twelve Whidbey Island- and Harpers Ferry-class LSDs replaced long before the end of their forty-year service lives. Accordingly, the Navy would take the seven youngest ships, transfer them to the Military Sealift Command, give them a modest mid-life upgrade, and use them as the command ships for the aforementioned Global Fleet Stations. These ships would also be available to augment the amphibious landing fleet, if necessary, in times of crisis.

The naval maneuver force will continue to benefit from ships dedicated to the maneuver support/rapid reinforcement mission. However, the new Future Maritime Prepositioning Force squadron is ill-conceived and ill-suited for both naval maneuver and WMD elimination missions, and generally too large for presence and engagement missions. Moreover, with some modifications, the legacy MPF squadrons can continue to excel in the maneuver support/rapid reinforcement role, while taking on additional capacities to support seabased operations.

Accordingly, the Navy should continue to retain three legacy MPF squadrons. This would require that two MPF ships be added to the fourteen now in the fleet. An additional seventeen ships would continue to provide joint maneuver support (prepositioning). The present requirement for a MPFF squadron, at least in its currently planned

[140] Four CVEs would cost $14.4 billion, compared to the $11.3 billion for a single CVN-21. Moreover, the aggregate crew for these four ships would be larger than that found on a CVN-21. However, this report assumes the extra flexibility derived from this plan would be worth the extra expenditure of resources.

form, should be dropped. The single T-AKE now in the Navy's plan should become a twelfth Combat Logistics Force T-AKE. However, the Mobile Landing Platforms in the Navy's plan should be built and added to each legacy MPF squadron. These ships can be used to offload MPF ships "in stream," away from a pier, and can augment amphibious operations by acting as bases for air-cushioned landing craft. They will also provide the TFBN with valuable operational experience in at-sea transfer of equipment, and highlight new capabilities for future MPF squadrons.

Joint Sealift Ships

The sixty-eight ships in the strategic sealift fleet provide a ready pool of sealift ships affords the United States an enormous competitive advantage in the transoceanic movement of equipment, supplies, ammunition, and bulk fuel. Indeed, when taken together, one analyst estimated that the combined US prepositioning and strategic sealift fleet represents about 95 percent of the world's militarily useful sealift.[141] Moreover, because all of these ships are operated and maintained by either the Military Sealift Command or the Maritime Administration, and are kept in various stages of readiness, they are relatively cheap to retain and maintain.

The new ships could thus support both the movement *and* maneuver of joint combat forces across transoceanic ranges.

The Navy has not published its recapitalization plan for its sealift fleet. As a result, this report assumes the Navy will maintain the sixty-eight ships now in the strategic sealift fleet, replacing dated ships as necessary. However, a comment on one specific ship type—the Fast Sealift Ship (FSS)—bears mentioning. The eight FSSs are the fastest oceangoing cargo ships in the world, and together can carry almost all of the equipment of two Army heavy brigade combat teams. Together with eleven Large Medium-speed Roll-on/Roll-off ships, these ships provide the joint force with a large "surge" sealift capacity.

All eight FSSs were originally launched between 1971 and 1973 for commercial service, but proved to be uneconomical for that role. In FY 1982, the Navy purchased four of the ships for use in the surge sealift role, and then bought the remaining four in FY 1984. They are therefore approaching forty years of age. Even though they have been used relatively little over this period, they will likely have to be replaced within the next two decades. They should be succeeded by a new class of High Speed Shallow Draft Ships, capable of carrying an intact combat unit (personnel and equipment) directly from a port of embarkation in the United States to an austere port anywhere in the world, and discharging them in ready-to-fight condition. With these capabilities, the new ships could thus support both the movement *and* maneuver of joint combat forces across transoceanic ranges.

[141] A.D. Baker III, "Sea Power 1999; Costly Fleets: Capability versus Affordability," *The Year in Defense2000* (Tampa, FL: Government Services Group), p. 108.

Combat Logistics Force and Support Ships

The Navy authorized a twelfth T-AKE in the FY 2009 budget with the intention of using it as an MPFF ship. Based on the aforementioned cancellation of the MPFF squadron, this ship would be transferred to the Combat Logistics Force.

