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NAVY CARRIER BATTLE GROUPS

The Structure and Affordability of the Future Force

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To the President of the Senate and the
Speaker of the House of Representatives

This report discusses the policy, operational, and force structure aspects of carrier battle groups and provides possible alternatives for meeting national security requirements with fewer carriers. The information in this report should be useful to the Congress in its deliberations on the size and composition of future naval forces, particularly the affordability of several decisions regarding the Navy's plans to acquire carriers, aircraft, surface combatants, submarines, and logistics support ships to support future battle groups.

We are sending copies of this report to the Secretaries of Defense and the Navy, the Director of the Office of Management and Budget, interested congressional committees, and other interested parties.

This report was prepared under the direction of Richard Davis, Director, Navy Issues, who may be reached on (202) 275-6504 if you or your staff have any questions. Major contributors to this report are listed in appendix IX.

Charles A. Bowsher
Comptroller General
of the United States

Executive Summary

Purpose

Aircraft carrier battle groups are the centerpiece of the Navy's surface force and significantly influence the size, composition, and cost of the fleet. The annualized cost to acquire, operate, and support a single Navy carrier battle group is now about $1.5 billion[1] and will continue to increase. As defense funding declines and defense expenditures come under increased scrutiny, attention will be focused on the size and affordability of the carrier force. GAO developed information on options that policymakers may consider when deciding on the size and makeup of future naval forces, particularly the number of carriers, required to meet our national security goals in times when defense spending is being reduced.

Background

The Navy's carrier battle groups have traditionally supported the national defense strategy by providing overseas presence and a crisis response capability. Carrier battle groups consist of the carrier, its air wing of about 80 aircraft, and about 9 escort ships, including surface combatants, attack submarines, and logistics support ships. Several other ships and aircraft provide logistics and training support. At the beginning of fiscal year 1993, the Navy had seven conventional- and seven nuclear-powered carriers in its active force and an aviation training carrier. The 14 active carriers allowed for near-continuous overseas presence of at least one carrier battle group in each of the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea regions. Only about 25 percent of the carriers are deployed overseas at any one time because of maintenance, training, and personnel policies.

The Navy plans to reduce the force to 12 active carriers and an aviation training carrier by the end of fiscal year 1995. The Navy intends to replace its conventional carriers with nuclear carriers on a one-to-one basis to maintain a 12-active carrier force. Table 1 shows the changes in the Navy's carrier force plan through fiscal year 2010.

Table 1: Navy's Carrier Force Structure Plan

	Number of carriers at end of fiscal year							
	1992	1993	1995	1996	1998	2003	2008	2010
Conventional	7	6	5	4	3	2	1	0
Nuclear	7	7	7	8	9	10	11	12
Training	1	1	1	1	1	1	1	1
Total	**15**	**14**	**13**	**13**	**13**	**13**	**13**	**13**

[1]All dollar amounts are expressed in fiscal year 1990 constant dollars unless otherwise noted.

The Navy has two nuclear carriers under construction, the John C. Stennis and the United States, which are scheduled for delivery in fiscal years 1996 and 1998, respectively. In addition, the USS Enterprise is being overhauled and its reactors refueled at a cost of over $2 billion (then-year dollars). Other nuclear carriers will be overhauled and refueled beginning in the late 1990s, ensuring a relatively large carrier force for about 30 more years. GAO's analysis shows that in fiscal year 1993 the Navy intends to invest between $11.5 billion and $15.1 billion (then-year dollars) to acquire carrier battle groups: ships, aircraft, and weapons. This includes $832.2 million (then-year dollars) for advance procurement of material (mostly nuclear components) for another nuclear carrier, CVN-76, to be requested in fiscal year 1995. The estimated cost of the new carrier is about $4.2 billion (then-year dollars). The Navy believes this carrier will allow it to maintain a highly capable carrier force as the number of carriers is reduced. More importantly, it believes the scheduled construction of the CVN-76 is vital to maintaining the unique industrial base for building nuclear aircraft carriers. Canceling or delaying the carrier would affect Newport News Shipbuilding and Drydock Company—the only shipyard capable of building nuclear carriers—and its nuclear propulsion vendors and would likely increase the carrier's cost when eventually built.

