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Budgeting for Naval Forces: Structuring Tomorrow's Navy at Today's Funding Level



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**BUDGETING FOR NAVAL FORCES:
STRUCTURING TOMORROW'S NAVY
AT TODAY'S FUNDING LEVEL**

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NOTES

Unless otherwise indicated, all dollar amounts in this study are in 2000 dollars.

Numbers in the text and tables may not add up to totals because of rounding.

The cover shows artists' representations of (from top to bottom) the Virginia class attack submarine, the LPD-17 amphibious transport dock, the DD-21 land-attack destroyer, and the CVNX aircraft carrier. (Drawings courtesy of the U.S. Navy and Electric Boat Corporation.)

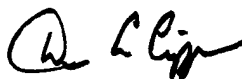
Preface

How much money does the Department of the Navy need to sustain its current force of about 300 ships and 3,500 aircraft? Many analysts argue that the service will need a larger budget in the future if it is to maintain a high state of readiness, modernize its ships and aircraft, and improve the quality of life for its sailors, pilots, and marines. If the Navy cannot sustain its fleet under current budget levels, what are some possible alternatives to its current force structure and modernization plans?

This Congressional Budget Office (CBO) study—prepared for the Subcommittee on Sea Power of the Senate Committee on Armed Services—examines the Navy's missions, its modernization plans, and the budgetary implications of supporting the service's current and planned fleets through 2020. It also looks at four alternative force structures that the Navy might be able to sustain at roughly its current funding level of \$90 billion (adjusted for inflation). In keeping with CBO's mandate to provide objective analysis, this study makes no recommendations.

Eric J. Labs of CBO's National Security Division wrote the study under the general supervision of Christopher Jehn and R. William Thomas. Raymond Hall of the Budget Analysis Division prepared the cost analysis under the general supervision of Mick Miller. Sally Sagraves thoroughly reviewed the manuscript before publication. The author would also like to thank Lane Pierrot, Jo Ann Vines, Dawn Regan, and Kent Christensen of CBO, Ivan Eland of the Cato Institute, and numerous employees of the Department of the Navy for their help. Robert Shackleton, Arlene Holen, and Barry Anderson of CBO and the late James L. George provided thoughtful comments on an earlier draft of this study. (The assistance of external participants implies no responsibility for the final product, which rests solely with the author and CBO.)

Leah Mazade and Christian Spoor edited the study, and Christine Bogusz proofread it. Judith Cromwell produced drafts of the manuscript, Kathryn Quattrone prepared the study for publication, and Annette Kalicki prepared the electronic versions for CBO's Web site.



Dan L. Crippen
Director

October 2000

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Summary

In the view of the Congressional Budget Office (CBO), the U.S. Navy will have trouble carrying out its current acquisition and modernization plans without a substantial increase in annual funding over the next 20 years. If such an increase does not occur, how could the Navy structure itself to perform its missions in the coming decades?

The Navy's strategy has evolved since the Cold War—from combating a large Soviet fleet in the world's deep oceans to confronting smaller, regional powers in coastal (littoral) areas. Nevertheless, although the size of the Navy has shrunk dramatically during the past decade, its composition has largely remained the same. The service continues to buy many of the same weapons that it did during the Cold War. In addition, it plans to build a more-modern version of each major type of vessel it uses. But CBO estimates that carrying out those plans—and sustaining the Navy at its current size of about 300 ships—will cost \$105 billion annually (adjusted for inflation) through 2020. That amount is about \$17 billion more per year than the service receives now.

Without more funding, the Navy will face trade-offs in terms of which missions it can perform or how well it can perform them. This study presents four alternative force structures, each of which emphasizes one of the Navy's current missions. Each of the alternative fleets would cost roughly \$90 billion per year (in today's dollars) through 2020. For that sum, the future Navy could focus on:

- o Continuing to provide visible military presence around the world (known as forward presence) with aircraft carriers but fewer other ships;
- o Providing forward presence with other surface combat ships, including a new multipurpose presence vessel, which would be designed specifically for littoral operations;
- o Performing strike missions (attacking targets on land) with a fleet of new strike submarines, which would be less vulnerable to regional foes armed with antiship cruise missiles, mines, or small submarines than U.S. surface ships would be; or
- o Providing more support to the amphibious operations of the Marine Corps.

Those alternatives are by no means exhaustive. They simply illustrate some of the directions that the future Navy might take at today's funding level.

Conceptually, determining what missions the Navy should perform or whether it has enough ships ought to begin by assessing the U.S. role in the post-Cold War world and by identifying specific foreign policy objectives. From that analysis would follow a national security strategy, which would include the option of military force and how it might be used to execute that strategy. Planners could then determine the missions that the Navy (or any of the services)

should be ready to carry out, the Navy's size and composition, and the level of funding necessary to support that force structure. However, whether or to what extent the current Navy is consistent with the Administration's national security strategy is beyond the scope of this analysis. Instead, this study examines the size, composition, and funding requirements of the Navy with only general reference to the current national security strategy.

The Navy in the Post-Cold War World

Throughout the Cold War, the Navy had a number of clearly defined missions: maintaining control of the seas, operating the sea-based "leg" of the United States' nuclear deterrent, monitoring the Soviet fleet of ballistic missile submarines, and defeating any enemy concentration of naval power should war occur. To carry out those missions, the Navy invested heavily in attack submarines and other weapon systems for anti-submarine warfare. It also equipped its surface combatants with the sophisticated Aegis air-defense system. During most of the 1980s, the Navy's goal for its force—what it needed to fulfill its main missions

and other duties—was a fleet of 600 ships, including 100 attack submarines and 15 aircraft carriers.

By the mid-1980s, it had become clear that the U.S. Navy far outstripped the Soviet fleet. Shortly thereafter, the Soviet Union collapsed and the Cold War ended. The Navy's civilian and military leadership began to redefine the service's roles and missions. Those efforts resulted in the white papers . . . *From the Sea* in 1992 and *Forward . . . From the Sea* in 1994.

With those papers, the Navy's doctrine evolved to focus on a different kind of threat and on a mission that encompasses both peacetime and war. That evolution shifted the Navy's wartime mission from fighting the Soviet navy to projecting military power ashore in the world's littoral areas against regional foes (as part of the overall U.S. strategy of being able to fight two nearly simultaneous major theater wars). The Navy's peacetime mission emphasizes forward presence through regular patrols and the stationing of naval vessels around the world. Training and practicing to fight a large opponent with a global deep-water navy is very different from training and practicing to fight much smaller opponents who operate in the littorals. For example, tracking Soviet ballistic missile submarines in the quiet, deep waters of open oceans

Summary Table 1.
Distribution of Navy Ships, 1990 and 2000

	1990		2000	
	Number of Ships	Percentage of Fleet	Number of Ships	Percentage of Fleet
Aircraft Carriers	15	3	12	4
Surface Combatants	213	37	116	37
Attack Submarines	97	17	56	18
Ballistic Missile Submarines	35	6	18	6
Amphibious Ships	66	11	39	12
Combat Logistics Ships	60	10	34	11
Mine Warfare Ships and Fleet Auxiliaries	88	15	41	13
Total	574	100	316	100

SOURCE: Congressional Budget Office based on data from the Navy.

requires different skills and equipment from those needed to detect diesel-electric submarines in the noisy, shallow waters of coastal regions.

Yet despite that shift in doctrine, the Navy continued throughout the 1990s to buy weapons similar to those it bought during the Cold War, including Aegis-equipped ships, nuclear-powered aircraft carriers, and attack submarines. Although the total number of ships has dropped from 574 in 1990 to 316 by 2000, the distribution of forces among the Navy's three major warfare "communities"—air, surface, and submarine—is similar to what it was during the Cold War (see Summary Table 1). Although Navy officials might disagree, today's force could be characterized as a reduced version of the Cold War Navy.

Can the Navy Sustain a 300-Ship Fleet?

CBO's analysis of the Navy's budgetary and procurement plans suggests that the service will have difficulty maintaining a fleet of 300 ships within its current annual funding of about \$90 billion. That funding level is unlikely to cover all of the ships and aircraft the Navy will need to buy and also support readiness and a good quality of life for the service's sailors, pilots, and marines. To sustain its 300-ship fleet, its inventory of aircraft, and the infrastructure that supports them, the Navy will need an annual budget of about \$105 billion in today's dollars—\$17 billion more than it is expected to receive, on average, under the Administration's Future Years Defense Program (FYDP) for fiscal years 2001 through 2005.

The Navy plans to build 45 ships between 2000 and 2005, or seven and a half ships per year (see Summary Table 2). Those vessels include more of the current models of aircraft carriers and destroyers. They also include new designs, such as the DD-21 destroyer, the Virginia class attack submarine, and the LPD-17 amphibious ship. Assuming that the average service life of a Navy vessel is 35 years, that planned shipbuilding rate is sufficient to keep the Navy at about 300 ships through the coming decade. Eventually, however, as more ships reach the end of their ser-

Summary Table 2.
The Navy's Planned Purchases of New Ships and Aircraft Through 2020

	2000-2005	2006-2020 ^a
Ships		
Aircraft carriers	1	4
Surface combatants	14	48
Submarines	5	38
Amphibious ships	11	5
All others	<u>14</u>	<u>33</u>
Total	45	128
Aircraft		
Fighters	267	219
Strike aircraft	0	984
Medium lift aircraft	246	374
Trainers	160	210
All others	<u>37</u>	<u>439</u>
Total	710	2,226

SOURCE: Congressional Budget Office based on data from the Navy.

a. These purchases represent the Navy's preliminary projections for the future rather than its official requirements or programmatic decisions.

vice lives than are replaced, the Navy must buy larger numbers of ships or the size of the fleet will decline.

With respect to aircraft, the Navy is planning to buy planes in smaller quantities than required to maintain the current inventory. To sustain a fleet of about 3,500 aircraft, the Navy needs to buy, on average, 152 planes and helicopters per year. Under the 2001 FYDP, it will purchase 710 aircraft through 2005, or an average of 118 a year.

Alternatives for Structuring Future Naval Forces

If the Navy does not receive more resources in the future than it is getting now, it will eventually have to reduce its force structure. That could be done in many

ways. In this analysis, CBO assumes that the Navy's funding is fixed at \$90 billion (adjusted for future inflation)—roughly its average budget for the next five years under the 2001 FYDP.

CBO constructed four alternative fleets that the Department of the Navy could pursue between today and 2020 to fit within a \$90 billion budget. Each of the options emphasizes a particular portion of the Navy's existing force structure. They illustrate different ways in which the Navy could reduce its fleet further and still replace older ships with newer and usually more-capable ones. Which of the alternatives is the "best" choice for the force structure, under the budgetary assumptions of this analysis, depends on how the world evolves between now and 2020 and on what missions the Navy is asked to perform.

Each alternative has advantages and disadvantages, which are discussed in the context of the differ-

ent directions that the world might take over the next 20 years. It should be emphasized, however, that the alternatives illustrate only what a smaller Navy might look like; this analysis does not consider the numerous other potential ways to structure U.S. naval forces.

Alternative I: Rely on Aircraft Carriers and Focus on Providing Forward Presence

This option would keep the Navy's fleet of aircraft carriers at its current size, 12, which would mean limiting the numbers of other types of ships. Proponents of keeping a large carrier fleet would argue that maintaining a robust forward presence with those ships deters aggressors, reassures friends, and allows the United States to respond more quickly in a crisis than if its fleet sailed from U.S. ports.

Summary Table 3.
Force Structure Under the Navy's Current Plan and Four Alternatives

	Navy's Current Plan ^a	Alternative I: Keep a 12-Carrier Navy for Forward Presence	Alternative II: Use Other Ships for Presence Missions	Alternative III: Build a Submarine Strike Navy	Alternative IV: Reorient the Navy to Provide More Support to the Marine Corps
Aircraft Carriers	12	12	7	7	10
Surface Combatants	117	83	118	58	93
Attack Submarines	55	25	34	72	30
Strike Submarines	0	0	0	50	0
Ballistic Missile Submarines	14	10	10	10	10
Amphibious Ships	36	24	6	18	43
Combat Logistics Ships	31	26	26	26	26
Mine Warfare Ships	16	16	16	16	47
Fleet Auxiliaries	<u>23</u>	<u>23</u>	<u>23</u>	<u>29</u>	<u>23</u>
Total Ships	304	219	240	286	282
Aircraft Carrier Air Wings	11	11	6	6	9

SOURCE: Congressional Budget Office.

a. Assumes that the Navy achieves the force goal of the Quadrennial Defense Review, after adjustments in 2007 and 2012, plus five additional submarines and one additional surface combatant.

To pay for 12 carriers and their upkeep, the Navy would have to reduce the surface combatant force from the currently planned level of 117 ships to 83 by 2020—a decline of almost 30 percent. Under this option, that force would consist of 58 Arleigh Burke destroyers and 25 “sea dominance” versions of the DD-21 destroyer, which is a less-capable ship than the version of the DD-21 that the Navy is now planning to buy. The current fleet’s 27 Ticonderoga class cruisers would be retired and not replaced.

Other cuts under Alternative I would include reducing the number of attack submarines from 55 to 25 and the number of ballistic missile submarines from 14 to 10 (see Summary Table 3). This fleet would also have fewer support (logistics) ships than the planned Navy. Because the option emphasizes aircraft carriers, the Navy and Marine Corps would buy both the F/A-18E/F fighter aircraft and the Joint Strike Fighter.

Overall, this force would support the same level of forward presence with aircraft carriers as the planned Navy. It would be effective for carrying out that mission day to day in regions considered vital to U.S. interests and for responding quickly to any rapidly developing crises there. This fleet would also be an effective instrument for controlling the seas. However, the Navy would have less ability to use surface combatants to fill any gaps that arose in maintaining forward presence with aircraft carriers. In addition, other presence missions that do not require carriers (such as operations to prevent drug smuggling or joint exercises with other navies) would probably have to be curtailed.

Furthermore, this alternative’s fleet would be able to fight two nearly simultaneous major theater wars, but it would be less flexible in performing unmanned strike missions because it would have fewer Tomahawk missile launchers. It would also have fewer attack submarines available for forward deployment. That limitation, according to a 1999 Pentagon review, would make it difficult for the attack submarine force to perform either its peacetime or its wartime missions.

Alternative II: Use Other Ships for Presence Missions

Some critics have argued that the Navy is not designing and building the right kinds of ships to operate mainly in coastal waters. This option illustrates one way to address that criticism. It would cut the number of aircraft carriers and use the resulting savings to develop a surface combatant force especially designed for overseas presence. Under this alternative, the Navy would have seven aircraft carriers, 118 surface combatants (58 Arleigh Burke destroyers and 60 “presence” ships, described below), six large flat-deck amphibious ships, 34 attack submarines, 10 ballistic missile submarines, and slightly fewer support ships than under the Navy’s current plan (see Summary Table 3).

Instead of building the surface combatant force around the DD-21 destroyer, the Navy would commission a new type of presence ship. It would be a multi-purpose vessel that could perform many of the missions in littoral areas that are now distributed among several classes of ships. As suggested by Admiral William Owens (former Deputy Chief of Naval Operations and Vice Chairman of the Joint Chiefs of Staff), the ship would resemble a hybrid of a surface combatant and a flat-deck amphibious ship. It could carry and deploy marines, shoot Tomahawk and Standard missiles from vertical launch system cells, and provide long-range gunfire support to troops on shore.

This alternative would provide a robust forward presence. The U.S. carrier that is currently based in Japan could provide full-time presence in the Western Pacific. The remaining carriers could provide either a modest level of presence in both the Mediterranean and Persian Gulf regions or nearly full-time presence in one of those two areas. At the same time, this option would allow the Navy to maintain eight presence ships and five attack submarines in continuous forward deployment.

What this option would add to performing the presence mission, however, it would subtract from the

Navy's ability to fight two major theater wars. Even several presence ships would be unlikely to prove as effective in wartime as an aircraft carrier. One criticism of the hybrid presence ship is that it could perform many missions but none of them optimally. Yet in other ways, the presence ship could be quite flexible because, as a large multipurpose ship, it could adapt more easily to changes in technology than could smaller, more specialized craft.

Alternative III: Build a Submarine Strike Navy

This alternative would deemphasize the forward presence mission in favor of increasing the Navy's ability to carry out large strike operations with missiles. In the future, the areas where the Navy may operate could be dominated by regional powers armed with large numbers of relatively inexpensive antiship cruise missiles and small diesel-electric submarines. Because such developments could make surface ships more vulnerable, this alternative would build more submarines to perform the strike missions that are now conducted by surface combatants and carrier-based aircraft. The quietness of submarines makes them ideal for stealthy strike operations from the sea.

The fleet under this option would be very different from the force structure that the Navy now envisions (see Summary Table 3). In this alternative, the Navy would design and acquire 50 new "strike submarines"; like the current Trident ballistic missile submarines, each strike submarine would have two crews. Those new submarines would be large vessels with the means to launch hundreds, if not thousands, of various land-attack weapons, including missiles and unmanned vehicles. This alternative would also increase the attack submarine force to 72 (compared with 55 under the Navy's current plan), for a total fleet of 122 submarines. The Navy considers an attack submarine force of 72 to be the minimum size necessary to meet all of its peacetime requirements for presence and intelligence collection by 2020. The surface combatant force would be reduced to just the 58 Arleigh Burke destroyers, whose principal mission would be to protect the seven remaining aircraft carriers. The amphibious fleet would be cut by half and the number of support ships reduced slightly, but the number of sub-

marine tenders (vessels that provide a floating maintenance facility) would jump from two to eight.

The Navy's principal mission under this alternative would be to provide a capability for land-attack warfare with missiles that would be difficult to defeat or destroy—in military terms, this fleet would be "highly survivable." About 25 strike submarines (each with two crews) and 12 attack submarines could be forward deployed continuously, ready to strike a potential aggressor with a large amount of ordnance. However, the Tomahawk missiles that submarines fire today are not as flexible a weapon as aircraft launched from carriers. The major virtue of this option is the fleet's ability to strike with great power and yet survive in an environment in which surface ships may not be able to operate safely. In addition, as new technologies were developed to make missiles smaller, more versatile, and more accurate, the bombardment capability of the strike submarine force would increase dramatically. Whether that capability could ever exceed the capability of today's carrier fleet, though, is an open question.