Like the LPD-17 hull, the Lewis and Clark-class T-AKE hull is especially commodious and, with modifications, likely suitable for use both as a fleet oiler and a triple-product station ship. The Navy now plans to replace its fifteen fleet oilers between FY 2018 and 2026 (at an average rate of two per year), and its four T-AOE station ships between FY 2029 and FY 2034 (at an average rate of one per year). Using the same logic as above, a better plan might be to start building the oilers based on the T-AKE hull in FY 2011, at the rate of one per year, with the last ship authorized in FY 2025. In FY 2027, the Navy would then shift over to a new T-AOE(X) station ship, based on the T-AKE hull, at an average rate of one per year. By the mid-2030s, the CLF fleet would thus consist of thirty-one ships, all based on a common hull, providing significant savings in training and maintenance costs.

However, the Navy may need to increase the size of its station ship fleet. A ten-CVN force should be able to generate five CSGs in thirty days, and one more within ninety days. Assuming a four-ship escort carrier force can generate three CVEs in thirty days, the overall requirement would be for nine station ships or station ship equivalents (e.g., a T-AKE and an oiler). Should the Navy elect to increase the number of purpose-built station ships, it could easily do so by extending the future production run of T-AOE(X)s.

The force plans for TFBN support ships should remain unchanged, with two exceptions. First, the Navy plans to buy seven Joint High Speed Vessels, at a rate of one per year, between FY 2009 and FY 2015. As discussed above, these seven ships would be assigned to the Naval Expeditionary Combat Command as riverine support ships for each of the seven Global Fleet Stations. Since these are flexible, inexpensive ships that can perform a variety of tasks, an additional five ships should be procured for general fleet support. Second, the Navy should replace its two hospital ships with variants of either the LPD-17 or T-AKE hulls. An option would be to build a total of four hospital ships: two based on the T-AKE hull for large-scale operations, and two based on the LPD-17 hull for medium to small-scale operations.

Supporting TFBN Capabilities

This report assumes the Navy will execute its plans for the P-8A Poseidon, Broad Area Maritime Surveillance system, and MH-60R/S helicopters as discussed earlier. This may be a heroic assumption. The Navy's aviation plans are under as much fiscal pressure as the Navy's shipbuilding plans. However, assessing each and every Department of the Navy aviation program is well beyond the scope of this paper. At a minimum, TFBN planners should anticipate that all of these systems will be procured at a slower-than-optimal rate, and that the number of active aircraft systems will not increase as quickly as hoped.

A LARGER, MORE CAPABLE, AND MORE VERSATILE TFBN

If the Navy implements these recommendations, twenty years from now the TFBN ship count would include a total of 488 ships and deployable boat/vessel units (see Figure 5). All ships and craft would be specifically designed to operate as an integral component in a Navy-wide Total Force Battle Network, which itself would be part of a larger Joint Total Force Battle Network. All combat systems would have a common commercial-off-the-shelf/open architecture computing environment configuration, enabling rapid TFBN-wide hardware and software capability upgrades. Every