Results in Brief

Mounting budget pressures, a reduced threat environment, competing priorities, and affordability issues dominate the congressional debate on national security. At the same time, the Navy is embarking on several costly carrier-related programs—procuring another carrier, refueling the reactors on existing nuclear carriers, and replacing and upgrading aircraft. These programs will have long-term impacts on the size and cost, and potentially the capability, of a 12-carrier force. For example, the total cost to replace current tactical combat aircraft with the planned F/A-18E/F and AX aircraft could well exceed $120 billion. There are alternatives that could save tens of billions of dollars.

GAO's analysis indicates that there are opportunities for using less costly options to satisfy many of the carrier battle groups' traditional roles without unreasonably increasing the risk that U.S. national security would be threatened. For example, a smaller, less expensive carrier force could be achieved by relying more on increasingly capable surface combatants and amphibious assault ships and/or by employing a more flexible carrier deployment strategy. GAO believes that the Department of Defense and the Congress must agree on the size and affordability of the carrier force

required to meet national defense goals, including the consideration of other options, before a commitment is made to build another nuclear carrier.

GAO's Analysis

Changing Defense Strategy

In response to changes in the security environment, the United States has shifted its strategy from containment of the former Soviet Union to ensuring regional stability by focusing on strategic deterrence, overseas presence, and crisis response while maintaining an ability to rebuild, or reconstitute, a large force should a global threat reemerge. The Navy believes carrier battle groups are the best force for meeting the presence and crisis missions because of their superior sustainability, flexibility, and capabilities, and their ability to operate independent of land-based forces or facilities. Even with 12 or fewer carriers, however, the Navy can still maintain a significant overseas presence. Table 2 shows possible annual overseas presence achievable in the three regions at various carrier force levels under current operating, maintenance, and personnel policies.

Table 2: Examples of Annual Presence at Various Carrier Levels

	Regional presence (in average months per year)			
Number of carriers[a]	Mediterranean Sea	Western Pacific Ocean	Indian Ocean/ Arabian Sea	Overall annual presence (percent)
12	12	12	8.5	90
10	12	12	5.8	83
8	12	12	3.2	75
6	10	12	1.6	66

[a]These figures include a carrier home ported in Japan that is counted as continuously deployed. This carrier provides most of the presence in the western Pacific Ocean region and some in the Indian Ocean/Arabian Sea region. Carriers originating from the eastern and western United States have traditionally provided presence in the Mediterranean Sea and Indian Ocean/Arabian Sea regions, respectively.

Current deployment practices and the long distances involved make it difficult to maintain a high level of presence in the Indian Ocean/Arabian Sea region without adversely affecting the level of presence in the other two regions.

Cost of New Naval Aircraft Will Affect the Affordability of Carriers

The cost of new carrier-based tactical aircraft—the F/A-18E/F fighter/attack and the AX advanced strike—over the next decades could affect the affordability of carriers or hinder carriers from deploying with full complements of aircraft. With acquisition costs expected to be much higher than current aircraft, GAO estimates that future air wings, comprised of these new aircraft, for 8 carriers would cost about the same as the air wings for a 12-carrier force today. Each F/A-18E/F is estimated to cost almost $50 million, whereas the AX could be significantly more—over $100 million each. Thus, the total cost to replace the current tactical aircraft could well exceed $120 billion. Also, the Navy is planning a number of life extension programs for existing tactical and support aircraft.