Of the four options examined in this study, Alternative III would be the least effective in providing visible forward presence during peacetime. With so few surface ships in the fleet, substantial periods of time could elapse during which large U.S. ships were unavailable in different regions of the world. In wartime, however, this fleet could effectively deny other navies or civilian ships the use of the sea because of its large attack submarine force.

Alternative IV: Reorient the Navy to Provide More Support to the Marine Corps

Shaping the fleet to provide more support to the Marine Corps may be a logical approach to force structure in the post-Cold War world. The United States is unlikely to face a global competitor like the Soviet Union for many years to come. At worst, it may someday confront one or more smaller, regional powers that endanger U.S. interests by, for example, threatening allies or interfering with the free flow of commercial shipping. The amphibious assault capabilities of the Marine Corps could prove useful against

such opponents, should the United States need to attack them with ground forces. In addition, the Corps is well suited to perform most of the missions that U.S. forces have been involved in since the end of the Cold War: peacekeeping operations, humanitarian interventions, hostage rescues, and evacuations of civilian personnel. The Marines are structured and trained to conduct precisely those missions, which often arise with little warning.

Compared with the Navy's current plan, this alternative would spend more on amphibious ships. It would buy 12 large helicopter carriers (either the LHA or LHD class) and 12 LSD transport docks, the same numbers slated for purchase in the current plan. However, this option would also buy 19 LPD-17 dock landing ships to the current plan's 12 (see Summary Table 3). The extra seven LPD-17s would allow the Navy to meet the Marine Corps's goal of being able to transport the assault echelons of three Marine expeditionary brigades.

In addition, Alternative IV would buy 31 more mine-clearing ships than the Navy's current plan calls for. To pay for those ships, it would cut the carrier force to 10 and the surface combatant force to 93 (58 Arleigh Burke destroyers and 35 maritime support versions of the DD-21). The submarine force would also shrink: the number of attack submarines would fall to 30, and the number of ballistic missile submarines would drop to 10.

The central mission of the Navy under this alternative would be to support the Marine Corps in any operation it might have to conduct from the sea. This fleet would be better suited for that role than the fleet created under any other alternative, including the Navy's current plan. It would provide more transport

capacity, more mine-clearing capability, and more gunfire support. But by orienting its fleet primarily toward supporting the Marine Corps, the Navy would give up some capabilities—most notably its performance of deep-strike missions. Under this alternative, those missions would fall to the Air Force, and the Navy's carrier aircraft would be used to provide closer air support to the Marine Corps.

Conclusions

The Navy's roles and missions in the post-Cold War environment are still evolving. The old Navy of the open ocean is becoming a Navy that focuses on coastal warfare. But uncertainty abounds regarding the right combination of ships and aircraft for that new orientation. Compounding that uncertainty is the reality that the Navy's budget is not large enough to pay for all of its programs—including those designed to conduct coastal warfare. To purchase what it wants, the service must either receive a substantial increase in procurement funding or cut its force structure.

As the Navy seeks a balance between its roles, missions, and budget, there are many alternatives to its current plans that it could explore. This study outlines four such options. Each has strengths and weaknesses in its approach to different threats and environments, and each focuses on performing one of the Navy's varied missions. Determining which alternative (or combination of them) is "best" depends on which missions one considers most important and which threats or challenges the United States is likely to face well into the 21st century.

The U.S. Navy in the Post-Cold War World

The U.S. Navy has changed its doctrine and reduced its size since the mid-1980s, when the United States and the Soviet Union were engaged in the Cold War. Day to day, however, the Navy continues to perform many of the same tasks that it did 15 years ago. The service's budget has shrunk by about 35 percent since 1985 (adjusting for inflation); consequently, fewer ships are deployed overseas. But the number of operations the Navy has been called on to carry out has risen. If that trend continues, the Navy will find it increasingly difficult to modernize the fleet, maintain the same level of operational readiness and overseas presence as in the past, and provide a good quality of life for its sailors, pilots, and marines.

In this study, the Congressional Budget Office (CBO) focuses on four questions that are central to the Navy's future:

- o What missions might the Navy be asked to perform between now and 2020?
- o Does the Navy have a viable plan to sustain and modernize its current fleet of about 300 ships?
- o Can the Navy pay for that plan if its funding is limited to an inflation-adjusted level of \$90 billion per year (roughly the average amount budgeted under the Future Years Defense Program for fiscal years 2001 through 2005)?

- o What are some possible alternatives to the Navy's current force structure and modernization plan?

Conceptually, determining what missions the Navy should perform or whether it has enough ships to do so ought to begin by understanding the U.S. role in the post-Cold War world and how specific foreign policy objectives would support that role. From that understanding would follow a national security strategy, which would include the option of military force and how it might be used to execute that strategy. Then, planners could determine the missions that the Navy (or any of the services) should be ready to perform, the Navy's size and composition, and the level of funding necessary to support its force structure.¹ Although vital, questions about the role of U.S. interests and foreign policy objectives in shaping the nation's military strategy or the Navy's missions, structure, and budget are beyond the scope of this analysis. So are questions of whether or to what extent the current Navy is consistent with the national security strategy.

1. Very different foreign policies and national security strategies could lead to very different naval missions, force structures, and budget levels. For example, U.S. foreign policy today calls for an active presence in world affairs; consequently, the Navy deploys a large percentage of its fleet overseas in support of that policy. A foreign policy that articulated a much less active role for the United States might well lead to many fewer ships being deployed overseas, a smaller fleet, and a smaller budget for the Navy.

Instead, this study analyzes the size, composition, and funding requirements of the Navy with only general reference to the current national security strategy. The core objectives of that strategy, as articulated by President Clinton, are to enhance U.S. security, bolster the nation's economic prosperity, and promote democracy abroad.² To achieve those goals, the United States pursues a variety of lesser objectives. They include maintaining a military presence in many regions around the globe, promoting an open trading system, exporting U.S. goods and services, protecting the flow of oil from exporters to importers, and maintaining the military capability to win two major theater wars nearly simultaneously as well as to conduct smaller operations.

Sea power—through the missions that the Navy and its related service, the Marine Corps, perform—is a fundamental element in achieving both the broad and the specific goals of the national security strategy. This chapter reviews changes in the strategy and missions of the Navy since the Cold War, the Navy's current force structure, recent attempts to determine the optimum size of that force, the service's plans for procuring and modernizing ships, and potential threats to U.S. naval forces around the world.

The Evolution of Naval Strategy and Missions Since the Cold War

During the Cold War, the U.S. Navy's main mission was to counter the threat posed by Soviet maritime forces. If a war had broken out in Europe, Soviet submarines and long-range bombers would have tried to disrupt supplies and reinforcements being shipped from the United States to Europe. Soviet (and now Russian) naval forces in the European theater have always been geographically constrained. Thus, before they could attack U.S. resupply convoys crossing the North Atlantic, Soviet submarines and bombers would have had to traverse two relatively narrow waterways:

one between Greenland and Iceland and the other between Iceland and the United Kingdom (an area commonly called the GIUK gap at that time).

As a result, the North Atlantic Treaty Organization (NATO) advocated a strategy of "sea control," which called for setting up defensive barriers between Greenland, Iceland, and the United Kingdom. NATO antisubmarine forces—including U.S. subs—would try to intercept Soviet submarines before they reached the Atlantic Ocean. Similarly, U.S. aircraft based on carriers and in Greenland, Iceland, and the United Kingdom would attempt to shoot down Soviet bombers before those bombers could use their long-range cruise missiles against NATO shipping.

As the Soviet and U.S. navies grew during the Cold War, the U.S. Navy developed an offensive strategy in the mid-1980s called the maritime strategy. It called for attacking Soviet maritime forces as far forward as possible—in their home bases or as they traversed the Norwegian Sea en route to the Atlantic. Navies are much easier to find and more vulnerable when they are in port or in more confined waters. The maritime strategy argued that if Soviet forces were found and attacked under those conditions, they would be much less likely to reach the open ocean and disrupt NATO sea control. As part of that strategy, U.S. attack submarines would try to destroy not only Soviet subs capable of firing nuclear ballistic missiles but also the attack submarines guarding them in defensive bastions near the Soviet homeland.³

In either the sea control or the maritime strategy, defense planners presumed that the Soviet Union would attack U.S. vessels in the open ocean with submarines and land-based bombers. Consequently, during the Cold War, the U.S. Navy made investing in attack submarines and antisubmarine warfare systems its highest priority. A close second was equipping its surface ships with sophisticated systems to defend against attack from the air. In the later portion of the maritime strategy—once Soviet maritime forces had been eliminated—deep-strike aircraft from carriers would be used to attack the Soviet Union itself. On the basis of those strategies, the U.S. Navy's goal dur-

2. The White House, *A National Security Strategy for a New Century* (December 1999), p. iii.

3. Admiral William A. Owens, *High Seas: The Naval Passage to an Uncharted World* (Annapolis, Md.: Naval Institute Press, 1995), pp. 3-4.

ing most of the 1980s was to have a fleet of 600 ships, including 100 attack submarines and 15 aircraft carriers.

With the end of the Cold War and the dramatic decay of the Russian navy, the United States was left without a major rival for control of the seas. As a result, the U.S. Navy began to question its mission. It moved away from the maritime strategy when it published the white papers . . . *From the Sea* in 1992 and *Forward . . . From the Sea* in 1994. Instead of warfare in the open ocean, those documents emphasized projecting military power ashore. With the United States capable of controlling the world's oceans and no major threat to maritime transportation in view, the Navy began to concentrate almost exclusively on fighting smaller, regional foes in the world's littoral (coastal) areas. As its principal peacetime mission, the Navy emphasized overseas, or forward, presence—having its ships patrol the world's oceans to deter trouble.

Among the Navy's many missions, sea control and forward presence are paramount: sea control makes performing the Navy's other tasks possible, and forward presence makes performing them easier. At any given time, about half of U.S. naval forces are at sea—either deployed forward in key regions around the world, going to and from those regions, or training for deployment. With those forces, the Navy keeps in place the military power necessary to control the sea lanes. Military and commercial shipping can traverse those waters but only with the acquiescence of the U.S. Navy.

By controlling the sea lanes, the Navy can carry out such peacetime tasks as evacuating noncombatant U.S. personnel from crisis situations, providing humanitarian assistance and disaster relief, enforcing sanctions, combating narcotics smuggling, supporting peacekeeping operations, reinforcing U.S. diplomacy, and reassuring allies.⁴ In wartime, the Navy's major

missions would include projecting U.S. power ashore with Tomahawk cruise missiles, carrier aircraft, or Marine amphibious forces.

Among their other missions, U.S. naval forces—especially attack submarines—also gather intelligence, which is one of the few missions that does not necessarily depend on control of the sea. In addition, naval forces conduct a variety of missions aimed at deterring potential aggressors from attacking their neighbors or threatening U.S. interests. Ballistic missile submarines, which are virtually invulnerable to detection and attack, are the mainstay of the U.S. strategic nuclear force. They provide an extra measure of deterrence beyond the quick military response that forward-deployed naval forces represent. (The Navy may have another mission in the future: using surface combat ships to provide a defense against ballistic missiles.)

The Current Organization of the Navy

The Navy organizes many of its ships into battle groups centered around 12 aircraft carriers. During the Cold War, a notional carrier battle group consisted of one carrier surrounded and protected by six surface combatants. Those ships usually consisted of two cruisers or destroyers (equipped with the Aegis combat system for air defense) and four destroyers or frigates (to defend against opposing submarines and surface vessels). Rounding out the group were combat logistics ships for resupplying the carrier and the surface combatants. In addition, attack submarines were sometimes assigned to provide support to a battle group, but they were not well integrated with the group's operations.

Today, the composition of a notional carrier battle group varies according to the severity of the likely threat and the mission to be undertaken. Nevertheless, those groups still look much like they did during the Cold War. One difference is that attack submarines operate more often with battle groups now to help guard against enemy subs. With less need to perform independent missions against Russian nuclear subma-

4. Generally, the Navy and the Marine Corps are used more often than the Air Force or the Army to respond to international events or crises. See Barry M. Blechman and Stephen S. Kaplan, *Force Without War: U.S. Armed Forces as a Political Instrument* (Washington, D.C.: Brookings Institution, 1978), pp. 38-48. See also Department of the Navy, *Vision . . . Presence . . . Power: A Program Guide to the U.S. Navy* (1999).

Table 1.
Distribution of Navy Ships, 1990 and 2000

	1990		2000	
	Number of Ships	Percentage of Fleet	Number of Ships	Percentage of Fleet
Aircraft Carriers	15	3	12	4
Surface Combatants	213	37	116	37
Attack Submarines	97	17	56	18
Ballistic Missile Submarines	35	6	18	6
Amphibious Ships	66	11	39	12
Combat Logistics Ships	60	10	34	11
Mine Warfare Ships and Fleet Auxiliaries	<u>88</u>	<u>15</u>	<u>41</u>	<u>13</u>
Total	574	100	316	100

SOURCE: Congressional Budget Office based on data from the Navy.

rines than during the Cold War, U.S. submarines are becoming more integrated with battle-group operations.

At the beginning of 2000, the Navy possessed 116 surface combatants (see Table 1). Although the majority are associated with carrier battle groups, the remainder are available for independent presence missions, crisis response, exercises, and specialized missions. Surface combatants, including those equipped with Tomahawk missiles and the Aegis air-defense system, sometimes form what used to be called surface action groups. Those groups substitute for carrier battle groups where gaps exist in maintaining forward presence, responding to crises, or conducting other independent missions.⁵ For example, the Navy regularly sends the Middle East Force, a surface action group, to the Persian Gulf. (Surface ships of the U.S. Coast Guard sometimes also take part in overseas presence missions. Their role is discussed in Box 1.)

Like surface combatants, attack submarines can also be used for independent missions. Those missions include collecting intelligence off the coast of a hostile nation or landing teams of special-operations forces ashore. (In practice, roughly two-thirds of the

Navy's submarine missions gather intelligence whether they are supporting a carrier battle group or not.) During the Cold War, in contrast, most U.S. submarines were devoted to tracking and, in the event of war, attacking Russian ballistic missile and attack submarines.⁶ The U.S. Navy would probably consider that to be the primary mission of its attack submarines once again if relations between the United States and Russia deteriorated significantly.

The Navy's amphibious ships are organized into 12 amphibious ready groups (ARGs) of about three ships each. Those groups sometimes accompany carrier battle groups to conduct forward presence missions or respond to crises, but they can also operate independently. ARGs are designed for such missions as landing Marines in a limited amphibious assault, rescuing noncombatant personnel during a crisis, and providing humanitarian assistance.

An amphibious ready group is usually centered around a large flat-deck ship that is similar to a medium-sized aircraft carrier (but smaller than the very large carriers that are the mainstay of the U.S. Navy). The flat-deck ship helps transport marines and

5. See Robert Holzer, "114 Navy Warships Won't Do the Job, Study Says," *Navy Times* (June 6, 1994), p. 34.

6. For a picture of submarines' new missions, see Don Ward, "New Horizons: As Subs Surface from the Cold War, the View Is Friendlier but Busier," *Navy Times* (November 15, 1993), p. 14.

equipment to shore. It can also launch helicopters and fixed-wing aircraft that take off and land vertically, landing craft that travel on a cushion of air, and amphibious personnel carriers that "swim" to shore. The other, smaller amphibious ships in an ARG can also launch helicopters, landing craft, and amphibious vehicles. In the long term, as newer, more-capable amphibious ships replace more-numerous older models, each ready group will comprise one large flat-deck ship, one amphibious transport dock, and one dock landing ship.

A fast combat logistics ship (also known as a station ship) accompanies every aircraft carrier battle group to supply fuel, ammunition, and dry-cargo provisions. The combat logistics force also contains shuttle ships for each of those commodities; shuttle ships

travel from port to the battle group to resupply the station ship. Other support ships that do not operate with carrier battle groups or amphibious ready groups include surveillance ships for hunting submarines, tenders that provide a floating maintenance facility for other vessels, ships used to clear mines, and open-ocean tugboats.

Rounding out the Navy are 18 ballistic missile submarines, the portion of U.S. nuclear forces that are considered most likely to survive a nuclear war. Those submarines are very quiet and operate independent of other forces. In a nuclear war, they would launch their missiles while hiding in the deep ocean. The Navy intends to reduce that force to 14 submarines by 2004.

Box 1. **The Role of the U.S. Coast Guard**

The Coast Guard is the fifth armed service of the United States. It is much smaller than the other services, with about 35,000 uniformed and 6,000 civilian personnel and an annual budget of about \$4 billion. Unlike the other services, it is part of the Department of Transportation. The Coast Guard's fleet consists of 125 cutters and large patrol boats, 190 aircraft and helicopters, and many small boats. That fleet both supplements and complements the Navy, but it also has unique responsibilities and missions.

The Coast Guard's high- and medium-endurance cutters, though smaller than Navy frigates, participate in overseas combat operations and peacetime presence missions. During the Vietnam War, Coast Guard cutters patrolled Vietnamese waters, providing gunfire support to troops and attacking enemy supply routes, base camps, and rest areas. More recently, a Coast Guard cutter was assigned to the Navy's Sixth Fleet and is helping to patrol the Adriatic Sea after the NATO air campaign against Serbia. Coast Guard cutters are regularly involved in presence missions to ports on the Mediterranean Sea and the Persian Gulf.

The Coast Guard's primary mission is the coastal defense of the United States, and its performance of that mission frees the Navy to operate else-

where. The Coast Guard is responsible for protecting millions of square miles of ocean and thousands of miles of coastline from relatively low intensity threats such as narcotics trafficking and illegal immigration. The Navy is also responsible for protecting U.S. shores from those types of threats, of course, but its principal focus in coastal defense is on the greater perils posed by the navies of potentially hostile nations.

Unlike the Navy, the Coast Guard is also a law-enforcement organization. In effect, Coast Guard personnel are the police, firemen, and paramedics of the sea. They enforce marine regulations, respond to environmental hazards such as oil spills, and conduct search-and-rescue operations for boats and aircraft lost at sea.

The Coast Guard hopes to embark on a \$15 billion acquisition program known as Deepwater to replace many of its aging ships and aircraft. The program is also intended to integrate the Coast Guard's sensors, ships, and aircraft to make the service a smaller but more effective force. Currently, the Coast Guard is soliciting design plans from three teams of contractors. The Congress is expected to authorize the first ship in that program after fiscal year 2001.

Determining How Big the Navy Should Be

Determining the size of the Navy depends heavily on a myriad of assumptions. They include what the Navy's ships will be used for, how many commitments or conflicts are expected, how capable the ships are, what level of force is necessary to do the job, and how hard the ships' crews are worked.