FIGURE 5. **PROJECTED TFBN SHIP/VESSEL COUNT AS OF 30 SEPT 2028**

Type/Class	Requirement	Count	Description
Strategic Deterrent Fleet	12	12	Ohio-class SSBNs, transitioning to SSBN(X)
Large Undersea Combat Systems (SSNs and SSGNs)	52	43	Includes 6 Improved Los Angeles, 32 Virginia, and 3 Seawolf SSNs; and 2 Ohio-class SSGNs; number does *not* include adjunct JMMSs, MMUVs, or AUVs
Aviation Seabases	14	15	11 CVNs, with 10 active air wings each containing 75 fixed and rotary wing aircraft; and 4 CVEs with Marine STOVL air wings
Large Battle Network Combatants	80	87	Includes 14 LBNCs and 73 Burke-class DDGs
Small Battle Network Combatants	55	55	55 LCSs with 64 mission packages
NSW/NECC Ships and Craft	88*	88*	Includes 7 T-LSD station command ships; 9 Maritime Security Frigates; 28 PCs; 29 active and reserve boat detachments; 7 riverine squadrons; 3 special boat teams; 6 SS(X)s and 6 MMUV/DDS task units
Naval Maneuver Ships	33	33	Includes 11 LHD/LHD(X)/LHA(R), and 22 LPD-17
Naval Maneuver Support (Prepositioning) Ships	36	36	Includes 16 MPF ships and 3 Mobile Landing Platforms carrying Marine equipment; 10 prepositioning ships carrying Army equipment; 7 prepositioning ships carrying other service/agency equipment
Joint Sealift Ships	67	67	Includes 7 HSSDS, 11 LMSR, 27 RO/ROs, 2 LASH, 2 Heavy Lift ships, 6 Transport Tankers, 6 Auxiliary Crane Ships; 6 various cargo ships
Combat Logistics Force Ships	31	31	Includes 4 T-AOE, 12 T-AKE, 15 T-AO
Support Vessels	31	31	Includes 2 Command Ships (LCC), 2 Submarine Tenders (AS), 2 Hospital ships (T-AH), 4 Salvage Ships (T-ARS), 4 Fleet Ocean Tugs (T-ATF), 5 Ocean Surveillance Ships (T-AGOS), and 12 Joint High Speed Vessels (JHSVs)
Total Count	489	488	* These numbers include both ships and deployable boat units with over 300 small boats and craft

ship category with the exception of large undersea combat systems would be at or over requirement—and this shortfall would be ameliorated somewhat by the small submarines, manned multipurpose underwater vehicles and autonomous underwater vehicles developed to support undersea combat network operations.

Compared to today's fleet, the 2028 TFBN would be more capable across the full naval warfighting spectrum. At the lower end of the spectrum, the TFBN would have substantially more capacity for day-to-day engagement with smaller navies and for counterterrorism and maritime security missions. At the higher end, the TFBN's undersea combat fleet would be more capable of taking on undersea combat networks, and its surface fleet would be far more able to fight from range against maritime recon-strike networks and nuclear-armed regional powers. The naval maneuver and maneuver support fleets would be able to lift five Marine Expeditionary Brigades, and seven new High-Speed Shallow Draft Ships would add an important new capability for both naval maneuver and movement.

Compared to today's fleet, the 2028 TFBN would be more capable across the full naval warfighting spectrum.

The TFBN would be in the midst of a fleet-wide transition and consolidation of ship types. The SSBN fleet would be transitioning from Ohio-class SSBNs to SSBN(X)s. The SSN fleet would be well on its way toward a fleet consisting entirely of Virginia-class attack boats or variants thereof. The aircraft carrier force would consist of two types of CVNs and shifting to an all-CVN-21 fleet. The large battle network combatant fleet would be ten years into a transition to a single class of modular warships. The small littoral combatant fleet would have one or two hull types capable of carrying identical mission packages. The combined fleets of amphibious, CLF, and large support ships would be building toward twenty-five ships based on the LPD-17 hull and at least thirty-one ships based on the T-AKE hull. By the mid-2030s, the fleet would be even further along this consolidation pathway, with significant payoffs for training, maintenance, and logistics.

These ships would have a high degree of interoperability and mission flexibility. The large undersea combat system fleet of SSNs and SSGNs would both be able to employ the same weapons and manned and unmanned undersea combat systems. Both large and small battle network combatants would be specifically designed for modular combat systems or mission packages. The LCS fleet would be capable of performing a wider range of missions than conceived of today, and could be modified to assume an open-ocean escort role, if necessary. This interoperability and flexibility would result in a TFBN that is more adaptable and versatile.

Over the next thirty years, this plan would see the new construction of 328 major warships and submarines, not counting any ships built or leased for the sealift fleet (see Figure 6). This compares to 296 ships in the Navy's most recent thirty-year shipbuilding plan. The plan's average build rate of 10.66 new ships per year would be high enough to sustain the shipbuilding design and industrial base, and to create the spare capacity necessary to respond to a more concerted future maritime challenge. Designing the new SSBN(X), two more SSGN conversions, and smaller manned and unmanned undersea combat systems would sustain the submarine design base.