Alternatives to Carrier Battle Groups

The Navy is beginning to develop alternatives for carrier battle groups in low-threat areas to fill the voids that will occur with a 12-carrier force. These include shifting carriers between regions during a deployment and using different types of forces, such as smaller groups of increasingly capable surface combatants—many equipped with the AEGIS weapon system and Tomahawk land attack missile—and amphibious assault ships, in place of carriers. The Navy is testing and evaluating these operational concepts to determine the extent of possible changes to its operations and doctrine.

Increased Capabilities of Other Naval Ships to Meet Regional Contingencies

The surface combatants now entering the fleet are increasingly capable in strike, antiair, antisurface, and antisubmarine warfare that makes them increasingly suitable for regional contingencies. For example, the Navy has around 45 Tomahawk-capable surface combatants with a land-attack capability of more than 650 miles, which is enough range to reach over three-fourths of the world's land areas. Most attack submarines—about 70—also can launch Tomahawk cruise missiles. Together these ships and submarines could carry between 2,100 and 5,200 Tomahawk missiles, depending on missions and inventories. The Navy plans to have over 150 Tomahawk-capable surface combatants and attack submarines by fiscal year 2000. Planned Tomahawk upgrades include a lighter but equally lethal warhead, increased range, shipboard mission planning capability, improved navigation, and a capability to control the missile's time of arrival to its target.

The capability of amphibious assault ships is also increasing. The Wasp class of multipurpose amphibious assault/sea control ships are now

entering the fleet. They provide both a flight deck for helicopters and Harrier vertical/short takeoff and landing aircraft that can deliver a variety of ground support and strike munitions, as well as a capability to launch air-cushioned and conventional landing craft. These ships, however, do not have the multimission capability of a carrier.

Another class of amphibious assault ship, designated the LX, is being developed to replace several older classes. The LX, as envisioned, will carry an assault force and support material and could have enhanced defensive and offensive capabilities. It is expected to begin entering the fleet around the year 2000.

Utilizing a Smaller Carrier Force

Increased reliance on other naval forces to implement the national defense strategy could result in fewer overseas carrier deployments and eventually a smaller carrier force. Even with carriers spending more time in their home port areas, they could still maintain their readiness and ability to deploy to a crisis. For example, at force levels of 12, 10, 8, and 6, the Navy can have 5, 4, 3, and 1 carriers, respectively, deployed or capable of deploying immediately. The Navy can have nine, eight, seven, and four carriers, respectively, at each level deployed within a 2-month period.

Reduced Force Structure Has More Potential for Cost Savings Than Reduced Operating Tempo

Decreasing the frequency and duration of carrier operations and training does not significantly reduce operating and support costs because most costs are fixed. These fixed costs, accounting for more than 80 percent of a carrier battle group's operating and support costs, include major maintenance and military personnel. The significant costs to modernize and replace carriers, escorts, and aircraft remain. However, substantial savings can be achieved largely by reducing the size of the carrier force and its complement of aircraft. A smaller carrier force is possible by using other naval forces to achieve overseas presence and by maintaining carriers to provide rapid deployment from the United States in sufficient numbers when required to respond to overseas crises.

Matters for Congressional Consideration

GAO believes it is essential that the Congress and the Department of Defense reach early agreement on the size and affordability of the carrier force needed to meet future national defense requirements. Reaching such an agreement during deliberations on the fiscal year 1994 budget submission is important because the number of carriers and their role in the new security environment directly affect (1) the Navy's plans to

acquire carriers, surface combatants, attack submarines, and combat logistics ships and (2) the affordability of developing and procuring a full complement of costly new tactical aircraft.

In the context of this agreement on the size and affordability of the carrier force, the Congress should consider the extent that other, less costly force options could satisfy many national security needs and reduce the requirements for carrier battle groups before approving full funding for the new nuclear carrier in the planned fiscal year 1995 request.

Agency Comments

The Department of Defense provided comments on a draft of this report, which are included in appendix VIII. Defense agrees with some of the major findings of the report, but only partially agrees or disagrees with others. Defense's comments and GAO's detailed evaluation of them are included in the report where appropriate.