Strategy Reviews in the 1990s

Since the end of the Persian Gulf War in 1991, the Department of Defense (DoD) has carried out two major strategy reviews to determine the proper size and composition of U.S. military forces, including the Navy. The first was conducted in 1993 as part of the department's Bottom-Up Review (BUR). The second, held in 1997, was called the Quadrennial Defense Review (QDR). Different assumptions led the two reviews to different conclusions about what the future Navy should look like. Despite those assumptions, however, the reductions in U.S. naval forces that occurred during the 1990s appear to have been driven largely by declining budgets, brought on by the collapse of the Soviet Union.

The plan that emerged from the BUR decreased the Navy's force goal from 574 ships in 1990 to 346 ships by 1999.⁷ The recommended number of carriers was reduced to 12 and attack submarines to between 45 and 55. But the BUR was unclear about the required number of surface combatants, which may explain how it could recommend a specific number for the total fleet but a range for the attack submarine force. Later, the overall force goal was lowered to 331 ships—to save funds to modernize the fleet—but it was restored to 346 in 1995 by the Chief of Naval Operations. That decision was apparently made because of a more optimistic outlook for the Navy's budget and because naval forces were being heavily used

for overseas forward presence and crisis-response missions.⁸

The 1997 Quadrennial Defense Review revisited the Navy's force goal and further reduced the recommended numbers of attack submarines and surface combatants.⁹ Subsequent Navy statements and briefings and DoD's 1998 *Annual Report* to the President and the Congress confirm a force goal of slightly more than 300 ships by 2003. That goal includes 12 aircraft carriers, 116 surface combatants, 50 attack submarines, and 41 amphibious ships (see Table 2). In addition, the 2000 *Annual Report* and the President's budget for fiscal year 2001 added five submarines and possibly one surface combatant to that goal.

The BUR and the QDR illustrate the difficulty in determining the optimum size and composition of the Navy. Despite the substantial differences between the two reviews, each maintained that the naval forces it recommended were sufficient to fight two major theater wars nearly simultaneously as well as to maintain a robust forward presence. In fact, the Bottom-Up Review specifically stated that 10 carrier battle groups were adequate to fight two such wars but that 12 were necessary to maintain a forward presence in three key regions of the globe: the Western Pacific, the Persian Gulf and Arabian Sea, and Europe (usually the Mediterranean Sea).

Current Reviews of Naval Forces

In preparation for the next Quadrennial Defense Review, set to begin in 2001, the Navy continues to study its structure in detail. One review, the Surface Combatant Force Level Study II, is examining whether the Navy needs more than 116 surface combatants to perform all of the missions required of that fleet.¹⁰ Preliminary analysis argues that by 2015, with the likely addition of theater missile defense to its missions, the

7. Secretary of Defense Les Aspin, *Report on the Bottom-Up Review* (October 1993), p. 28.

8. John Burlage and Ernest Blazar, "Drawdown Doesn't Jibe with Navy's Course," *Navy Times* (July 3, 1995), p. 4.

9. Secretary of Defense William S. Cohen, *Report of the Quadrennial Defense Review* (May 1997), pp. 29-30.

10. Robert Holzer, "Requirements Rise May Force Larger U.S. Warship Fleet," *Defense News* (May 24, 1999), p. 1.

Table 2.
Drawdown of Navy Ships Between 1990 and 2003

	1990	1994 (BUR) ^a	2000	2003 (QDR Goal)
Aircraft Carriers	15	12	12	12
Surface Combatants	213	110	116	116
Attack Submarines	97	87	56	50
Ballistic Missile Submarines	35	16	18	14
Amphibious Ships	66	41	39	41 ^b
Combat Logistics Ships	60	47	34	34 ^c
Mine Warfare Ships	8	15	16	16
Fleet Auxiliaries	<u>80</u>	<u>59</u>	<u>25</u>	<u>23</u>
Total	574	387	316	306 ^d

SOURCE: Congressional Budget Office based on data from the Navy.

NOTE: BUR = Bottom-Up Review; QDR = Quadrennial Defense Review.

- a. These numbers represent the Navy's force level shortly after the BUR was published, not the BUR force goal, which was 346 ships.
- b. As the Navy replaces more-numerous older ships with more-capable ships, this number will fall to 36 by 2007.
- c. As the Navy replaces more-numerous older ships with more-capable ships, this number will fall to 31 by 2012.
- d. Under the QDR, this number was supposed to fall to 298 by 2012. However, in 2000 the Department of Defense added five submarines and, apparently, one surface combatant to its force goal. Thus, by 2012 the total would be 304.

Navy would need as many as 95 surface combatants for peacetime operations. The service has not yet determined how many of those ships it would need to carry out combat missions, but the number would be larger, perhaps around 140. It is not clear when, if ever, the Navy will issue that report.¹¹ Moreover, if a national missile defense system is deployed on surface ships, the requirements for those vessels will increase substantially.

The guidance from recent DoD reviews is also ambiguous when it comes to determining the size of the attack submarine force. The Bottom-Up Review specified that 45 to 55 boats would be necessary to meet combat requirements but that the lower number of that range would jeopardize the Navy's ability to perform peacetime missions. Somewhat arbitrarily, the QDR rounded that number to an even 50. In

March 1998, military officials argued before the Senate Armed Services Committee that requirements for attack submarine deployments, "which include CVBG [carrier battle group] deployments, national tasking, arctic operations, special forces missions, and independent presence missions[,] would dictate a force of 72 attack submarines."¹² A 1999 study for the Chairman of the Joint Chiefs of Staff determined that the Navy needs 55 submarines by 2015 to meet wartime requirements and between 55 and 68 to fulfill the most critical peacetime requirements.

In the absence of a real enemy to fight, the size of the attack submarine force might be driven by the number of submarines that U.S. political and military leaders want to keep forward deployed. According to a Navy calculation, 5.8 submarines are necessary to keep one submarine forward deployed at all times.

11. The first version of that analysis was done in the early 1990s and argued that the Navy needed 120 to 135 surface combatants to fulfill peacetime presence missions and 135 to 165 ships to fulfill wartime requirements.

12. Ronald O'Rourke, *Navy Attack Submarine Programs: Background and Issues for Congress*, Report for Congress RL30045 (Congressional Research Service, February 4, 1999), p. 21.

Thus, using the Navy's formula, 50 submarines can keep eight submarines operating in that manner.

Although the size of the Navy's fleet has fallen since 1993, the carrier force has remained steady at 12. That number appears to be a compromise between what is required for forward presence and what the Navy needs to fight wars. As noted above, the Bottom-Up Review stated that 10 carriers were enough to fight two regional wars nearly simultaneously but that keeping an aircraft carrier deployed in East Asia, the Persian Gulf area, and the Mediterranean at all times would require a force of 15 carriers.¹³

According to the BUR, 12 aircraft carriers can provide a high level of presence in those regions and meet warfighting needs "at an acceptable level of risk."¹⁴ What that appears to mean is that 12 carriers can meet the requirements for both warfighting and forward presence with about two-month gaps each year in their coverage of the Mediterranean and Persian Gulf areas. In the event that full-time forward presence was necessary because of a crisis, the carriers could be kept at their stations longer than their usual six-month deployment, albeit at the risk of exhausting their crews. Restoring the Navy to a force of 15 aircraft carriers would be an expensive proposition: procurement costs would reach more than \$30 billion if all new ships and aircraft were built, and operating and support costs would add about \$1 billion annually. Conversely, cutting the carrier fleet to 10 would save money but leave extremely large gaps in presence in the Mediterranean and the Persian Gulf—in the absence of any remedial actions that could keep the carriers on patrol longer.¹⁵

The requirements for the carrier fleet depend on a host of assumptions, such as what type of future carriers the Navy buys, how frequently and how long they are deployed, the time required for crews to achieve a

high level of readiness, and the availability of overseas home ports for carrier battle groups. Analyses by outside organizations have come to similar or different conclusions than DoD depending on the assumptions they used. For example, a study by the Center for Naval Analyses showed that an 18-month deployment cycle for carriers could generate the same amount of forward presence as a 21-month cycle but with two fewer carriers.¹⁶

Procuring and Modernizing Navy Ships

Although the overall size of the Navy is in flux, the service is developing or building a new ship for each major type of vessel it uses. Because the service lives of ships range from 30 to 50 years, all of the ships that the Navy is buying today or that it plans to buy in the next 10 years will probably still be in the fleet in 2020, and some will still be there in 2040. Thus, they represent major claims on the Navy's future resources.

Procurement Since the Cold War

While its strategy and missions shifted in the 1990s, the Navy continued to buy either the same weapons it had purchased during the Cold War or new versions of them (with the exception of attack submarines). For example, the Navy is still buying the DDG-51 Aegis-equipped destroyer, which was designed to counter massive attacks by Soviet cruise missiles over open water. The DDG-51 (the Arleigh Burke class) is not as effective in the more cluttered littoral environment. Moreover, early versions of the ship cannot house a helicopter, which is a potent weapon against coastal patrol boats armed with antiship missiles—the main naval weapon of many potential regional adversaries.

For two other types of vessels—aircraft carriers and submarines—the Navy is not straying far from the ships it now deploys. Although it has begun research

13. See Aspin, *Report on the Bottom-Up Review*; and Congressional Budget Office, *Improving the Efficiency of Forward Presence by Aircraft Carriers*, CBO Paper (August 1996).

14. Department of the Navy, *Vision . . . Presence . . . Power*, p. 13.

15. Creating a home port in the Mediterranean or bringing in a new crew while an aircraft carrier was in its theater of operations rather than back in the United States could keep carriers at their stations for a much longer time. See Congressional Budget Office, *Improving the Efficiency of Forward Presence by Aircraft Carriers*.

16. William H. Sims, *Budget-Driven Carrier Employment Options and Implications for Future Carrier Design* (Alexandria, Va.: Center for Naval Analyses, July 1992), pp. 6-7.

and development of an aircraft carrier to replace the current Nimitz class ships, it still has one Nimitz under construction and will order another in 2001. The Navy also purchased a third Seawolf submarine in 1996 and began buying its less expensive successor, the Virginia class attack submarine, in 1998. The Virginia is the first major naval weapon that is designed to perform missions in littoral areas but is still able to operate effectively in the blue water of the open ocean.

In the area of aircraft procurement, the Navy has begun buying the E/F model of the F-18 fighter. That aircraft can fly farther and carry a bigger payload than its predecessor—the F-18C/D—which should make it more useful as a bomber and thus better for operations against land targets in coastal regions.¹⁷ In the longer term, one version of the Joint Strike Fighter is expected to become the Navy's principal aircraft for ground attacks.

Although the total number of U.S. ships will drop to 316 in 2000 from 574 a decade earlier, the distribution of forces among the service's three major warfare "communities"—air, surface, and undersea—remains similar to what it was during the Cold War (see Table 1). The force has become slightly more "carrier heavy"—that is, the number of aircraft carriers has been reduced by less than the number of surface combatants and submarines (by 20 percent versus 46 percent and 44 percent, respectively). Nevertheless, the balance of forces among the three communities has not changed greatly, and all of them continue to modernize by buying new, more-capable weapons. Thus, although Navy officials might disagree, the current force could be characterized as a reduced version of the Cold War Navy.

The fact that changes in force structure and procurement lag behind changes in strategy and missions is not surprising. Historically, that is almost always true for any nation or military. When the Cold War ended, many years and dollars had been invested in researching, developing, and procuring weapons (such as the Arleigh Burke destroyer and the Nimitz carrier)

designed for combat against the Soviet navy. Because the service lives of ships are so long, the entire force structure could not be transformed quickly—except at very great expense.

Modernizing Aircraft Carriers

Most of the 12 aircraft carriers that the Navy operates are Nimitz class vessels. That class was originally designed in the 1960s, but each new ship built since then has been modified and improved. Now, the Navy would like to change the design of its carriers and develop a new class.

Building and operating an aircraft carrier over its 45- to 50-year service life is expensive. A carrier begun today would cost \$5 billion to \$6 billion to procure and outfit and \$15 billion to operate and support over 50 years, CBO estimates. Much of that cost is for paying the crew of around 3,500 people who operate the carrier (and the other 2,000 or so personnel who operate and support the carrier's air wing). The Chief of Naval Operations hopes to reduce the personnel needed for an aircraft carrier by nearly 30 percent by using new technology that would automate many tasks now performed by crew members.¹⁸ Redesigning the carrier's nuclear propulsion plant so that it would not need to be refueled during its lifetime could also save money. The Navy considers a new, more-efficient power plant its first priority in the modernization program.

Originally, the Navy intended to redesign the carrier all at once—developing a new class of ship—with the first new vessel to be authorized in 2006. But that revolutionary design fell victim to budgetary realities. Navy officials recognized that the service lacked the \$6 billion to \$7 billion necessary to develop the new ship. Consequently, they adopted a more evolutionary approach. The Navy will increase the amount of money it spends on new technologies that can be incorporated into the CVN-77, the Nimitz class carrier that it wants to order in 2001. More new technology will be incorporated into succeeding ships, the CVN-

17. According to the General Accounting Office, however, the E/F model does not provide significant improvements over the C/D in its performance as a fighter plane. See General Accounting Office, *Navy Aviation: F/A-18E/F Will Provide Marginal Operational Improvement at High Cost*, GAO/NSIAD 96-98 (June 1996).

18. Joe Hart and Rick Lazisky, *CVX: An Evolutionary Path to a Revolution in Naval Warfare*, Critical Issues Paper (Arlington, Va.: Center for Security Strategies and Operations, August 28, 1998), p. 15.

Table 3.
Capabilities of Navy Attack Submarines

	Los Angeles Class (Improved)	Seawolf Class	Virginia Class
Size			
Displacement (Tons, submerged)	6,900	9,100	7,800
Length (Feet)	360	353	377
Draft (Feet)	32	35	31
Beam (Feet)	33	40	34
Speed (Knots)			
Maximum	33	35	34
Tactical (Silent speed)	n.a.	20	n.a.
Operating Depth (Feet)	950	about 1,600	more than 800
Crew Size	129	133	113
Armament (Number of missiles or torpedoes)	37	50	38
Weapon Launchers			
Torpedo tubes (21 inches) ^a	4	8	4
Vertical launch system cells	12	0	12

SOURCE: Congressional Budget Office.

NOTE: n.a. = not available.

a. The Seawolf has 26.5-inch torpedo tubes that launch its weapons.

78 and CVN-79, which will be the first ships of the evolved CVNX class. The Navy has not yet determined—and probably does not yet know—which new technologies will fit within the existing Nimitz hull and which will not.¹⁹

The Navy may have to live with the decisions it ultimately makes about the new carrier for a long time. If the CVN-77 is authorized in 2001 and commissioned in 2006, it will probably remain in service until after 2050 (assuming the same service life as today's carriers). The first carrier of the new CVNX class will be authorized in 2006 and probably commissioned in 2013. If the Navy buys 10 of those ships—as it expects to do with the Nimitzes—the last CVNX

would still be in service after 2100. If the evolutionary approach to carrier design does not work, the Navy can, of course, stop the new class after producing a few ships and begin again. But such a decision would be very costly.

Modernizing Attack Submarines

The mainstay of the U.S. attack submarine force at the end of the Cold War and today is the Los Angeles class submarine. Sixty-two were built; about 55 remain in the force. Over the next 20 years, most of those submarines will reach the end of their useful service life. To replace them, the Navy first developed the Seawolf. Although it was arguably the most capable submarine in the world, the Seawolf was also the most expensive. That program was canceled, and only three of the submarines were ordered.

19. Robert Holzer, "Navy Sinks Futuristic Carrier: Service Abandons CVX, But Will Test Technologies on Next Nimitz," *Defense News* (May 25, 1998).

The Virginia class attack submarine was proposed in 1990 by the Chief of Naval Operations as a lower-cost successor to the Seawolf. The Navy expects it to be as quiet as the Seawolf but somewhat less capable in terms of the weapons it carries (see Table 3). However, the Virginia is designed to be flexible enough to conduct missions in support of the Navy's doctrine of littoral warfare—something the Seawolf and Los Angeles classes are less capable of doing—and to serve as a hedge against the possibility of a rejuvenated Russian submarine threat. The Virginia class submarines will be able to carry out various missions, including stealthy strikes with Tomahawk missiles, antisubmarine warfare in the littorals and deep water, antiship warfare, covert intelligence, and mine laying against enemy shipping. Those submarines will also be able to support carrier battle groups and special-operations forces. The Navy's current modernization program calls for buying 30 Virginia class submarines at a total cost of around \$60 billion.

Modernizing Surface Combatants

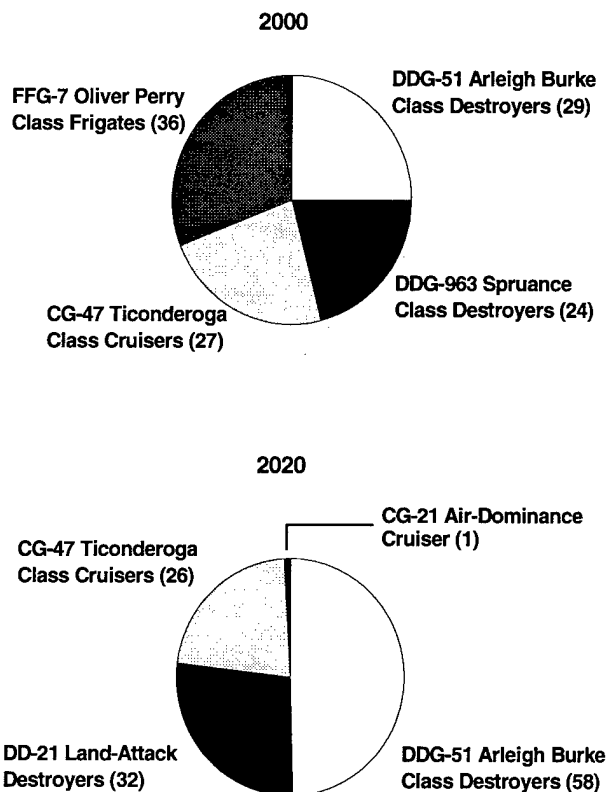
The Navy's current surface combatant force is composed of four types of ship: Ticonderoga class cruisers, Arleigh Burke class destroyers, Spruance class destroyers, and Oliver Perry class frigates. By 2020, the Navy will probably still have four types of surface combatants, but they will be different types. The DD-21 Zumwalt class land-attack destroyer will replace the Spruance destroyers and the Perry frigates, and the fleet may have one new CG-21 air-dominance cruiser (see Figure 1).