Designing a new LBNC and variations of LPD-17 and T-AKE hulls would sustain the surface ship design base. Large undersea combat systems would be built in two yards, at a low but still sustainable rate of one boat per yard, per year. Aircraft carriers and CVEs would be built at a sustainable rate of one every five and three years, respectively. Large and small battle network combatants would be built at rates of two and four per year, respectively, enough to keep two large and two small combatant yards in business. Medium amphibious landing ships and combat logistics force ships would both be built at the average rate of one ship per year, enough to sustain two auxiliary yards.

The plan has ample built-in capacity to respond to more stressing future maritime challenges. For example, should the aircraft carrier fleet need to be expanded, the Navy could increase the planned production rate from one carrier every five years to one carrier every four. Should the Navy desire to retain four SSGNs, or to maintain the large undersea combat system fleet at fifty-two boats, it could do so by simply modifying the planned 2-1-2-1 tactical submarine production rate after FY 2028. By sustaining LCS production at four ships per year, the Navy can either expand its own fleet of ships or add to the maritime capacities of its naval allies. And, as discussed above, by keeping two submarine, two large surface combatant, and two small surface combatant yards in business, the Navy should have the spare capacity to respond to a global maritime challenge, if needed.

The plan has ample built-in capacity to respond to more stressing future maritime challenges.

BUT IS IT AFFORDABLE?

Using the most conservative Congressional Budget Office estimates as a basis for comparison, the average yearly total shipbuilding costs for this plan would be $21.8 billion, including $19.9 billion in new-ship construction. These figures include the costs for the SSBN(X), as well as those for small boats, craft, and manned underwater vehicles (in the "Other" category, Figure 6). This plan achieves these savings, in part, by building ships with lower average prices. The average price per new ship in this plan is $1.82 billion, compared to $2.5 billion per ship in the Navy's current plan. Nevertheless, the plan would still call for a significant increase in shipbuilding resources—about 74 percent more than the $12.6 billion per year spent on shipbuilding between FY 2003 and FY 2008.

Figure 6 does not include costs for sealift ships. Assuming that the Navy expends $1 billion a year on sealift ships, the average cost for the thirty-year shipbuilding plan increases to $22.8 billion a year. While $4 billion per year less than the current plan, this level of expenditure will still place great strain on the Navy's overall budget. The real story behind Figure 6 is that whichever plan the Navy decides upon, it must be based on the most conservative estimates and be made with a cold-eyed view of expected future budgets.

TABLE 1. **SHIP-BUILDING COSTS**

	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23
CVNs					1					1					1
Big-deck Amphib		1			1			1			1			1	
SSBNs											1		1		1
VA-class SSNs	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Improved VA-class															
DDG-1000s	1														
DDG-51s		1	2	1	2	1	1	2	1						
LBNCs							1		1	2	2	2	2	2	2
LCSs	2	3	4	4	4	4	4	4	4	4	4	4	4	4	4
Med Amphibs	1	1	1	1	1	1	1	1	1	1	1	1	1		
CLF Ships	1		1	1	1	1	1	1	1	1	1	1	1	1	1
Command Ships				1		1									
Tenders															1
MLPs		1		1		1									
JHSVs	1	1	1	1	1	1	1	1	1	1	1	1			
Support Ships							1		1	1	1	2		2	2
NSFs		1	1	1	1	1	1	1	1	1					
New Ships	**7**	**10**	**12**	**13**	**14**	**13**	**13**	**13**	**13**	**14**	**14**	**13**	**11**	**12**	**14**
New Ship Costs	**10.35**	**10.00**	**14.25**	**15.85**	**14.35**	**15.95**	**15.45**	**14.45**	**15.55**	**15.45**	**14.95**	**15.15**	**14.65**	**13.20**	**14.55**
Amt CVN	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26
Amt Big Deck	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
SSBN										3.25	3.25	3.25	3.25	3.25	3.25
Other	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
New construction	14.31	13.96	18.21	19.81	18.31	19.91	19.41	18.41	19.51	22.66	22.16	22.36	21.86	20.41	21.76
Refueling	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Modernization	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75
TOTAL SHIP COSTS	**16.26**	**15.91**	**20.16**	**21.76**	**20.26**	**21.86**	**21.36**	**20.36**	**21.46**	**24.61**	**24.11**	**24.31**	**23.81**	**22.36**	**23.71**