Defense partially agrees with GAO's use of annualized amortized costs to represent potential savings of alternative forces, stating the method is potentially misleading. Defense believes the method is not appropriate for evaluating near-term budget decisions. Defense considers acquisition costs as "sunk" costs that cannot be saved in the near term and that actual expenditures have "peaks and valleys" rather than averages. However, Defense stated that this method has some utility for showing rough, long-term costs of different types of forces. GAO believes annualized amortized costs, when viewed over an extended period of time, reflect the significant investment requirements for these major force structure elements and thereby provide insight into the potential impact these elements may have on future budgets: in this case, the cost implications of replacing, operating, and supporting carrier battle group elements.

Defense does not believe the risks associated with alternative force options, particularly the absence of the carrier's organic air capability, are adequately discussed in the report. Defense also emphasizes that the Base Force of 12 deployable carrier battle groups and 1 training carrier is sized to meet what it considers the minimum needs to support its new regionally oriented national defense strategy. GAO agrees that carrier battle groups with their multidimensional mission capabilities are an important component of the new defense strategy and that those groups will continue to play a major role in fulfilling future security needs. GAO also recognizes the risks associated with alternative naval forces—such as the lack of air capabilities—increase as the seriousness of the threat

increases. However, GAO believes the tradeoff between risk and cost of these alternative forces needs to be considered in the context of reduced defense budgets, a diminished global threat to U.S. national security, and increasingly capable surface combatants and other ships to conduct power projection missions against regional threats. GAO does not advocate abandoning the role and employment of carrier battle groups for presence and crisis response missions but is suggesting that there are opportunities to rely less on these groups and use other, less costly types of forces for expanded roles in the new security environment. GAO continues to believe that alternative forces, such as the surface action groups described in the report, should be considered for fulfilling many traditional carrier roles, which would thereby reduce the requirements for relatively costly carrier battle groups.

A draft of this report provided to Defense for comment contained a Matter for Congressional Consideration concerning release of advance procurement funds requested for CVN-76. The suggestion was based on the belief that approval of the funding represents a significant commitment to fund the remainder of the ship in fiscal year 1995, which would, in turn, require early retirement of a conventional carrier to maintain a 12-carrier force. GAO further suggested that, given the declining defense budget, changing security environment, increasingly capable surface combatants and amphibious ships, high cost of upgrading and replacing carrier aircraft, and long-term costs of maintaining the planned carrier force level, the Congress and Defense need to reach early agreement on the size and affordability of the carrier force needed to meet national defense requirements.

Defense did not concur with the suggestion concerning the release of the advance procurement funds, stating that there are defense industrial base imperatives that require these funds. Further, Defense believes that the Congress and Defense agree on the size of the future carrier force. Subsequently, the funds were authorized and appropriated by the Congress and obligated by the Navy. The report has been revised to reflect that action.

GAO still believes, however, that the reasons cited for the need for the Congress and Defense to reach early agreement on the size and affordability of the carrier force remain valid. GAO also believes that other options, such as the increased use of surface action groups and other force configurations, to meet some of the roles and missions traditionally met by

carrier battle groups should be fully examined before making a commitment to build another carrier.

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Abbreviations

DOD	Department of Defense
GAO	General Accounting Office
OPTEMPO	operating tempo
PERSTEMPO	personnel tempo

Introduction

Carrier battle groups are the centerpiece of the Navy's power projection forces and its most expensive assets. U.S. decisionmakers have relied on carrier battle groups to achieve political and military objectives because of their operational flexibility, capabilities, mobility, sustainability, responsiveness, and high visibility compared with other forces. In peacetime, the overseas presence of these groups can help promote U.S. foreign policy, maintain stability, and deter aggression; in crisis and in wartime, battle groups can conduct naval operations to project U.S. military power ashore and maintain control of the seas.