Currently, the Navy has only one building program for surface combatants, that for the Arleigh Burke destroyers. Authorization for that program will end in 2005 at 58 ships (with the last commissionings in 2010). Also in 2005, the Navy expects to order the first DD-21—the first ship specifically designed for the post-Cold War environment and littoral warfare.²⁰ It is expected to have a highly stealthy design to reduce its chance of being detected during the close-to-

shore operations it is intended to conduct. The DD-21 is also designed to be highly effective at antisubmarine warfare and to have a greater land-attack capability than any other ship in the fleet, except aircraft carriers. Its land-attack weapons will include 128 to 256 vertical launch system cells containing missiles with varying ranges; it will probably also carry two advanced gun systems for high-volume fire support.

As with the CVNX carrier, the Navy is hoping to keep procurement and life-cycle costs for the DD-21 low through the use of new technology. The service would like to spend no more than \$750 million (in fiscal year 1996 dollars) per ship. It also hopes to keep the size of the crew to around 100—compared with the 340 or more personnel required for other cruisers and destroyers now in the fleet. The Navy's plan is to

Figure 1.
The Navy's Surface Combatant Force, 2000 and 2020 (By number of ships)



SOURCE: Congressional Budget Office.

20. If the DD-21 program is delayed further, as appears likely, the Navy may need to buy more Arleigh Burke destroyers to maintain the industrial base for building destroyers. According to news reports, the Navy has already discussed that possibility.

use automated systems, sensors, and the like to reduce the number of people needed for damage control, ship-board logistics, and other areas of the ship's operations.

Is the cost goal for the DD-21 realistic? One way to answer that question is to consider historical norms. Research has shown that new ship designs typically cost 15 percent more than their predecessors. Arleigh Burke destroyers, which some observers might view as the predecessor of the DD-21, cost around \$900 million to \$1 billion to procure today. Thus, a \$750 million DD-21 would cost about 25 percent less than an Arleigh Burke destroyer. Arleigh Burkes, however, are equipped with the Aegis combat system, a highly effective but also extremely expensive air-defense capability, which the DD-21 will not have. If one considers Spruance class destroyers to be the DD-21's true predecessor, then the target of \$750 million may fit within historical norms. But the changes and new technologies that the Navy hopes to introduce in the DD-21 make it likely that the ship will have a price tag closer to that of the Arleigh Burke.

Reducing the size of the crew may be more difficult than keeping costs down, in part because the Navy's goal is so ambitious. By cutting the number of crew members for a destroyer by more than two-thirds, the Navy hopes that the DD-21 will have annual operating and support costs equal to no more than 30 percent of those for the Arleigh Burke. But questions remain about whether such a drastic reduction in personnel will decrease the effectiveness of the DD-21 or, worse, its survivability in combat.²¹

Foreign Threats Facing the U.S. Navy

What ability do other powers have to threaten, undermine, or otherwise inhibit U.S. naval forces from executing their missions? In many respects, very little. Most analysts would agree that the United States is by

far the strongest naval power in the world. In fact, its current level of superiority is probably comparable only with those of the U.S. Navy immediately after World War II and the British navy after the Battle of Trafalgar during the Napoleonic Wars—times when their opponents' fleets had been destroyed and no new opposition had yet arisen.

Comparing the United States' current naval forces with those of its potential adversaries—whether by simply counting ships or by comparing the quality of the ships, leadership, personnel, and organization—leads to the conclusion that no other nation can directly defeat the U.S. Navy anywhere in the world, either today or for the foreseeable future. However, one threat that may loom on the horizon is the possibility that a hostile power could deny U.S. naval forces access to an area by using large numbers of relatively cheap weapons, such as mines and antiship cruise missiles.

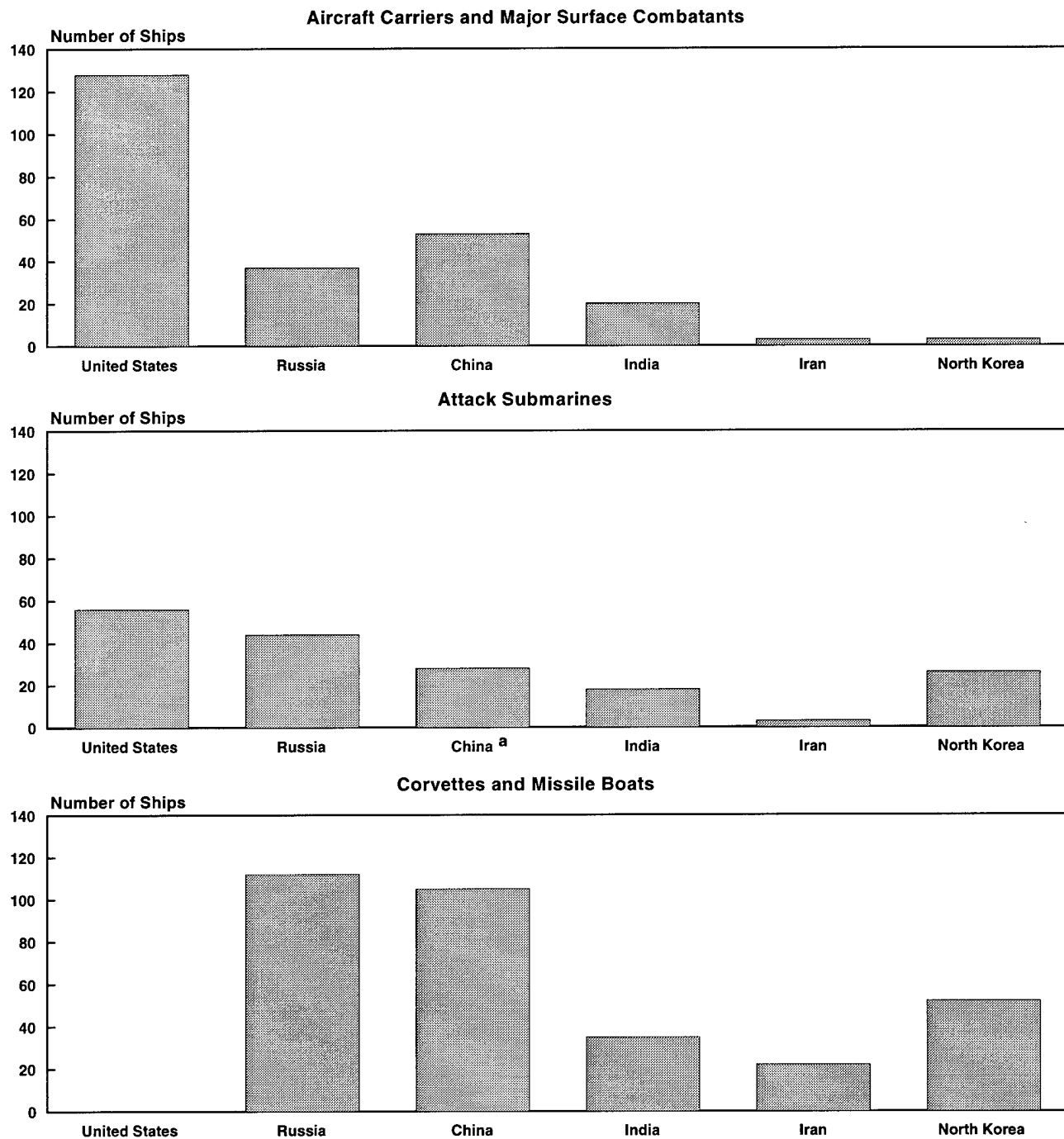
The Russian and Chinese Navies

U.S. relations with both Russia and China have been uneasy since the end of the Cold War. Although the United States and those countries share some interests, they disagree about various foreign policy issues. For example, U.S. relations with Russia deteriorated after NATO launched an air campaign against Serbia, a traditional friend of Russia, in March 1999. At one point, Russian President Boris Yeltsin claimed that he had not ruled out military intervention in the conflict. Relations with China took a turn for the worse in 1996, when China fired several ballistic missiles at Taiwan in an apparent effort to intimidate its leadership. The United States responded by sailing parts of the Seventh Fleet—including the aircraft carrier *Independence*—through the Taiwan Strait. Since then, U.S. military planners have monitored developments in both China and Russia closely. They consider both nations to be potential threats.

After the United States, Russia and China have the largest navies in the world. Their forces each have large numbers of surface warships and submarines (see Figure 2). Technologically, however, the fleets of both nations are much less capable than the U.S. Navy.

21. See, for example, Captain Pierre Vining, "Can a Minimum-Manned Ship Survive Combat?" *Proceedings*, U.S. Naval Institute (April 1999), pp. 80-83.

Figure 2.
Naval Force Levels of the United States and Selected Countries, 1999



SOURCE: Congressional Budget Office based on data from Captain Richard Sharpe, ed., *Jane's Fighting Ships, 1999-2000*, 102nd ed. (Alexandria, Va.: Jane's Information Group, 1999); and International Institute for Strategic Studies, *The Military Balance, 1999-2000* (London: Oxford University Press, 1999).

NOTE: The Russian fleet is in a serious state of decline. It has little money for training, deployments, or weapons, and major units of the fleet spend only a few days a year at sea.

a. Excludes China's obsolete Romeo class submarines.

Russia. Although the Soviet navy was once easily the second most powerful fleet in the world, the Russian navy, like Russia itself, has fallen on hard times. The number of ships has dropped dramatically, from nearly 300 large warships in the Soviet fleet in 1985 to less than 100 in the Russian fleet today. Moreover, the Russian navy is in a serious state of decline because of a lack of funding. With little money for training, deployments, or weapons, major parts of the fleet spend only a few days a year at sea. When major repairs or refits on a ship come due, more often than not the ship is abandoned.²²

Although much of that situation applies to the submarine fleet as well, Russia has made a greater effort to maintain production of new submarines than it has with other types of ships. For example, the Russian navy now appears to be producing one Akula II class submarine a year, but how long that pace can continue is unclear. Russia is also reported to be developing a new attack submarine, the Severodvinsk, and a new ballistic missile submarine, the Borey. But progress on both appears to be limited. Construction of the Severodvinsk either is extremely slow or has been suspended altogether—with an uncertain future. Only one Borey is under construction, and work appears to have been suspended because of problems at the shipyard and with the manufacturer.²³ Some analysts have speculated that the new Akulas are quieter than the Los Angeles class, the mainstay of the U.S. attack submarine force. But such concerns may be exaggerated. Those Russian submarines may indeed be quieter at very slow speeds—5 to 7 knots—but they are much noisier than Los Angeles class submarines at the higher speeds associated with normal combat operations.²⁴

China. The Chinese navy has grown rapidly over the past several decades, and it could one day challenge U.S. naval forces. As yet, however, it does not pose a threat comparable with that of the Soviet navy during the Cold War. In the late 1970s, the Chinese had fewer than two dozen major surface warships. By 1998, that number had grown to more than 50 ships that were much more capable. China's submarine force has not increased much in quantity, but its quality has improved considerably as new Chinese-built submarines, as well as submarines bought from Russia, replace old Soviet models.²⁵ China appears to have a long-term goal to build and deploy a genuine blue-water navy. Nevertheless, the nation has no aircraft carriers and only about half as many major surface combatants as the United States.²⁶ And not one of those surface combatants appears to be as capable as a U.S. Spruance class destroyer—much less an Aegis-equipped cruiser or destroyer.²⁷

China's amphibious fleet is also composed of dozens of ships, but those ships together can carry fewer than 8,000 troops and 250 tanks. China has recently revived production of its Yuting class amphibious ship and built four of them over the past year. They can carry 250 troops, 10 main battle

U.S. Navy Overestimates Stealth, Might of Russian Subs," *Defense News* (July 29, 1996), p. 50.

22. See the Haze Gray and Underway Naval History Information Center, *World Navies Today: Russia* (2000), available at www.hazegray.org/worldnav/russia/. See also Captain Richard Sharpe, ed., *Jane's Fighting Ships, 1999-2000*, 102nd ed. (Alexandria, Va.: Jane's Information Group, 1999), p. 556.

23. Sharpe, *Jane's Fighting Ships, 1999-2000*, pp. 558, 560. See also the Haze Gray and Underway Naval History Information Center, *World Navies Today: Russia*.

24. Reported to the Congressional Budget Office in a briefing by the Navy, September 18, 1996. See also Rear Admiral Michael Cramer as cited in Ivan Eland, *Subtract Unneeded Nuclear Attack Submarines from the Fleet*, Foreign Policy Briefing No. 47 (Washington, D.C.: Cato Institute, April 2, 1998), p. 5; and Robert Holzer, "Study:

25. For a good discussion of these issues and Russian submarine programs, see O'Rourke, *Navy Attack Submarine Programs*, pp. 14-19.

26. Periodically, there are rumors that China is building or trying to buy an aircraft carrier. But China does not appear to be close to doing so, and it would take years before it had the means to project power with an aircraft carrier. Acquiring such a vessel is only one obstacle. Training crew members and supporting a carrier are not skills that can be learned quickly.

27. Both the Spruance and China's largest and most modern warship, the Sovremenny class destroyer bought from Russia (China has no cruisers), displace about 8,000 tons and have comparable speeds and cruising ranges. The Chinese ship carries eight antiship cruise missiles; the Spruance has eight Harpoon antiship cruise missiles. The Sovremenny class destroyer has two surface-to-air missile launchers with 44 missiles (but no area air-defense radar), compared with 61 vertical launch system cells on the U.S. ship capable of firing Tomahawk missiles and antisubmarine rockets. The Chinese ship has four 130-millimeter guns and four torpedo tubes; the Spruance has two 5-inch guns and six torpedo tubes. China has purchased two of those ships and may buy two more. See Sharpe, *Jane's Fighting Ships, 1999-2000*, pp. 119, 810.

Box 2.

Are Surface Ships Becoming More Vulnerable?

A growing number of naval analysts contend that surface ships—especially aircraft carriers—are becoming increasingly vulnerable to attack.¹ That vulnerability began in World War II, they argue, but it could reach a critical stage soon as potentially hostile regional powers acquire large stocks of cheap antiship missiles and diesel-electric submarines.

The Six-Day War in the Middle East in 1967, the Falklands War in 1982, and the Iran-Iraq War in the late 1980s provide evidence of how vulnerable surface ships are to small, inexpensive missiles and submarines. In 1967, the defense world was surprised when a small Arab patrol boat sank the larger Israeli destroyer *Eilat* with antiship missiles. During the Falklands War, Argentine aircraft equipped with sea-skimming Exocet missiles sank five British surface ships and damaged 11 more.² On the other side of that conflict, the British nuclear submarine *Conqueror* sank the Argentine heavy cruiser *General Belgrano* in a torpedo attack. (That submarine also kept the entire Argentine navy bottled up in port for the rest of the war.)³ And during the Iran-Iraq War, an Iraqi aircraft mistakenly attacked and severely damaged a U.S. naval vessel—the frigate *U.S.S. Stark*—with an Exocet antiship missile. (That frigate and other U.S. ships were escorting Kuwaiti oil tankers to protect them from attack by Iran.)

Some analysts who argue that surface ships are increasingly vulnerable also maintain that aircraft carriers will become the most vulnerable surface ships of all. Although the Navy hopes to reduce the radar silhouette of

carriers in future versions of the ship, their huge size and angular shape make such a reduction difficult. Aircraft carriers are also vulnerable to saturation attacks by large numbers of antiship missiles. At first glance, the decline of Soviet maritime forces appears to reduce the likelihood of such attacks. But because carriers are more likely to operate in coastal areas now than during the Cold War, some analysts believe that the proliferation of inexpensive but deadly antiship missiles among potential regional adversaries will make coastal operations more dangerous.

Nations armed with antiship missiles are unlikely to possess the same large quantities as the former Soviet Union, but they could still pose a substantial threat because carrier battle groups operating closer to shore would have to react more quickly with less information. Battle groups that faced antiship missiles mounted on fast patrol boats nearby or on shore-based launchers might not have as much time to react to incoming missiles as they would have had in a confrontation with Soviet missiles launched from bombers hundreds of miles away. In addition, “land clutter”—trees, buildings, and other objects that radar cannot see through—could allow hidden, shore-based enemy launchers to surprise a battle group. During the Gulf War, such clutter rendered the sophisticated Aegis air-defense system on U.S. cruisers and destroyers much less effective than it would otherwise have been.⁴

New technologies, however, could ultimately permit effective countermeasures to those threats. For example, microwave or high-energy lasers might enable a surface ship to defeat saturation attacks by antiship cruise missiles. High-powered microwaves aimed at a salvo of incoming missiles might be able to disrupt their avionics simultaneously, rendering the attack ineffective. Other new technologies that are being explored to protect ships include water-barrier technology, which shoots up a large wall of water in front of a ship just before incoming missiles are about to strike. The missiles explode harmlessly against the water or are knocked out of the air. That technology has been tested successfully against single incoming missiles, and defense planners hope it will eventually be able to defeat groups of missiles.

1. See, for example, James F. Dunnigan, *How to Make War: A Comprehensive Guide to Modern Warfare for the Post-Cold War Era* (New York: William Morrow, 1993); George Friedman and Meredith Friedman, *The Future of War: Power, Technology and American World Dominance in the Twenty-First Century* (New York: St. Martin's Griffin, 1996), pp. 180-204; and John Keegan, *The Price of Admiralty: The Evolution of Naval Warfare* (New York: Viking, 1989), pp. 266-275.
2. Max Hastings and Simon Jenkins, *The Battle for the Falklands* (New York: Norton, 1983), pp. 351-360.
3. James L. George, *The U.S. Navy in the 1990s: Alternatives for Action* (Annapolis, Md.: Naval Institute Press, 1992), p. 73.

4. Friedman and Friedman, *The Future of War*, pp. 198-199.

tanks, four landing craft, and two helicopters.²⁸ (In contrast, the U.S. Navy has fewer amphibious ships but can carry about five times the number of troops as the Chinese ships. And some of the U.S. amphibious ships could be used to strike other sea- or land-based targets.)