	w/o SSBN	**w/ SSBN**
New-ship Cost	521.10	596.10
FY2009-2038		
Avg Cost per YR	17.37	19.87
Total Cost	579.60	654.60
FY2009-2038		
Avg Cost per YR	19.32	21.82

CVN-21	11.3
Big-deck	3.6
SSBN	6.5
VA SSN	2.6
Imp VA SSN	2.8
DDG-1000	3.7
DDG-51	*See Note*

NOTE: assumed costs for DDG-51 were derived from CBO testimony on July 31, 2008. Assumes $400 million start-up costs in FY 2009. Nominal rate for one ship per year is $2.36 billion; for two ships per year is $1.85 billion

24	25	26	27	28	29	30	31	32	33	34	35	36	37	38		
				1					1					1	**6**	
	1			1			1			1			1		**10**	**22**
1	1	1	1	1	1	1	1	1							**12**	**12**
1	2	1													**32**	**63**
1		1	2	2	1	2	1	2	1	2	1	2	1	2	**21**	**42**
															1	**0**
															11	**11**
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	**44**	**44**
4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	**117**	**232**
															13	**25**
1	1		1		1	1	1								**20**	**39**
															2	**4**
	1														**2**	**4**
															3	**6**
															12	**23**
2	1														**13**	**26**
															9	**18**
12	**13**	**9**	**10**	**11**	**9**	**10**	**10**	**9**	**8**	**9**	**7**	**8**	**8**	**9**	**328**	

13.40	**14.35**	**12.60**	**14.10**	**12.80**	**11.30**	**14.10**	**11.30**	**12.80**	**10.00**	**12.80**	**10.00**	**12.80**	**10.00**	**12.80**	**399.3**
2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	2.26	
1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	
6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50							
0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	
23.86	24.81	23.06	24.56	23.26	21.76	24.56	21.76	23.26	13.96	16.76	13.96	16.76	13.96	16.76	**596.1**
1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	
0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	0.75	
25.81	**26.76**	**25.01**	**26.51**	**25.21**	**23.71**	**26.51**	**23.71**	**25.21**	**15.91**	**18.71**	**15.91**	**18.71**	**15.91**	**18.71**	**654.6**

CBO ASSUMED SHIP COSTS (IN CONSTANT FY 2009 DOLLARS)