The current plan to restructure the military calls for reducing the number of active aircraft carriers from the fiscal year 1990 level of 15 to 12 by the end of fiscal year 1995 and maintaining that level for the foreseeable future. However, the Congress continues to seek further defense reductions to address the growing federal budget deficit and other competing spending priorities. The high cost of acquiring and operating carrier battle groups may require additional reductions of carriers and their associated battle groups and an examination of other force options to accomplish future security objectives.

New Defense Strategy

Since World War II, the threat to U.S. national survival posed by the former Soviet Union had provided the rationale for U.S. force requirements, planning, and expenditures. However, this threat has greatly diminished because of the significant political and military changes in the former Soviet Union. There appears to be little likelihood of a massive, short-warning attack by the new Commonwealth of Independent States (the former Soviet Union) against the United States and its allies or a global war in the foreseeable future.

In August 1990, President Bush announced a new defense strategy that shifts the focus of defense planning away from the threat of a global war to a variety of threats in major regions of consequence to U.S. interests, particularly Europe, Southwest Asia, and East Asia. The Department of Defense (DOD) believes these threats are likely to involve more than one nation, be unconventional in character, and possibly develop suddenly and unpredictably (e.g., Iraq's invasion of Kuwait) into smaller-scale regional crises. Such threats are becoming more dangerous because of the proliferation of advanced weaponry, including chemical, biological, and nuclear capabilities, among an increasing number of countries. The new strategy focuses on strategic nuclear deterrence and strategic defense,

overseas presence, crisis response, and reconstitution[1] to establish the basis for future force requirements and employments.

Base Force

The fiscal year 1992 budget proposed a plan, called Base Force, to implement the new defense strategy. The plan reduces and restructures the U.S. military to meet near-term national security requirements within anticipated smaller defense budgets. The Base Force is considered the minimum force structure[2] required to address future regional contingencies against various potential threats. Force requirements are based on having forces capable of involvement in two concurrent regional contingencies that start sequentially. These forces are organized into four groups: Strategic Forces, Atlantic Forces, Pacific Forces, and Contingency Forces.

Naval battle forces assigned to the Atlantic and Pacific Forces, particularly carrier battle groups, figure prominently in the new defense strategy for peacetime overseas presence and crisis response. These forces would also become important elements of the Contingency Force during escalating crises. Although these forces are smaller in size, their roles and employment appear to have changed little from Cold War requirements.

Impact of Base Force on Future Carrier Force Structure

Under Base Force, the number of active aircraft carriers is expected to decline from 15 in fiscal year 1990 to 12 by fiscal year 1995.[3] Since the mid-1970s, the Navy has acquired only nuclear-powered aircraft carriers. At the beginning of fiscal year 1993, the Navy had seven conventional and seven nuclear aircraft carriers in its active inventory and plans to have three conventional and nine nuclear carriers by the end of this decade. Conventional carriers, which are powered by fossil fuel, will be retired to reduce and maintain the force at 12 carriers. Appendix II provides information on the Navy's carrier force structure plans.

[1]Reconstitution involves forming, training, and fielding new fighting units. This includes initially drawing on cadre-type units and military assets in storage, mobilizing previously trained or new personnel, and activating the industrial base on a large scale.

[2]Force structure refers to the numbers, size, and composition of active and reserve units comprising the military, such as ships and air wings, and the facilities of the supporting base infrastructure.

[3]The Navy also maintains one aviation training carrier in its inventory. Because the carrier possesses no combat capability, it is not included in the number of active carriers at a given force level. However, the Navy plans to maintain a capacity to convert the training carrier to a combat status within a 12-month period to augment, if necessary, the active fleet.

Similar reductions are planned for other air and naval assets associated with carrier battle groups. The number of carrier air wings will be reduced from 15 (13 active and 2 reserve) in fiscal year 1990 to 13 (11 active and 2 reserve) by fiscal year 1995. The overall number of naval battle force ships will drop from the fiscal year 1990 level of 547 to 452 by fiscal year 1995 and will be further reduced to 435 by fiscal year 1997.