Other Nations' Navies

Other powers with which the United States might one day come in conflict have much smaller naval forces than Russia and China do. Iraq has never possessed much of a navy and has none now. Iran's navy comprises a few frigates, two dozen corvettes or missile boats, and several diesel-electric submarines purchased from Russia. Those submarines appear to worry U.S. naval planners the most (as discussed in the section below). In addition, just this year, Iran built and launched its first domestically produced submarine. India has built a large fleet that seemingly represents equally large ambitions, but financial constraints have apparently dampened its ardor in recent years.²⁹

Area-Denial Strategies

The Navy is less occupied with analyzing the threats that specific countries pose and more with what defense planners call capabilities-based threat analysis. In other words, analysts try to determine what capabilities (technologies and weapon systems) are available on the international arms markets that could ultimately threaten U.S. Navy ships.

The capabilities that the Navy worries about most involve relatively cheap weapon systems that countries can buy abroad or produce at home in quantity—mines, antiship cruise missiles, fast-attack torpedo and missile boats, and small diesel-electric submarines.³⁰ If a country had enough of those weap-

ons, it could implement what defense analysts refer to as an asymmetric area-denial strategy. Such a strategy would not attempt to challenge and defeat U.S. naval forces directly. Instead, it would seek to inhibit the U.S. Navy's operations in a region by strewing coastal areas with mines, putting hundreds of antiship cruise missiles along the shore, and having several quiet diesel-electric submarines roam littoral waters.³¹ Many analysts worry that surface ships are becoming increasingly vulnerable to such measures. (For more details, see Box 2 on page 15.) As the Navy puts it, "In future crises and conflicts . . . access-denial weapons could make the projection of U.S. power so costly that the United States might be deterred from acting."³²

In one possible scenario for an area-denial strategy, Iran might be able to prevent the U.S. Navy from operating in the Persian Gulf by mining the Strait of Hormuz and then guarding it with antiship cruise missiles and small submarines to thwart mine-clearing operations.³³ Could China do the same with the Taiwan Strait?

The purpose of such area-denial strategies is to prevent the United States from defending its interests or its allies. The Korean War offers a historical example. The amphibious assault by U.S. forces at Wonsan was delayed for eight days by mines, prompting the U.S. commander to declare, "The U.S. Navy has lost control of the seas."³⁴ And North Korea did not even have a fleet.

pendent propulsion—that do not need to come to the surface frequently to charge their batteries or refresh their air supplies, the threat could be especially potent.

28. Robert Sae-liu, "China Revives Yuting-class Ship Programme," *Jane's Defence Weekly* (June 14, 2000), p. 87.

29. Admiral J.G. Nadkarni, "Indian Navy Stands at a Crossroads," *Proceedings*, U.S. Naval Institute (March 1998), pp. 70-72.

30. See Department of the Navy, Office of Naval Intelligence, *Challenges to Naval Expeditionary Warfare* (1997), pp. 7-13. If those submarines are of the new "closed system" variety—also known as air-inde-

31. Simon Saradzhyan, "Russia Expects to Boost Exports of Ships and Subs," *Defense News* (June 1, 1998), p. 10. See also Joris Janssen Lok, "Mini Submarines and Special Forces Pose Maximum Threat," *Jane's International Defense Review* (June 1998), pp. 63-68; and Captain Ed Smith, "They Can Buy It, But . . ." *Proceedings*, U.S. Naval Institute (February 1994), pp. 45-48.

32. Department of the Navy, *Vision . . . Presence . . . Power*, p. 3.

33. See Department of the Navy, Office of Naval Intelligence, *Worldwide Submarine Challenges* (1997), pp. 29-31. See also Andrew F. Krepinevich, Jr., *A New Navy for a New Era* (Washington, D.C.: Center for Strategic and Budgetary Assessments, May 1996).

34. James L. George, *The U.S. Navy in the 1990s: Alternatives for Action* (Annapolis, Md.: Naval Institute Press, 1992), pp. 175-176.

Can the Navy Maintain a 300-Ship Fleet at Current Budget Levels?

The Congressional Budget Office's analysis of the Navy's budgetary and long-term procurement plans suggests that it will be difficult for the Navy to maintain its current force goal of about 300 ships. Current funding levels are inadequate to cover all of the ships and aircraft the Navy wants to buy and also maintain readiness and a good quality of life for sailors, pilots, and marines.¹ To sustain its 300-ship fleet and inventory of aircraft, as well as the infrastructure that supports them, the Navy will need about \$105 billion annually (adjusted for inflation), CBO estimates. That amount is over \$17 billion more per year than the Navy is expecting to receive, on average, under the Administration's Future Years Defense Program for fiscal years 2001 through 2005 (referred to here as the 2001 FYDP).

The Navy's Modernization Plans Through 2005

The 2001 FYDP would authorize 45 new ships—or an average of 7.5 per year—between 2000 and 2005.

1. Although costs for aircraft are part of the overall modernization bill, CBO's analysis focuses primarily on the Navy's ability to meet its force goal for ships. For a more comprehensive treatment of the Department of Defense's ability to pay for all of its tactical aircraft programs, including those of the Navy, see Congressional Budget Office, *A Look at Tomorrow's Tactical Air Forces* (January 1997). For an update of that analysis, see the statement of Christopher Jehn, Assistant Director, National Security Division, Congressional Budget Office, before the Subcommittee on AirLand of the Senate Committee on Armed Services, March 10, 1999.

Specifically, the Navy would buy one aircraft carrier, 14 DDG-51 and DD-21 destroyers, five Virginia class attack submarines, 11 LPD-17 and LHD amphibious ships, and 14 combat logistics ships and fleet auxiliaries (see Table 4). That shipbuilding program represents an increase from previous plans. The 1998 FYDP, for example, would have built only 6.2 ships per year between 1998 and 2003. However, press reports about the Navy's budget for fiscal years 2002 through 2007 indicate that the planned shipbuilding rate may fall back to 6.5 a year.

For most of the 1990s, the Navy built far fewer ships, on average, than required to maintain a force of 300 in a steady state. Between fiscal years 1992 and 1999, the Navy ordered an average of 4.5 ships per year, about half the steady-state requirement. That low level of shipbuilding was possible because the Navy had many more ships than it needed to fulfill its force goal at the conclusion of the Cold War and was even retiring ships before the end of their useful service life. The shipbuilding plan under the 2001 FYDP would allow the Navy to meet its force goal for the next 10 years or so. Eventually, however, the Navy would have to buy more ships or the attrition that occurs as vessels reach the end of their service life would lead to a smaller fleet.

The planned purchases of naval aircraft under the 2001 FYDP are smaller than the number needed for steady-state replacement. The Navy plans to buy 710 new aircraft, or an average of 118 a year. Those planes include the F/A-18E/F (fighter/attack) aircraft, the tilt-rotor V-22 (which can fly like a helicopter or a

Table 4.
The Navy's Planned Purchases of New Ships and Aircraft Through 2020

	2000-2005		2006-2020 ^a	
	Total Purchase	Annual Average	Total Purchase	Annual Average
Ships				
Aircraft carriers	1	0.2	4	0.3
Surface combatants	14	2.3	48	3.2
Submarines	5	0.8	38	2.5
Amphibious ships	11	1.8	5	0.3
All others	<u>14</u>	<u>2.3</u>	<u>33</u>	<u>2.2</u>
Total	45	7.5	128	8.5
Aircraft				
Fighters	267	44.5	219	14.6
Strike aircraft	0	0	984	65.6
Medium lift aircraft	246	41.0	374	24.9
Trainers	160	26.7	210	14.0
All others	<u>37</u>	<u>6.2</u>	<u>439</u>	<u>29.2</u>
Total	710	118.3	2,226	148.4

SOURCE: Congressional Budget Office based on data from the Navy.

a. These purchases represent the Navy's preliminary projections for the future rather than its official requirements or programmatic decisions.

propeller plane) for transporting Marine Corps troops and equipment, several training aircraft, and an upgraded version of the E-2C early-warning aircraft. Overall, CBO estimates that the Navy's requirement for planes is about 3,500. Assuming an average service life of about 30 years per plane, the Navy would have to buy about 150 aircraft a year to fulfill its steady-state requirement.

Sustaining the 300-Ship Fleet Beyond 2005

Sustaining the Navy's force goal of about 300 ships over the long term (in this analysis, the next two decades) will require inflation-adjusted budgets of \$105 billion a year, by CBO's estimate. Yet the average Navy budget over the next five years will be \$88 billion, according to the 2001 FYDP. Under that plan, the Navy would not have enough funds to support its

force goals on a steady-state basis. Thus, it would have to either receive more resources than it is now expected to get or reduce its force structure.²

Estimating the Navy's Long-Term Budget Requirements

CBO estimated how much money the Department of the Navy needs to sustain and modernize its force structure between 2001 and 2020 by determining the level of funding necessary in each of the major budget accounts: procurement, personnel, operation and maintenance, research and development, military construction, and family housing.

For ship and aircraft procurement, CBO estimated a sustaining budget under which the Navy

2. The Department of Defense as a whole faces similar problems over the long term. For more details, see Congressional Budget Office, *Budgeting for Defense: Maintaining Today's Forces* (September 2000).

would buy the appropriate numbers each year to replenish its fleet and its inventory of aircraft as they age. To estimate that budget, CBO first determined the annual purchases required for replenishment by dividing the Navy's inventories of ships and aircraft by the service life of each type of vessel and plane. (In the case of aircraft, CBO added an adjustment for expected annual losses through accidents, combat, or other sources of attrition.) Those annual purchases were then multiplied by CBO's estimates of the unit (per-item) cost for each type of ship or plane. The results were a required budget of \$10.8 billion per year (in 2000 dollars) for new ships and \$10.2 billion for new aircraft (see Table 5). By comparison, the average amounts budgeted for those categories under the 2001 FYDP are \$9.4 billion and \$8.1 billion, respectively.

Table 5.
Estimated Annual Budget Needed to Sustain
the Planned Navy Through Fiscal Year 2020
Compared with Annual Funding Under the 2001
FYDP (In billions of 2000 dollars)

Budget Category	Average Annual Funding Under the 2001 FYDP	Annual Sustaining Budget (CBO Estimate)
Procurement		
Ships	9.4	10.8
Aircraft	8.1	10.2
Other	7.7	13.9
Military Personnel	26.0	29.5
Operation and Maintenance	26.0	27.4
Research and Development	8.3	10.3
Military Construction	1.0	1.4
Family Housing	1.2	1.1
Other	<u>0.5</u>	<u>0.4</u>
Total	88.2	105.0

SOURCE: Congressional Budget Office.

NOTE: 2001 FYDP = Future Years Defense Program for fiscal years 2001 through 2005.

For other procurement—including such items as missiles, trucks, communications equipment, and equipment modifications—CBO's estimate was based on past spending for those items and on the relationship between that spending and spending for ships and aircraft.

For the budget categories of military personnel and operation and maintenance, CBO used the appropriations for fiscal year 2000 and adjusted them for inflation and for anticipated increases in military pay over the 2001-2020 period. Thus, CBO's estimate provides operating and support funding that would maintain the current levels of operations, maintenance, and support. That estimate also includes an allowance for pay increases to keep the compensation of Navy uniformed and civilian personnel competitive with compensation in the private sector (which is expected to increase, in inflation-adjusted terms, along with labor productivity).

For research and development, CBO used a value determined by the historical budget share devoted to that category since 1974. The Navy has generally spent about 10 percent of its total budget on research and development, which would amount to about \$10.3 billion of CBO's estimated annual sustaining budget.

For military construction, CBO estimated the amount required to sustain the Navy's existing infrastructure of bases, naval air stations, and so forth. CBO's figure, \$1.4 billion per year (in 2000 dollars), is based on what the Department of the Navy spent on facilities during the 1980s—the last period, according to many defense leaders, in which investment in military construction approached the level needed to sustain the Navy's infrastructure. That estimate does not take into account future base closings that might generate savings.

For family housing, CBO estimated the replacement value of the Navy's stock of family housing, based on recent construction costs per unit. Dividing that sum by 50 produced an estimate of how much the Navy would need to spend annually on construction and revitalization, assuming its housing units have an average service life of 50 years.

Long-Term Shipbuilding Rates

The Navy's long-range planning calls for purchasing 128 new ships between 2006 and 2020—an average of 8.5 per year (see Table 4). Specifically, the Navy hopes to build four aircraft carriers, 48 DD-21 land-attack destroyers and CG-21 air-dominance cruisers, 38 attack and ballistic missile submarines, five amphibious ships, and 33 mine warfare ships and fleet auxiliaries. Under that building program, the Navy would be able to maintain a 300-ship fleet through the next decade, but by 2020, the fleet would fall to about 290 ships, according to CBO's analysis of the Navy's current fleet, the remaining service lives of those ships, and planned commissionings and decommissionings. To maintain a 300-ship Navy through 2020—assuming an average service life of 35 years per vessel fleet-wide—would require a building rate of 8.6 ships a year.

The Navy already plans to keep some ships longer than it had expected when they were first constructed. For aircraft carriers, the Navy used to assume an average service life of 45 years, but today, 50 years is the norm. Similarly, when the Navy first built its force of Trident ballistic missile submarines, it assumed a service life of 30 years, which is typical for a submarine. Now, the Navy assumes that Trident subs will last between 40 and 42 years. In addition, the Navy is planning to make a modest investment in extra maintenance to keep some Los Angeles class submarines for 33 years—up from 30 years. Finally, some new classes of ships may have longer service lives than their predecessors.³

Those planned extensions of service life do not mean that the Navy is continuing to use ships that it should have retired. Projected service lives depend on

many factors such as the amount of time ships spend at sea, the intensity of their use, and the quality of the maintenance they receive. For example, Trident ballistic missile submarines, unlike attack submarines, tend to sail relatively slowly and in relatively shallow water. Their mission is to hide and stay quiet, not track and hunt other submarines. Because their hulls do not undergo the same kind of stress that attack submarines face, they can remain in the fleet longer.

Despite longer service lives, achieving the Navy's force goal for ships over the long term will cost considerably more than the level of funding the service is receiving under the 2001 FYDP. As noted above, CBO estimates that the Navy needs to spend about \$10.8 billion a year on ship construction to maintain a 300-ship fleet through 2020. But under the 2001 FYDP, it will spend an average of \$1.4 billion a year less than that.

The relationship between the Navy's force goals and budget levels is illustrated by its programs for the attack submarine fleet. The Navy plans to build less than one attack submarine a year between 2000 and 2006. That low rate of production is sufficient to maintain a fleet of 55 attack subs through 2015 because the Navy has many more Los Angeles class submarines with useful service life left in them than it needs. But continuing to build one new attack submarine a year indefinitely would lead to a fleet of 28 by 2028, and 33 in the very long term, as older subs were retired at a faster rate than they were replaced. Maintaining the 55-sub force for a longer period means that the Navy must increase procurement to two submarines a year after 2006. Annual costs for producing two submarines a year would be about \$3.5 billion—approximately half of the Navy's total shipbuilding budget for 2000 (a year in which the Navy is not buying an aircraft carrier).

Long-Term Aircraft Procurement

To fulfill its long-term requirements for aircraft, the Navy plans to buy 2,226 planes during the 2006-2020 period, or an average of 148 a year. Those planes consist of various types of fixed-wing aircraft: the F/A-18E/F, two versions of the Joint Strike Fighter (one for the Navy's carrier air wings and one for the

3. Some analysts question whether the Navy will be able to keep its ships as long as it plans. For example, the average service life for surface ships historically is less than 30 years (indeed, most classes are well below that), but the Navy's notional service life is 35 years. That historical average is based on Navy data, but those data do not distinguish between ships that were retired because they wore out and ships that were retired because the Navy no longer wanted or needed them. During the 1990s, the Navy retired many ships before they reached the end of their notional service life because Navy budgets were declining and the service could no longer afford to keep a larger fleet. There are increased costs associated with retaining ships longer, but it is not clear whether those costs are to keep the ship operating or for technological improvements.

Marine Corps), new support aircraft, a new jammer to replace the Navy's EA-6B, and a new early-warning aircraft to replace the E-2C. The Navy also intends to buy the V-22 tilt-rotor aircraft (as medium lift to transport troops and equipment for the Marine Corps) and to remanufacture (completely overhaul) the SH-60 antisubmarine helicopter and various support aircraft. However, those plans would leave the Navy with fewer aircraft than it needs to maintain its inventory on a steady-state basis—continuing a trend evident during the 1990s.

Even though it would be buying many fewer aircraft than its steady-state requirement, the Navy's planned purchases are sizable. The schedule for the F/A-18E/F calls for producing 48 planes annually for most of the next decade. Purchases of that plane are expected to total 548 (much less than the original goal of about 1,000 aircraft for the Navy and Marine Corps). Production of the Joint Strike Fighter is expected to start with 12 aircraft in 2006. Purchases increase to 84 per year by 2011, for a total of about 1,000 planes between 2006 and 2020. The Navy's schedule for the V-22 completes production at 403 aircraft by 2014.

Increasing aircraft production by enough to sustain the Navy's inventory would be virtually impossible at current budget levels. By CBO's estimate, the steady-state procurement costs for that inventory are about \$10.2 billion a year (in 2000 dollars). But aircraft production is budgeted for an average of about \$8 billion a year under the 2001 FYDP.

The Increasing Age of the Fleet

Today's fleet is relatively young. Under the Navy's procurement plans, the average age of many of the principal classes of ship in that fleet would increase, but only slightly. The average age of attack submarines would initially rise and then fall back to about 16

Table 6.
Average Age of Navy Ships, 2000 and 2020
(In years)

	2000	2020	Expected Service Life
Aircraft Carriers	21	25	50
Surface Combatants	13	18	35
Attack Submarines	13	16	33
Ballistic Missile Submarines	11	29	40
Amphibious Ships	20	20	40
Combat Logistics Ships	19	16	35
Mine Warfare Ships	8	21	30
Fleet Auxiliaries	15	14	35

SOURCE: Congressional Budget Office.

years by 2020, as the Virginia class submarines were procured in quantity. The average age of surface warships would increase from about 13 years today to 18 years by 2020; the average age of amphibious ships would initially decline from its current level of 20 years and then return to that number by 2020; and the average age of aircraft carriers would increase from about 21 years to 25 years (see Table 6). One notable problem could be the Navy's ballistic missile submarines. Under current plans, the average age of that fleet would increase from about 11 years today to 29 years by 2020. Apparently, the Navy does not plan to buy any new boats until that latter date. Overall, the average age of the total fleet would rise from about 14 years now to 19 years by 2020. Moreover, in that year, almost two-thirds of the fleet would be older than the midpoint of the ships' average service life of 35 years.⁴

4. For a discussion of the aging of the Navy's aircraft, see Congressional Budget Office, *A Look at Tomorrow's Tactical Air Forces*, and the statement of Lane Pierrot, Senior Analyst, National Security Division, Congressional Budget Office, before the Subcommittee on Military Procurement of the House Committee on Armed Services, February 24, 1999.