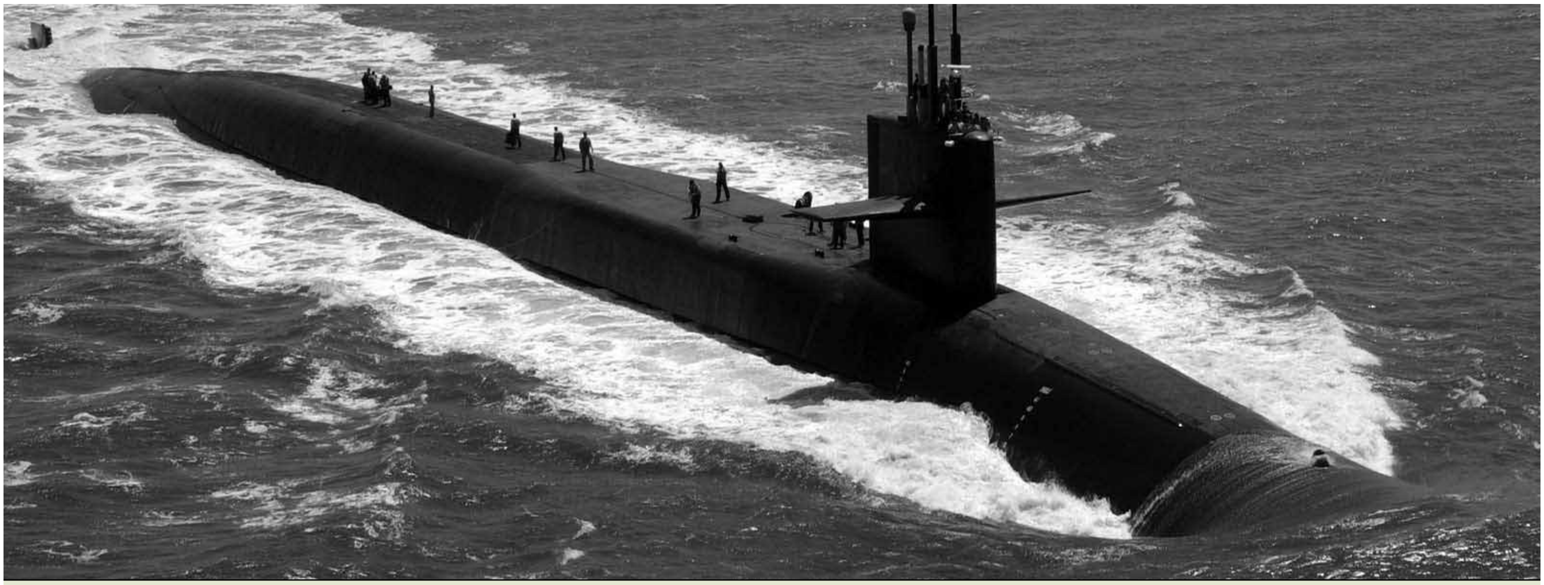
LBNC	2.5	**Command**	2	**NSF**	0.5
LCS	0.55	**Tender**	1.35		
Med Amphib	1.75	**MLP**	1.1		
CLF Ships		**JHSV**	0.2		
T-AKE	0.6	**Support Ships**			
T-AO	0.5	**T-AGOS, T-ATF**	0.1		
T-AOE (X)	1.3	**T-ARS**	0.2	**Average price per ship**	1.817

The savings associated with Figure 6 are less than hoped for. Recall that the desired goal was to reduce the planned yearly cost for total shipbuilding by about 25 percent to approximately $20 billion. Despite reducing the carrier force by one, foregoing nuclear power for large battle network combatants, and reducing the requirement for these ships by 10 percent, holding the sustained building rate of LCSs to four ships per year, and aggressively using existing hulls to reduce costs, this plan achieved a savings of only 19 percent compared to the Navy's current plan. Cutting the nine Maritime Security Frigates, five JHSVs, and four escort carriers included in this alternate plan only saves an average of $663 million per year. This exercise therefore helps to demonstrate the daunting shipbuilding challenge the Navy now faces.

As a matter of more urgent priority, the Department of the Navy, OSD, and Congress need to come to a final decision on plans for the TFBN's large battle network combatant fleet.

Figure 6 also helps to illustrate the high costs associated with recapitalizing the nation's strategic undersea deterrent fleet. The $70 billion plus SSBN(X) program has a major impact on both yearly shipbuilding costs in the 2020s, and on the thirty-year average shipbuilding costs. Removing the SSBN(X) from the plan's calculations drops the average yearly shipbuilding costs by $2.5 billion a year, to a more manageable $19.3 billion a year (about 53 percent higher than the FY 2003–2008 average). Because of the submarine's very high impact on the Navy's long-range plans, OSD and Congress must address the costs and plans for these ship types in the 2009 Quadrennial Defense Review. One option might be to start a SSBN(X) recapitalization fund. By spreading the projected $70 billion cost for the twelve-ship SSBN(X) fleet over the full thirty-year shipbuilding time horizon, the Navy will be better able to execute its overall shipbuilding plans.