Alternative Structures of Future Naval Forces

When confronted with funding constraints, the Navy has often reduced its force structure. The service has trimmed the number of its battle force ships by more than 45 percent since 1990. More recently, in 1998, it lowered its force goal from 346 ships to about 300. As the previous chapter indicated, in the absence of additional funding, the Navy could well face further reductions in the fleet.

This chapter presents four alternative force structures that the Navy could develop between now and 2020 at roughly its current budget level (adjusted for inflation). Like today's Navy, all of the alternative fleets are power-projection navies. However, each alternative emphasizes a particular portion of the Navy's existing forces: aircraft carriers, surface combatants, submarines, or amphibious ships.

Analyzing the Alternatives

These options illustrate different ways in which the Navy could shape its fleet. Which choice would be "best" depends on how the world evolves between now and 2020 and therefore on what missions the future Navy is asked to perform. The nature and number of future threats to U.S. interests would be an important factor in that choice, but so would the foreign policy goals of the United States and the role of sea power in achieving them. Each alternative has advantages and disadvantages, which are discussed in the context of the different ways in which the world security situation might change over the next 20 years.

Elements of CBO's Analysis

The Congressional Budget Office made a number of assumptions in developing and analyzing the alternatives. The primary assumption was that over the next two decades, the Navy's annual budget would be limited to the inflation-adjusted equivalent of about \$90 billion (in 2000 dollars)—roughly the average the Navy expects to receive each year through 2005 under the 2001 Future Years Defense Program. Moreover, CBO assumed that the force structure for each alternative would be fully funded within that \$90 billion budget limit. The modernization costs that are part of CBO's estimates assume that the Navy would purchase all of the elements of the fleet in adequate numbers to sustain the force structure in the long run.

Each alternative includes at least one new class of ship that the Navy is not currently planning to buy. The designs of those future ships are based on information developed by CBO or by the Navy for analytic purposes. For example, for the future DD-21 land-attack destroyer, the Navy conducted an analysis of alternatives, which considered several different designs for the next surface combatant. In some of the alternatives presented here, CBO used a variant of the design that differs from the DD-21 concept that the Navy actually selected.¹

1. In designing the DD-21 land-attack destroyer, the Navy thoroughly analyzed the missions and requirements the ship would have to fulfill, the capabilities it would have, and the ship's potential costs. (That exercise is called a cost and operational effectiveness analysis.) As part of that process, the Navy also examined various alternatives to the DD-21, including at least six different types of ships as well as combinations of those types. Among the ship types that the Navy studied

The final element that CBO included in its analysis is operating and support costs for each alternative. Those estimates are based on operating costs for the ships in the fleet today.

Overall, three categories of cost—procurement, operation and maintenance, and military personnel—vary with each alternative, depending on the type of ships and aircraft that the alternative includes. However, for any given category, those differences are not greater than 12 percent from one alternative to another. Research and development costs in all of the alternatives are set at \$9 billion—their historical budget share. For military construction and family housing, CBO uses the estimates discussed in Chapter 3: \$1.4 billion and \$1.1 billion, respectively.

Measures of Comparison

The Navy's two groups of missions—peacetime and wartime—provide a framework for analyzing the advantages and disadvantages of these alternatives. The Navy's principal peacetime mission is maintaining a visible forward presence. Other missions that fall under that broader category include enforcing sanctions, responding to humanitarian or other crises, putting ground forces ashore for peacekeeping operations, making diplomatic visits or port calls, and "showing the flag" around the world. The Navy's principal wartime mission is defined in terms of capability rather than actions: the Navy articulates it as having the ability to fight two major theater wars at almost the same time. Under that rubric, the Navy's wartime missions would include controlling the seas and denying enemies their use, conducting forcible-entry operations with Marine Corps troops, and carrying out strike operations.

None of the fleets in CBO's alternatives could perform all of those missions as well as today's Navy can (and today's Navy cannot perform all of them as well as the much larger Navy of 1990 could). But each alternative fleet should be able to perform some

of those missions better than the other alternative fleets could.

Thus, CBO compares each alternative using two criteria: capability and flexibility. Capability is the ability of the force to perform the mission or operate in the environment for which it is best suited. Flexibility is the force's ability to respond to the requirements of different missions. Another way to think about those characteristics is to consider how balanced the fleet is. Can it perform a variety of missions? What is the risk that it will be unable to protect U.S. interests if the international environment in 2020 is different from the one that planners now expect? CBO did not use a formal model to apply those criteria in its analysis. Instead, it performed the analysis qualitatively.

Readers should note, however, that none of these alternatives would be fully suitable if the United States faced an adversary with a naval force that rivaled the U.S. Navy in size and quality of ships. In that event, the \$90 billion budget level would most likely be inadequate—and the force structure too small—for U.S. forces to prevail easily.

Alternative I: Rely on Carriers and Focus on Providing Forward Presence

Under this alternative, the Navy would retain 12 aircraft carriers, at the expense of maintaining other types of ships. The Navy justifies the size of the current carrier force by the requirement to maintain overseas presence rather than by the role those ships would play in wartime.² Thus, the principal mission of this alternative's fleet would be to maintain as much forward presence with aircraft carriers as possible. Proponents of keeping a large force of aircraft carriers would argue that maintaining a robust forward presence deters aggressors, reassures friends, and allows the United States to respond more quickly in a crisis

were a large-capacity missile ship (a variation of the arsenal-ship concept canceled several years ago); a relatively inexpensive sea-dominance maritime interdiction ship; and a power-projection ship capable of carrying Marines, helicopters or V-22s, and Tomahawk missiles.

2. The Department of Defense's 1993 *Report on the Bottom-Up Review* stated that a force of 10 carriers would be adequate to fight two nearly simultaneous regional wars.

than if its fleet sailed from U.S. ports. According to CBO's analysis, the current 12-carrier force would allow the Navy to deploy a carrier in the Far East 100 percent of the time and one each in the Mediterranean and Persian Gulf regions about 85 percent of the time.³

Retaining 12 carriers while staying within current budget constraints would make the Navy even more "carrier heavy" than it is now. As noted earlier, when the Navy reduced its forces after the Cold War, the number of carriers declined less than the number of other major types of ships. Keeping the same number of carriers and remaining within the budget that CBO has assumed for this analysis would require the Navy to cut the number of other ships further.

Force Structure Under Alternative I

This alternative would preserve aircraft carriers as the core of the Navy and would continue the service's modernization programs for carrier aircraft according to current plans. The Navy would buy the F/A-18E/F and the Joint Strike Fighter for both its carrier wings and the Marine Corps's squadrons. In that respect, there would be no difference between this alternative and the Navy's long-term plan.

In the area of surface combatants, however, Alternative I would differ sharply from the Navy's current force goals. By 2020, the number of surface combatants would drop from 117 under the Navy's plan to 83 under this option—a decline of about 29 percent (see Table 7). In that year, the force would comprise 58 sophisticated, multipurpose, Aegis-equipped DDG-51 (Arleigh Burke) destroyers. The remaining 25 ships would be the Navy's new surface combatant, the DD-21—but not the high-end model of that vessel now planned. Instead, the Navy would purchase the less expensive sea-dominance version, which CBO estimates would cost about \$600 million apiece. That version of the DD-21 would have strong

capabilities against enemy submarines and surface ships and the ability to enforce maritime quarantines. Unlike the more sophisticated ships with Aegis radar, however, it would not provide air defense for the fleet, although it would have a self-defense capability. Also missing from this version of the DD-21 would be vertical launch system (VLS) cells to shoot Tomahawk missiles. To stay within budget constraints, Alternative I would also retire all 27 of the Navy's Aegis-equipped Ticonderoga class cruisers and would not replace them. Thus, although the Navy's current force goal calls for 85 Aegis ships, Alternative I would have only 58—about the same number as are in the fleet today.

Under this alternative, the Navy's fleet of attack submarines would decline to 25, compared with the current force goal of 55. The ballistic missile submarine force would be reduced to 10, which is four submarines less than both the Navy's force goal and the number advocated by the Clinton Administration's Nuclear Posture Review.

This option would also reduce the amphibious fleet by one-third. The remaining 24 ships would be organized into eight amphibious ready groups, each containing one large flat-deck ship (capable of deploying amphibious forces by sea and air) and two other amphibious vessels. In many situations, ARGs can substitute for carrier battle groups in providing forward presence. For example, they could be used to fill the gaps in coverage of the Mediterranean and Persian Gulf regions when deployment cycles resulted in the absence of an aircraft carrier.

Under this alternative, the number of combat logistics (replenishment) ships would fall from 31 to 26 because fewer logistics ships would be needed to support the smaller fleet that this option envisions. However, the alternative would retain other vessels—submarine tenders, other support ships (such as surveillance ships and tugs), mine warfare ships, and fleet command ships—in the same numbers as in the Navy's plan.

Capability Under Alternative I

Overall, this option's force structure would provide the same ability to maintain forward presence with

3. Those figures are based on a projected force of 10 nuclear and two conventionally powered carriers in 2003. See Congressional Budget Office, *Improving the Efficiency of Forward Presence by Aircraft Carriers*, CBO Paper (August 1996), pp. 7-9. The 100 percent figure for the Far East is fixed by definition. The Navy counts the carrier based in Japan as being forward deployed even if it is docked in its Japanese home port.

Table 7.
Force Structure Under Alternative I Compared with the Navy's Current Plan

	Navy's Current Plan ^a	Alternative I: Keep a 12-Carrier Navy for Forward Presence	Difference Between Alternative I and the Navy's Plan
Aircraft Carriers	12	12	0
Surface Combatants			
DDG-51 destroyers	58	58	0
DD-21 destroyers	32	25 ^b	-7
CG-47 cruisers	<u>27</u>	<u>0</u>	<u>-27</u>
Subtotal	117	83	-34
Attack Submarines	55	25	-30
Ballistic Missile Submarines	14	10	-4
Amphibious Ships	36	24	-12
Combat Logistics Ships	31	26	-5
Mine Warfare Ships	16	16	0
Fleet Auxiliaries	<u>23</u>	<u>23</u>	<u>0</u>
Total Ships	304	219	-85
Aircraft Carrier Air Wings	11	11	0

SOURCE: Congressional Budget Office.

- a. Assumes that the Navy achieves the force goal of the Quadrennial Defense Review, after adjustments in 2007 and 2012, plus five additional submarines and one additional surface combatant.
- b. The DD-21 destroyers for this option are cheaper and less capable than those in the Navy's plan.

aircraft carriers as the Navy's current plan. That kind of force is best for day-to-day management of affairs and for quick responses to rapidly developing crises in the Mediterranean Sea, Indian Ocean, or Western Pacific regions. The presence of a U.S. military force in a theater of operations could help stop a regional aggressor in the critical early stages of a conflict. Carrier battle groups are also effective sea-control instruments because the long ranges of their aircraft allow them to patrol large areas of sea lanes as well as deal effectively with threats to those lanes.⁴

Yet despite its advantages, this option would substantially weaken the Navy's ability to use surface combatants for forward presence. Currently, the Navy fills its gaps in carrier coverage with groups of cruisers, destroyers, and frigates. But under this alternative, the Navy would be unlikely to have enough of those ships to continue doing so, unless it reduced the number of surface combatants that deploy with a carrier from the current level (typically, four to six).

Another drawback of this option is that other presence missions that do not require carriers might have to be curtailed. For example, Navy ships are routinely involved in trying to stop drug smuggling in waters close to countries that are the source of narcot-

4. For more on the value of carriers, see James L. George, *The U.S. Navy in the 1990s: Alternatives for Action* (Annapolis, Md.: Naval Institute Press, 1992), p. 103. For a current critique, see Rebecca Grant, "The Carrier Myth," *Air Force Magazine* (March 1999), pp. 26-31.

ics. Those ships also conduct joint exercises with other nations' navies. Such operations might have to be reduced under this alternative—or eliminated altogether.

Flexibility Under Alternative I

For the most part, this option would retain nearly the same flexibility to fight two major theater wars as the current Navy plan, but it would be less flexible in other respects. On the one hand, by keeping and modernizing the current fleet of 12 aircraft carriers and their air wings, the Navy would conserve much of the striking power of the battle group. (The remainder of that power is found in long-range missiles.) On the other hand, because the Navy would have fewer surface combatants and submarines under this alternative, its ability to conduct strike operations using Tomahawks or some other type of land-attack missile would be impaired.

The surface ships that this option would sacrifice to maintain the carrier force are the ones that contain large numbers of VLS cells, which carry and launch Tomahawk missiles. Overall, the force created under this alternative would have about 5,500 VLS cells—less than half the number in the Navy's plan. That might prove to be an important limitation if the Navy is increasingly called on to perform the kind of unmanned strike missions with Tomahawks that have been conducted recently in Afghanistan, Somalia, Iraq, and Serbia.

Attack submarines would continue to perform the same missions under this alternative that they do today—gathering intelligence, helping to defend carrier battle groups against attack by diesel-electric submarines in littoral waters, and performing some strike missions. But far fewer submarines would be available for those missions. According to the Bottom-Up Review, the Navy needs 45 submarines to fulfill wartime requirements, although that force is probably too small to fulfill all of the submarines' peacetime requirements. Overall, this option would substantially increase the risk of failure in conducting peacetime missions by attack submarines; it would also introduce considerable risk of failure in carrying out wartime missions. For example, with the 25 submarines under

this alternative, the Navy could keep only four attack subs forward deployed, compared with nine under the Navy's plan—a reduction of more than 50 percent. (To make that calculation, CBO used standards of measurement provided by the Navy.) However, at least one analyst has argued that a submarine fleet of the size that this option envisions would be sufficient: "The United States could cut the number of submarines to 25 modern hulls and still field the best force in the world."⁵

Alternative II: Use Other Ships for Presence Missions

Some critics of the Navy have argued that the service is not designing and building the right kind of ship to perform overseas presence missions, which usually involve operating in coastal waters. This alternative illustrates one way to address that criticism—by cutting the number of aircraft carriers and amphibious ships to buy a more-capable force of surface combatants.

Under this option, the Navy would build its surface combatant force around a new type of presence ship instead of the DD-21 destroyer. The new ship would be patterned after the littoral-supremacy ship proposed by Admiral William Owens, former Vice Chairman of the Joint Chiefs of Staff.⁶ It would resemble a hybrid of a surface combatant and a flat-deck amphibious ship and would perform many of the missions in littoral areas that are now distributed among several classes of ships.

The new vessel would have VLS cells capable of shooting missiles such as the Tomahawk for land attack and the Standard for air and tactical ballistic missile defense. The ship would also carry marines and be able to put them ashore using helicopters and high-

5. Ivan Eland, *Subtract Unneeded Nuclear Attack Submarines from the Fleet*, Foreign Policy Briefing No. 47 (Washington, D.C.: Cato Institute, April 2, 1998), p. 1.

6. Admiral William A. Owens, *High Seas: The Naval Passage to an Uncharted World* (Annapolis, Md.: Naval Institute Press, 1995), pp. 166-169.

speed landing craft. In addition, the vessel could provide landing forces with supporting fire (from the sea using long-range guns or from the air using attack helicopters and vertical or short take-off aircraft). Thus, this hybrid ship might be the only platform needed to conduct small amphibious operations, such as a raid or a rescue of personnel from an embassy.⁷

Force Structure Under Alternative II

Although the number of surface combatants under this option would be about the same as under the Navy's plan—118 versus 117—the capability of the ships would be greater. The surface combatant fleet in 2020 would comprise 58 Aegis-equipped DDG-51 destroyers and 60 of the new multipurpose presence ships (see Table 8). As in Alternative I, the 27 Ticonderoga class Aegis cruisers would be retired because the Navy could not afford them. In addition, the DD-21 land-attack destroyer program would be canceled because those destroyers would be replaced by the presence ships.

This alternative would help pay for the new presence ships by cutting the number of aircraft carriers and aircraft. The carrier force would be reduced from 12 to seven, and the Navy's inventory of tactical aircraft would be cut by eliminating five air wings.

The number of large flat-deck amphibious ships would also be reduced—from 12 to six—and the rest of the amphibious fleet would be retired. Consequently, the number of dedicated amphibious ships would fall from 36 to six. Nevertheless, because of the new hybrid ships, the Marine Corps would suffer no diminution of its lift capability (its capacity to transport troops and equipment). In analyzing this option, CBO assumed that the presence ships would have the same lift capability as the LPD-17 ships now under construction. Thus, this fleet would have substantially more lift capability with respect to troops, cargo space, vehicle space, and spots for air-cushion landing craft than the Navy's current plan. It would have slightly more capability with respect to spots for

vertical take-off and landing aircraft (630 versus 612 under the Navy's plan).

Alternative II would cut the number of ships in other categories as well. The attack submarine fleet would drop from 55 to 34.⁸ And as in Alternative I, the number of ballistic missile submarines would fall from 14 to 10, and the number of replenishment ships would decline from 31 to 26 because fewer would be needed to support a smaller fleet. Like the previous option, this alternative would retain the currently planned numbers of submarine tenders, other support vessels such as surveillance ships and tugs, mine warfare ships, and fleet command ships.

Capability Under Alternative II

The central mission of this option's fleet would be to provide a robust forward presence in many different regions of the world. The fleet's composition is designed to ensure that the maximum number of ships would be "on station" (patrolling their designated areas), ready to respond to low-level crises and to deter potential aggressors as well as promote stability by being visible and available.

In the Western Pacific, the Navy could maintain full-time presence using the aircraft carrier that is based in Japan. The remaining six carriers under this alternative could provide a modest amount of forward presence in the Indian Ocean and the Mediterranean Sea; alternatively, they could provide full-time presence in one of those regions, but the other would be without a carrier. At the same time, this alternative could maintain eight presence ships and five attack submarines in continuous forward deployment, in addition to the carrier battle groups.

With that kind of force structure, this fleet could perform several forward presence missions simultaneously. For example, it could maintain a carrier battle group in the Persian Gulf region continuously, per-

7. Some Navy analysts have also supported this idea. For example, see Commander Sam Tangredi, "A Ship for All Reasons," *Proceedings*, U.S. Naval Institute (September 1999), pp. 92-95.

8. For example, Michael O'Hanlon of the Brookings Institution has argued that a fleet of 35 submarines would be sufficient in light of the fact that U.S. subs no longer need to trail Russian ballistic missile submarines—a principal mission during the Cold War. See O'Hanlon, *How to Be a Cheap Hawk: The 1999 and 2000 Defense Budgets* (Washington, D.C.: Brookings Institution Press, 1998), pp. 125-126.

Table 8.
Force Structure Under Alternative II Compared with the Navy's Current Plan

	Navy's Current Plan ^a	Alternative II: Use Other Ships for Presence Missions	Difference Between Alternative II and the Navy's Plan
Aircraft Carriers	12	7	-5
Surface Combatants			
DDG-51 destroyers	58	58	0
DD-21 destroyers	32	0	-32
Presence ships	0	60	60
CG-47 cruisers	<u>27</u>	<u>0</u>	<u>-27</u>
Subtotal	117	118	1
Attack Submarines	55	34	-21
Ballistic Missile Submarines	14	10	-4
Amphibious Ships	36	6	-30
Combat Logistics Ships	31	26	-5
Mine Warfare Ships	16	16	0
Fleet Auxiliaries	<u>23</u>	<u>23</u>	<u>0</u>
Total Ships	304	240	-64
Aircraft Carrier Air Wings	11	6	-5

SOURCE: Congressional Budget Office.

a. Assumes that the Navy achieves the force goal of the Quadrennial Defense Review, after adjustments in 2007 and 2012, plus five additional attack submarines and one additional surface combatant.

haps to help enforce the no-fly zone against Iraq. It could also keep several presence ships in the Mediterranean—one or two of which might be launching Tomahawk missiles in response to a crisis in the Balkans while another was evacuating noncombatant personnel from a different country in the region. Still another vessel might be deploying marines for a peace-keeping mission in, say, Lebanon on short notice.

In the past, performing all of those missions at once would have required elements of a carrier battle group operating with an amphibious ready group. But this option's new presence ships—arguably fewer in number but, more important, on station year-round—could perform those missions because there would be no gaps in coverage. John Pike of the Federation of

American Scientists has argued that the Navy could reduce its carrier fleet substantially and substitute surface ships in presence missions, although he did not specifically endorse the concept of a littoral-supremacy ship.⁹

Flexibility Under Alternative II

What this alternative would add in performing the Navy's presence mission, it would subtract from the

9. Federation of American Scientists, *1998 Top Ten & Dirty Dozen: Cancel Aircraft Carriers CVN-76 & CVN-77; Cut to Eight Aircraft Carriers* (May 1, 1998), available at www.fas.org/pub/gen/mswg/msbb98/dd09cvn.htm.

service's ability to fight two nearly simultaneous major theater wars. It would keep enough carriers to fight one regional war and perhaps contribute to fighting a second. But the carrier force would not be large enough to provide a sea-based air fleet for two major regional wars if the Air Force did not have access to land bases. That could be a major concern if, as some analysts predict, the United States will face much more restricted access to overseas bases than it has in the past. Moreover, substituting presence ships or a surface action group for some carrier battle groups would lessen the chance that air power based on carriers would be available in a particular theater to halt an armored assault in the early stages of a war, before aircraft that would use land bases could arrive.

A further drawback of this fleet is that several presence ships would probably not be as effective in wartime as a carrier battle group. Indeed, one criticism of the hybrid ship is that although it could perform many missions, it would perform none of them optimally. For example, its limited number of VLS cells might not allow a large-scale strike against land targets, and its constrained capacity to carry marines would not permit a large-scale amphibious assault. In other words, a ship designed to perform all of the missions required for overseas presence might not be the best option for responding to more-severe crises or fighting a war.

Nevertheless, the presence ship could be a very flexible platform. According to Admiral Owens, large multipurpose ships adapt more easily to changes in technology than small specialized ships do: "The very characteristics that portend such power in the context of littoral warfare—the ship's size and multipurpose character—also tend to make it adaptable to whatever strategy we may eventually adopt three decades from now."¹⁰

Thus, in a post-Cold War world in which most crises were small, a force of hybrid ships could be ideal. If a low-level crisis escalated in a particular theater, the fleet's remaining aircraft carriers could always redeploy from other theaters or U.S. ports. But if a second crisis occurred at the same time and could not be contained by the presence ships in the

region, the fleet under Alternative II would have a very difficult time conducting a second major theater war.

Alternative III: Build a Submarine Strike Navy

Alternative III deemphasizes the forward presence mission in favor of the Navy's ability to carry out large strike operations (that is, attacks on land targets) with missiles. In the future, the areas where the Navy may operate could be dominated by regional powers armed with large numbers of relatively inexpensive antiship cruise missiles and small diesel-electric submarines. Because surface ships, especially carriers, may become more vulnerable as a result, this alternative would build more submarines to perform the Navy's strike missions.

Since the 1960s, the technology that makes submarines quieter and thus harder to detect has advanced more rapidly than the technology that allows surface ships or land-based forces to detect submarines. The best submarines are still detectable by surface forces—but only at distances that are within range of the submarines' weapon systems. Consequently, submarines are likely to find surface forces before those forces find them, which means that "[i]f a submarine is in an operating area, other platforms operate at its sufferance."¹¹

The stealthiness of submarines makes them an ideal platform from which to project military power. A major advantage of a fleet that emphasized submarines would be that credible threats of military violence against potential enemies could be made without fear that the means to carry out those threats would be preemptively destroyed. If military action was subsequently required, submarines on station would be able to execute it quickly. Moreover, because they would not be vulnerable to a country's air-defense system, they could use their precision weapons immediately to attack whatever targets U.S. political and military

10. Owens, *High Seas*, p. 169.

11. Naval Studies Board, *Technology for the United States Navy and Marine Corps, 2000-2035: Becoming a 21st Century Force*, vol. 6, *Platforms* (Washington, D.C.: National Academy Press, 1997), p. 86.

leaders chose in support of a particular policy. Thus, as the threats to surface ships multiply and become increasingly difficult to counter, it may be time for the submarine to become the true capital ship of the Navy. As the Naval Studies Board put it:

Over the next 40 years rapid proliferation of high-technology systems will render non-stealthy platforms and weapons systems increasingly vulnerable. The inexorable global spread of modern technology will allow hostile nations to increase their sea-denial capabilities through improved surveillance, enhanced reconnaissance, rapidly expanding information technology and precision weapons. This growing ability to inflict significant casualties on forces that can be detected and tracked easily places a premium on the value of stealth. U.S. forces, required to establish and maintain sea control when and wherever the national interest requires, will need maximum stealth capabilities. The increased value of, and emphasis on, stealth will likely result in increased reliance on submarines in future naval operations.¹²

Force Structure Under Alternative III

Under this option, the Navy would design and acquire 50 new "strike submarines" (see Table 9). It would also enlarge the force of attack submarines to 72—the minimum number that the service considers necessary to meet all peacetime requirements for presence and intelligence collection. The new strike submarines would be big vessels that could carry large numbers of land-attack weapons as well as some unmanned underwater vehicles and, possibly, unmanned aerial vehicles. The subs would also have the conventional armament, communications equipment, and intelligence and surveillance capabilities of an attack submarine. In theory, the new strike submarines could be modeled on the concept to modify Trident subs to carry VLS cells instead of ballistic missiles, which a number of

analysts advocate.¹³ In reality, though, a new strike submarine would be designed and built in a way that could make it far more capable and flexible than a converted Trident.

Although the strike capabilities of such a submarine force would be relatively limited today, they could expand dramatically in the future. New versions of the Tomahawk may be able to attack moving armored targets as a result of increased accuracy and the ability to "loiter" over the battlefield and be reprogrammed in midflight. That would make it possible to attack more-mobile targets. In addition, a report by the Naval Studies Board, *Technology for the United States Navy and Marine Corps, 2000-2035*, envisions a family of modular weapons based on a single-stage theater ballistic missile. Such a weapon—which would be less than half the diameter and length of the Tomahawk—would be three times as accurate and thus more capable of finding a way to destroy heavily protected (hard) targets.

Using the capacity of a Trident ballistic missile submarine as a model, a strike submarine could deploy up to 2,000 missiles. Its weapons would be of different sizes, ranges, and capabilities to perform the different missions of attacking wide areas, soft targets, hard targets, and mobile targets.¹⁴ A fleet of 50 such submarines could carry up to 100,000 weapons. (Similarly, a Virginia class attack submarine could deploy six such weapons for every Tomahawk or torpedo in its 38 weapon positions.) A fleet of strike submarines with that kind of bombardment capability would be formidable in any conflict. By comparison, all of the coalition air forces in the Gulf War flew

13. Rear Admiral William P. Houley, "Making the Case for SSGNs," *Proceedings*, U.S. Naval Institute (July 1999), pp. 47-49; Owen Cote Jr., *Precision Strike from the Sea: New Missions for a New Navy*, MIT Security Studies Conference Series (Cambridge, Mass.: Massachusetts Institute of Technology, Security Studies Program, 1998); Jim Courter, "The Boomer Reborn," *Proceedings*, U.S. Naval Institute (November 1997), pp. 51-53; Andrew Krepinevich, *The Trident 'Stealth Battleship': An Opportunity for Innovation*, Backgrounder (Washington, D.C.: Center for Strategic and Budgetary Assessments, February 24, 1999). For a contrary view of the value of these types of weapons platforms, see Norman Polmar, "Tridents Are Not the Answer" (letter to the editor), *Washington Post*, February 23, 1999.

12. *Ibid.*, p. 85. See also Robert Holzer, "Utility of Subs Rises as Targeting Grows More Precise," *Defense News* (April 10, 2000), p. 17.

14. Naval Studies Board, *Technology for the United States Navy and Marine Corps, 2000-2035: Becoming a 21st Century Force*, vol. 5, *Weapons* (Washington, D.C.: National Academy Press, 1997).

Table 9.
Force Structure Under Alternative III Compared with the Navy's Current Plan

	Navy's Current Plan ^a	Alternative III: Build a Submarine Strike Navy	Difference Between Alternative III and the Navy's Plan
Aircraft Carriers	12	7	-5
Surface Combatants			
DDG-51 destroyers	58	58	0
DD-21 destroyers	32	0	-32
CG-47 cruisers	<u>27</u>	<u>0</u>	<u>-27</u>
Subtotal	117	58	-59
Attack Submarines	55	72	17
Strike Submarines	0	50	50
Ballistic Missile Submarines	14	10	-4
Amphibious Ships	36	18	-18
Combat Logistics Ships	31	26	-5
Mine Warfare Ships	16	16	0
Fleet Auxiliaries	<u>23</u>	<u>29</u>	<u>6</u>
Total Ships	304	286	-18
Aircraft Carrier Air Wings	11	6	-5

SOURCE: Congressional Budget Office.

a. Assumes that the Navy achieves the force goal of the Quadrennial Defense Review, after adjustments in 2007 and 2012, plus five additional attack submarines and one additional surface combatant.

60,000 attack sorties against Iraqi forces.¹⁵ Operation Allied Force, the NATO air campaign against Serbia, involved almost 10,000 ground-attack sorties.

This alternative would produce the smallest number of surface combatants of any of the options in this study: just 58 Aegis-equipped Arleigh Burke destroyers, compared with 117 cruisers and destroyers under the Navy's current plan. The DD-21 land-attack de-

stroyer would be canceled in favor of the new strike submarine, and no other surface combatant would be designed or built. As in the previous alternatives, the 27 Ticonderoga class Aegis cruisers would be retired. As the first surface combatants designed with stealth in mind, the Arleigh Burke destroyers are the newest Aegis ships in the fleet and less vulnerable than the cruisers. The 58 destroyers would be sufficient to provide air defense for a smaller carrier fleet or to carry out their own operations.

Carriers and strike aircraft would be less important under this alternative than under any other. Thus, as in Alternative II, this option would leave the Navy with only seven aircraft carriers, compared with 12

15. Department of Defense, *Conduct of the Persian Gulf War* (April 1992), p. 150. An analyst at the Lexington Institute estimates that there are 25,000 to 35,000 major targets in a theater war, 10 percent of which would be leadership and infrastructure targets. See Vince Crawley, "Air Force Looks to New Cruise Missile, Not Bombers," *Defense Week* (July 12, 1999), pp. 1, 13.

under the current plan. That reduction would help pay for the large submarine force that this alternative would create. To save more money, this option would replace the Navy planes on board aircraft carriers with Marine Corps tactical aircraft squadrons, substantially lessening the Navy's need to maintain a large inventory of aircraft. That element of the option would carry the current practice of substituting some Marine Corps squadrons for Navy planes to its logical conclusion.

This alternative would also reduce the Navy's amphibious fleet—and consequently the Marine Corps's capability afloat—by one-half. If surface combatants are indeed becoming more vulnerable to cruise missiles and submarines, the Navy's amphibious force is in greater danger as well, because it must operate closer to enemy coasts to conduct its missions than any other type of combatant (except minesweepers). Specifically, under this option, the number of large flat-deck amphibious ships (LHAs and LHDs) would be reduced from 12 to six. And the number of LPD amphibious transport docks and LSD dock landing ships would drop to six each, down from 12 each under the Quadrennial Defense Review. As a result of those reductions, the Marine Corps would be able to maintain only 1.25 Marine expeditionary brigades afloat, down from the current capability of about 2.1 and well below the Navy's force goal of 2.5.

With respect to support ships, six submarine tenders would be added because of the large increase in underwater vessels in this option. In contrast, the number of replenishment ships would fall by five. Otherwise, the alternative would retain the same number of fleet support ships as in the Navy's current plan.

Capability Under Alternative III

This alternative is designed to address the problem of a world in which potentially hostile regional powers have acquired large numbers of antiship cruise missiles and diesel-electric submarines.¹⁶ The Navy's principal mission under this option would be to pro-

vide capability for land-attack warfare with missiles. The submarine force that this option provides would allow the Navy to deliver a large amount of ordnance against a potential aggressor. Moreover, the size of the force—50 strike submarines and 72 attack submarines—means that eight strike submarines and 12 attack submarines could be forward deployed continuously. (If the Navy maintained two crews for each strike submarine, as it does for its strategic Trident submarines, it could keep about 25 strike submarines forward deployed at once.) Thus, the Navy would have a considerable capability readily available to strike deep into enemy territory in several different regions simultaneously. It would also have a bombardment capability that could be generated in the event of crisis or war by putting most of the submarine force to sea on short notice.

Nevertheless, at least initially, the new submarine would be a less potent weapon for strike missions than an aircraft carrier, although it would also be less vulnerable. Compared with the Tomahawk missiles that the submarines would carry, the aircraft from a carrier can hit a wider variety of targets. The Tomahawk has a greater range than those aircraft but is still limited to soft or fixed targets (currently, it is ideal for low-level retaliatory strikes to punish an aggressor). Thus, if the strike submarines envisioned for this option carried only the existing Tomahawk missile or some similar weapon, they would not be nearly as effective as carriers.¹⁷

The rest of the fleet under Alternative III—the surface combatants, carriers, and amphibious ships—would continue to perform some of their traditional missions. But because of their reduced numbers and vulnerability, they would perform those missions less frequently, or in some cases not at all. The small surface combatant force would be sufficient only to protect the carriers and amphibious ready groups and might be hard-pressed to do even that. The seven carrier battle groups could still perform some forward presence missions in peacetime, maintaining full-time presence in the Western Pacific and either modest presence in both the Mediterranean Sea and Indian Ocean or nearly full-time presence in one of those two.

16. For additional discussion of that problem, see Cote, *Precision Strike from the Sea*, pp. 11-14.

17. On the advantages and disadvantages of this type of alternative, see George, *The U.S. Navy in the 1990s*, pp. 73-74.

Seven carriers would also be sufficient to fight one major theater war, but they would not be performing deep-strike missions and would be limited to close air support of troops on the battlefield. Finally, the smaller amphibious forces in this option could still carry out traditional missions such as evacuating non-combatant personnel, but their reduced numbers would make them less available for such tasks.

Flexibility Under Alternative III

Perhaps the biggest weakness of this alternative is the dramatic reduction it would make in the Navy's visible forward presence during peacetime. Under this option, the Navy would have 83 ships for that mission (seven aircraft carriers, 58 surface combatants, and 18 amphibious ships)—only half as many as under the service's current plan. That reduction would lead to a corresponding drop in the amount of visible presence the Navy could achieve.

Can submarines be used for visible forward presence? The answer is yes, but that use would defeat the purpose of investing in a large submarine force. The sail of a strike submarine may be as effective in "showing the flag" as the silhouette of an Aegis destroyer, but it exposes the submarine to discovery, identification, and attack, betraying its chief asset—stealth. Furthermore, a submarine sitting on the surface cannot defend itself against antiship cruise missiles.

With its emphasis on submarines, the fleet in Alternative III would have a much smaller capacity for sea control—in other words, for guaranteeing safe passage of military or civilian ships across the lines of communication at sea. If, as this option assumes, the proliferation of antiship cruise missiles based on land made surface ships more vulnerable, sea control in littoral waters might prove difficult if not impossible to achieve under this alternative. Submarine forces could do little to protect shipping unless their strike weapons could destroy every conceivable threat to a merchant ship in coastal regions. The carrier battle groups would be able to provide some measure of sea control in areas farther away from the littorals. But that capacity might be of relatively little use to mer-

chant vessels, since most attacks on shipping tend to occur near coasts.

Although it would have less capacity for controlling the seas, the Navy under Alternative III would probably be highly effective at denying other navies or civilian ships the use of the seas. As was demonstrated in World War II, submarines are the preeminent sea-denial weapon. How useful, though, is a potent sea-denial capability? Against an enemy such as Yugoslavia, which has only a very small navy, it is not particularly important. That capability is more useful against an opponent with a large amount of seaborne trade (although denying another state the use of the seas in peacetime, such as through an embargo, is more difficult with submarines because they have to surface to stop merchant ships).

A powerful sea-denial capability could prove highly effective against a large hostile Asian power that had a large navy and depended heavily on trade with its island neighbors. In any conflict with such a country, its shores would probably be heavily armed with antiship cruise missiles. Thus, the most effective naval response to such a power would probably be sea denial using submarines.