The Navy has time to address this issue. In the nearer term, as a matter of more urgent priority, the Department of the Navy, OSD, and Congress need to come to a final decision on plans for the TFBN's large battle network combatant fleet. The constantly changing plans for these ships are disrupting the overall TFBN shipbuilding plan. Whatever option is finally decided upon, maintaining strict cost control on these ships will be absolutely vital. Figure 6 assumes the average recurring cost for a modular LBNC will be $2.5 billion in FY 2009 dollars. If the actual cost for these ships is substantially higher, the probability that the Navy will be able to sustain its long-range shipbuilding plans will start to fall at a rate directly linked to costs in excess of the $2.5 billion target. This helps explain why a move to nuclear-powered surface combatants might threaten the Navy's overall TFBN transformation plan, regardless of the merits of the case.



CONCLUSION

As we have seen, the United States Navy currently enjoys a heretofore-unseen margin of superiority over any other navy in the world, in terms of tonnage displaced, if not total number of ships. However, the threats the United States and its allies now face are of a different nature than those faced during the Cold War, during which present Navy plans were created. Indeed, the defense plans of tomorrow must take into account radical Islamist terrorist groups and their non-traditional warfare methods, the potential rise of a more aggressive China (whose navy is a near-peer in terms of technology), and the proliferation of weapons of mass destruction, especially to non-state actors. Navy planners must embrace the paradigm shift necessary to begin to adequately plan and train for these threats.

The plan outlined in these pages represents less a radical alternate naval force structure than a prudent competition strategy that exploits the great advantage the TFBN now enjoys in terms of relative combat capability. This strategy improves the Navy's ability to engage forward in the near term and prepares it for stiffer challenges over the longer term. It does this by husbanding resources, exploiting the hulls currently in production, reducing ship crews, preserving the naval industrial and design bases, maintaining US undersea superiority, and making sure that future Carrier Strike Forces and the future surface combatant fleet can fight from longer ranges. It may very well be that future budget constraints will force the Navy to transform itself far more radically than recommended in this report. Should this be the case, time is wasting. Determining the size and shape of the future Total Force Battle Network should be an urgent priority of the 2009 Quadrennial Defense Review. Hopefully, this monograph will help inform that effort.

TABLE 2. **US SHIP TYPES**

Submarines	
SSBN	Nuclear-powered strategic ballistic missile submarine
SSGN	Nuclear-powered cruise missile and special operations transport submarine
SSN	Nuclear-powered attack submarine
Aircraft carriers	
CV	Aircraft carrier
CVE	Escort Carrier
CVN	Nuclear-powered aircraft carrier
Large surface combatants	
CG	Guided-missile cruiser
DD	General-purpose destroyer
DDG	Guided-missile destroyer
Small surface combatants	
FF	Frigate
FFG	Guided-missile frigate
LCS	Littoral Combat Ship
MCM	Mine countermeasures ship
MHC	Coastal minehunter
PC	Coastal patrol ship
Naval maneuver and maneuver support ships	
LHA/LHD	Amphibious assault ship
LPD	Amphibious transport dock
LSD	Dock Landing Ship
MLP	Mobile Landing Platform
MPF	Maritime prepositioning force (ship)
MPFF	Future maritime prepositioning force (ship)
Sealift Ships	
FSS	Fast sealift ship
HSSDS	High-speed shallow draft ship
LMSR	Large medium-speed roll-on/roll-off ship
RO/RO	Roll-on/roll-off ship
Combat Logistic Force Ships	
AE/T-AE	Ammunition ship
AFS/T-AFS	Combat stores ship
AKE/T-AKE	Dry cargo/ammunition ship
AO/T-AO Fleet oiler	
AOE/T-AOE	Fast combat support ship
Support Ships	
T-AGOS	Ocean surveillance ship
T-AH	Hospital ship
T-ATF	Fleet tug
T-ARS	Salvage ships
AS	Submarine tender
JHSV	Joint High Speed Vessel
LCC	Command ship

A “T” in front of a ship designation represents a US Naval Service ships operated by the Military Sealift command

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