Alternative IV: Reorient the Navy to Provide More Support to the Marine Corps

After the Cold War, the Navy revised its doctrine and shifted its focus from fighting the Soviet navy in the open ocean to conducting missions in coastal areas. As part of that revision, it published the white papers . . . *From the Sea* in 1992 and *Forward . . . From the Sea* in 1994. The first report emphasized the Marine Corps's role in the Department of the Navy and the Navy's support of that role. The second report put about equal emphasis on that mission and on the Navy's overseas presence and strike missions. This alternative would orient the Navy more in accordance with the principles in . . . *From the Sea* than with those in *Forward . . . From the Sea*.

In the strategic environment of the post-Cold War world, emphasizing the Marine Corps and its amphibious capabilities may make a lot of sense. The United States is unlikely to face a global competitor similar to the former Soviet Union for many years to come. At most, the nation may someday confront one or more smaller, regional powers that endanger U.S. interests by, for example, their ability to threaten allies or the free flow of commercial shipping. The Marine Corps's amphibious assault capabilities could prove useful against such opponents should the United States need to attack them with ground forces.

In addition, the Marine Corps is well suited to the low-intensity missions that U.S. forces have been involved in since the end of the Cold War—missions such as peacekeeping, humanitarian intervention, hostage rescue, and evacuation of civilian personnel. In the view of one analyst, those types of operations—not conflicts like the Persian Gulf War—are now the “norm.”¹⁸ The Marines are structured precisely to perform those missions, which often arise with little warning.

Force Structure Under Alternative IV

The most important feature of this alternative is that it would spend more on amphibious ships than the Navy's current plan. Under this option, those ships would number 43 rather than 36, because the Navy would buy 19 amphibious transport docks (LPD-17s) rather than the 12 now planned (see Table 10). Furthermore, the variant design of the LPD-17 assumed under this alternative would be equipped with VLS cells. Both Alternative IV and the Navy's plan would retain 12 LHA or LHD amphibious assault ships and 12 LSD dock landing ships.

Today, the Navy's (fiscally constrained) goal for amphibious lift is the capacity to deploy 2.5 Marine expeditionary brigades (MEBs). The Navy expects to meet that goal by 2010 when it completes the 12-ship LPD-17 program. The Marine Corps's requirement for the amphibious warfare fleet, by contrast, is to be able to deploy the assault echelons of three expedition-

ary brigades. To achieve that goal, the Navy would have to purchase another seven LPD-17s.

This option would buy those seven additional LPD-17s to reach the Marine Corps's goal of deploying three MEBs. That capability would give the Corps enough amphibious lift to land a contingency-response force capable of fighting its way in—what the Marines call a “forcible entry operation”—in two geographically distant theaters at the same time. (According to the Marine Corps, a MEB is the smallest force capable of conducting a forcible-entry operation.)¹⁹

The second most important feature of this alternative is that it would almost triple the size of the Navy's mine-clearing force. By procuring an additional 31 ships similar to the MCM-1 Avenger class, as well as two large vessels to serve as support ships, the Navy would increase the number of mine-clearing ships it could deploy to 47—meeting the minimum goal for those ships that it established after the Gulf War.²⁰ Part of the rationale for buying 31 new ships is that the existing 14 vessels of the Avenger class may be insufficient to clear mines for a single medium-sized amphibious assault, let alone two nearly simultaneously.

To help pay for those new ships, the carrier force would be cut to 10, which would be enough to support two medium-sized amphibious assaults. In addition, the attack submarine force would fall to 30. With respect to tactical aircraft, the Navy would purchase several F/A-18E/Fs, and the Marine Corps would buy the Joint Strike Fighter. But as was the case in Alternative III, the Marine Corps's tactical aircraft squadrons would substitute for Navy aircraft on carriers. That substitution would save money by reducing the Navy's inventory of tactical aircraft and would integrate the Marines into carrier operations, where they

19. Department of the Navy, *Integrated Amphibious Operations and USMC Air Support Requirements* (January 1990), p. 68. That report is commonly known as the DON Lift II Study.

20. Norman Polmar, *The Naval Institute Guide to the Ships and Aircraft of the U.S. Fleet* (Annapolis, Md.: Naval Institute Press, 1996), p. 198. The Navy also has 12 coastal minehunters of the MHC-51 Osprey class, which were designed and built to clear U.S. ports in the event they were mined. Those vessels, however, have limited endurance for overseas operations.

18. George, *The U.S. Navy in the 1990s*, p. 111.

would be well placed to carry out amphibious operations.

Like most of the other alternatives, this option would reduce the overall number of surface combatants. It would retain the 58 Arleigh Burke destroyers in the Navy's current plan and retire the 27 Ticonderoga class cruisers. But under this alternative, the Navy would also buy 35 future surface combatants dedicated to maritime support of the Marines in littoral areas. Those ships would be similar to the DD-21 as currently planned but would carry at least four 155-millimeter guns to support amphibious assaults. CBO chose that size of gun because the Army has already

developed antitank, fragmentation, and wide-area munitions for 155mm guns. If the Army and Navy could buy the same size ammunition, the Department of Defense might realize some savings from "economies of scale" on those purchases. Moreover, a Navy cost and operational effectiveness analysis chose that caliber of gun to improve fire support on the DD-21. The 155mm rocket-assisted shell would have a range of up to 100 nautical miles and be three times as powerful as the current 5-inch round.

In addition to 155mm guns, the maritime support ships would carry improved radar to reduce the harmful effects of interference from ground clutter, which

Table 10.
Force Structure Under Alternative IV Compared with the Navy's Current Plan

	Navy's Current Plan ^a	Alternative IV: Reorient the Navy to Provide More Support to the Marine Corps	Difference Between Alternative IV and the Navy's Plan
Aircraft Carriers	12	10	-2
Surface Combatants			
DDG-51 destroyers	58	58	0
DD-21 destroyers	32	0	-32
SC-21 (Littoral warfare)	0	35	35
CG-47 cruisers	<u>27</u>	<u>0</u>	<u>-27</u>
Subtotal	117	93	-24
Attack Submarines	55	30	-25
Ballistic Missile Submarines	14	10	-4
Amphibious Ships	36	43	7
Combat Logistics Ships	31	26	-5
Mine Warfare Ships	16	47	31
Fleet Auxiliaries	<u>23</u>	<u>23</u>	<u>0</u>
Total Ships	304	282	-22
Aircraft Carrier Air Wings	11	9	-2

SOURCE: Congressional Budget Office.

a. Assumes that the Navy achieves the force goal of the Quadrennial Defense Review, after adjustments made in 2007 and 2012, plus five additional attack submarines as well as one additional surface combatant.

afflicts most shipboard sensors. An improved system would also function as a counterbattery radar—similar to the land-based Firefinder system. With such radar, the Marines could pinpoint fire from enemy guns so those guns could be destroyed by shells from the support ships.

Capability Under Alternative IV

The central mission of the fleet under this alternative would be to support the Marine Corps in any operation it might have to conduct from the sea. In that respect, this Navy would be better suited for that role than any of the other alternatives, including the Navy's current plan. This Marine-support Navy would provide more amphibious lift, more mine-clearing capability, and substantially more gunfire from the sea. In addition, its carrier fleet would be oriented toward conducting close-air-support operations for the Marine Corps. In this sort of Navy, "All ships are either amphibious ships or amphibious support ships."²¹

Amphibious Lift. With the seven additional LPD-17s that this option would buy, the Navy's amphibious fleet would achieve the Marine Corps's goal of being able to transport the assault echelons of three Marine expeditionary brigades. Thus, it could support two simultaneous Marine operations in widely separated theaters, such as the South Pacific and the Mediterranean.

In addition, the three MEBs could constitute the assault echelons of a Marine expeditionary force. Such a force, which totals about 40,000 troops, could conduct a large amphibious assault in a major theater war. The United States has not conducted a major amphibious landing since the Korean War. Nonetheless, the three-MEB lift capability that this alternative would provide might offer insurance against a military need that has arisen in the past.

Mine Clearing. The added mine-clearing ships under this option would be sufficient for at least one major theater war. In the Gulf War, for example, the United States and its allies deployed a total of 34 mine-clear-

ing vessels. This alternative would give the Navy an even larger force that would be completely under its operational control. That force, however, would solve only part of the problem that the Marines face with mines. The current Avenger class ships cannot clear mines relatively close to shore. (If the United States had to clear such mines today, it would have to use sea mammals, such as dolphins.) Shallow-water mine clearance would require the development of new technology, which this alternative would allow under its general research and development budget. But long-term solutions for shallow-water mine clearance are speculative and beyond the scope of this study.

Supporting Fire. The Marine Corps's need for supporting gunfire from Navy ships flows from the fact that its ground units have fewer tanks and less artillery than the Army's tank or mechanized infantry divisions do. Consequently, the Corps's forces are lighter and, arguably, more mobile and flexible than the Army's, but they can also be more vulnerable. With the final retirement of the Iowa class battleships in 1992, the largest gun that Navy ships carry is 5 inches—which some experts consider inadequate to provide covering fire for a large-scale amphibious operation. Five-inch shells have several drawbacks: they have relatively limited lethality and a range of only 12 nautical miles, which requires Navy ships to expose themselves to enemy attack by coming close to the shore to fire.²²

Some planners see missiles fired from VLS cells on surface combatants as the solution to the Marines' need for covering fire. But missiles cannot provide all of the shore bombardment that the Marines require. Guns, by comparison, sustain a high volume of fire using cheaper projectiles to suppress enemy forces before and during an assault. Gunfire can also be adjusted easily at the request of ground forces.

Flexibility Under Alternative IV

By orienting its fleet more toward the requirements of the Marine Corps, the Navy would give up some of its

21. Rear Admiral Woody Sutton as quoted in Peter J. Skibitski, "Admiral Says Naval Amphibious Blueprint Must Change Dramatically," *Inside the Navy* (November 8, 1999), p. 8.

22. As an interim improvement, the Navy is developing an extended-range gun munition to provide more gunfire support. The munition is a rocket-propelled shell that will extend the range of the Navy's 5-inch guns to 63 nautical miles. Its complexity, however, is posing a technical challenge to the Navy.

current emphases—namely, the deep-strike mission. The Navy's current and future carrier aircraft programs give it the ability to strike targets far inland. Under this alternative, the Navy would cede most of that mission to the Air Force and orient its carrier aircraft toward providing close air support to the Marines. Navy ships would still offer some deep-strike capability, however, primarily through Tomahawk missiles deployed on surface combatants and attack submarines.

The United States currently has redundant capability among the services for striking inland targets. Heavy Air Force bombers (such as the B-1, B-2, and B-52), Air Force tactical fighters (such as the F-15E and the future Joint Strike Fighter), the Navy's tactical aircraft and Tomahawk missiles, and the Army's Tactical Missile System can all strike high-value, strategic fixed targets—such as bridges, airfields, or command-and-control installations—behind enemy lines. Alternative IV recognizes that redundancy and the fact that the Navy's relatively limited deep-strike assets (compared with the Air Force's) would probably be insufficient for conducting a major theater war. Under this option, the Navy's strengths would lie not in performing sustained deep-strike missions but in conducting small littoral operations that require relatively little deep-strike capability or in preparing the way for the introduction of land-based ground and air power, such as in securing a beachhead. Some Navy officers have argued for such an orientation.²³

With respect to other missions, this alternative's fleet would have more capability to conduct visible forward presence than the fleet described in Alternative III (though less than the fleets of the first two options). The 10 carrier battle groups would permit full-time presence in the Western Pacific and about half-time presence in the Mediterranean Sea and the Indian Ocean. The gaps in presence in those regions might be filled with the new maritime support surface combatants and with amphibious ships, in light of their increased numbers in this option. However, because the attack submarine fleet would be cut to 30, the Navy would be able to keep only five subs forward deployed.

Conclusions

CBO's four alternative fleets differ in varying degrees from the fleet in the Navy's current plan. With respect to numbers, the distribution of ships in Alternatives I and IV is similar to that in the planned fleet, but the distributions in Alternatives II and III vary significantly from that arrangement (see Table 11). With respect to displacement (tonnage), Alternative IV is the most balanced fleet and the most similar to the Navy's current plan. Alternatives I, II, and III differ more from that plan because they emphasize a particular type of ship.

The similarities among the alternatives and the Navy's current plan are not surprising. Ships have long service lives, between 30 and 50 years. Thus, many ships in the fleet today could still—and probably will—be in service a quarter century from now. Scrapping most of the fleet and replacing it with new ships is simply too expensive, even if the world is fundamentally different today than it was 15 years ago.

Continuing the Current Funding Level Would Force Future Trade-Offs

Within the same budget level, each of these alternatives describes a different Navy and emphasizes a different mission—which suggests some of the trade-offs that future naval planners may face. Alternative I maintains 12 carriers at the expense of all other types of ships and stresses the importance of those vessels in maintaining forward presence. However, that alternative would produce the smallest fleet—219 ships—among the navies examined here. Aircraft carriers and their air wings are clearly expensive investments, and the Navy's determination to keep the carrier fleet at 12 would have a deleterious effect on the rest of the fleet over the next 20 years in the absence of major increases to the service's budget.

Alternative II, like the first option, maintains a great deal of forward presence, but it adds some flexibility with ships that are capable of performing the varied yet relatively small missions that the Navy is frequently assigned. That option's fleet of 240 war-

23. See, for example, Commander Kevin Peppe, "Constant Bearing, Decreasing Range," *Proceedings*, U.S. Naval Institute (December 1996), p. 42.

ships combines the surface combatant and amphibious forces into one but is dominated by surface combatants, especially a new hybrid presence ship. As in the first alternative, however, all other major categories of ships must suffer substantial cuts to put this forward-presence-oriented force to sea.

Alternative III builds a Navy that is arguably the most different from today's. It allocates over 45 percent of the fleet to submarines (compared with 23 percent today) and would call on those vessels to perform many of the missions now conducted by aircraft carriers and surface ships. It is also the alternative that

Table 11.
Distribution of Ships Under the Navy's Current Plan and Four Alternatives

	Navy's Current Plan ^a	Alternative I: Keep a 12-Carrier Navy for Forward Presence	Alternative II: Use Other Ships for Presence Missions ^b	Alternative III: Build a Submarine Strike Navy	Alternative IV: Reorient the Navy to Provide More Support to the Marine Corps
Number of Ships					
Aircraft Carriers	12	12	7	7	10
Surface Combatants	117	83	118	58	93
Submarines	69	35	44	132	40
Amphibious Ships	36	24	6	18	43
All Others	<u>70</u>	<u>65</u>	<u>65</u>	<u>71</u>	<u>96</u>
Total	304	219	240	286	282
Percentage of Fleet By Numbers					
Aircraft Carriers	4	5	3	2	4
Surface Combatants	38	38	49	20	33
Submarines	23	16	18	46	14
Amphibious Ships	12	11	3	6	15
All Others	<u>23</u>	<u>30</u>	<u>27</u>	<u>25</u>	<u>34</u>
Total	100	100	100	100	100
By Displacement (Tonnage)					
Aircraft Carriers	25	34	14	17	24
Surface Combatants	24	18	58	12	21
Submarines	14	10	9	40	9
Amphibious Ships	20	18	5	12	27
All Others	<u>17</u>	<u>19</u>	<u>14</u>	<u>19</u>	<u>17</u>
Total	100	100	100	100	100

SOURCE: Congressional Budget Office.

a. Assumes that the Navy achieves the force goal of the Quadrennial Defense Review, after adjustments made in 2007 and 2012, plus five additional attack submarines as well as one additional surface combatant.

b. In effect, this alternative combines the surface combatant and amphibious fleets into one force.

faces the most technical risk. Having submarines serve as the Navy's principal strike weapon and carry out many of the strike missions now performed by aircraft carriers would require substantial improvements in submarines' weapons, sensors, and communications. Those improvements appear to be technically possible, but they do not yet exist. In a sense, this alternative emphasizes an emerging revolution in military affairs.

Alternative IV, which focuses on the Navy's support of the Marine Corps, is probably the alternative most like the Navy of today. Under that option, the amphibious fleet would grow by a few more ships, and each of the other major categories would be reduced fairly evenly, for a total fleet of 282 ships.

The Choice Among Alternatives Depends on the Future Security Environment

Inevitably, after an analysis such as this, the question arises, Which alternative is best? There are two ways to answer that question. First, the alternatives are merely illustrative. Each one represents a plan for reconfiguring the Navy over the course of 20 years. Many other approaches are feasible—for example, combinations that might mix and match elements from these alternatives or plans that represent something entirely different.

Second, which option is best depends on what one expects the world to look like in 2020. Different scenarios lead logically to different alternatives. Consider the following five examples:

- o If one expected that in 2020, the United States would be engaged in a new cold war with at least one rival superpower (a wealthy and hostile China, perhaps, or a rejuvenated Russia) and that rival was investing heavily in naval forces, none of these alternatives might be adequate. Instead, the United States might require a much larger Navy.
- o If one expected a relatively peaceful and prosperous world with perhaps two or three potential regional troublemakers who did not have powerful antiship capabilities, Alternative I might make the most sense. Its large carrier force would seem well suited to dealing with a problem nation, if necessary, while maintaining substantial forward presence to promote general tranquility.
- o Similarly, if one believed that all of the major regional powers in 2020 would be peaceful and that prosperity would be steadily, if slowly, expanding, Alternative II might look attractive. The fleet under that option would be a flexible force well suited to dealing with small problems; in addition, it could promote stability by maintaining more visible forward presence than any other alternative.
- o Conversely, if one envisioned a world in which numerous hostile regional powers were well equipped with effective and difficult-to-counter antiship cruise missiles, mines, and small, cheap submarines, Alternative III would appear to hold sway. In that world, the United States might not be the superpower it is today, but it would be much more than the equal of any regional power. A submarine strike Navy would permit the United States to pursue its interests during conflicts with one or more of those states without seriously jeopardizing its naval forces.
- o Finally, if one predicted a world of chaos, religious strife, and disintegrating political regimes, Alternative IV might be the best choice. In such a world, the United States would probably conduct operations similar to those it has undertaken in Haiti, Somalia, and Panama. A stronger and larger amphibious force with appropriate support ships could effectively perform those kinds of missions.

Clearly, there are distinct differences in the threats the Navy may one day face and the missions it may be called on to perform. Each alternative Navy discussed here would have strengths and weaknesses for dealing with those threats and performing those missions. Determining which alternative (or combination thereof) would be the best depends on which missions one considers most important and which threats or challenges the United States is likely to face well into the 21st century.