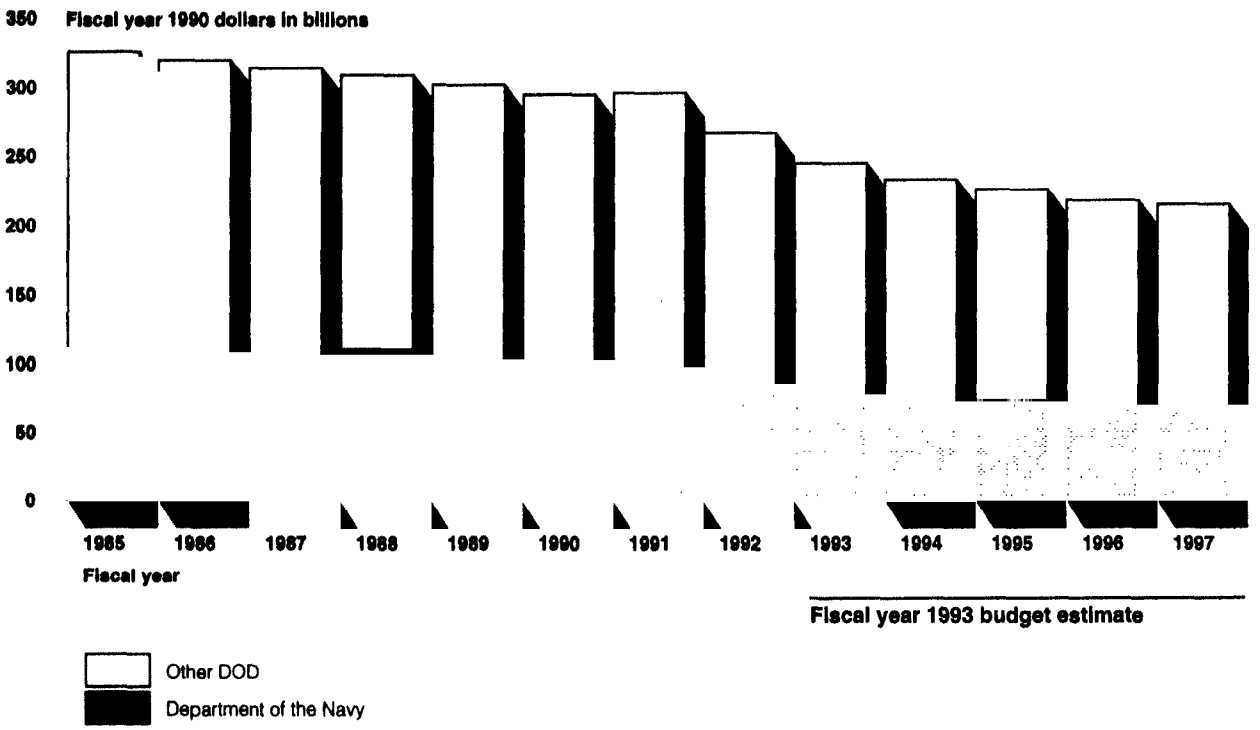
Future Defense Budgets

Significant additional cuts in defense spending beyond those envisioned in the Base Force proposal could likely be required over the next several years because of growing federal debts, rising interest payments on the national debt, and domestic spending priorities.

Defense spending surged in the early 1980s, reaching a high of $325 billion[4] in 1985. Since then, the defense budget has, with one exception, progressively declined. DOD's Fiscal Year 1993 Future Years Defense Program shows its budget will be about $214 billion by fiscal year 1997 in real terms—almost the same amount as the annual budgets during the mid-1970s. As the defense budget declines, so does the Navy's budget. In the late 1980s, total Navy Department budgets exceeded $100 billion each year, but the defense program shows the Navy's budget will be about $68 billion by fiscal year 1997. Figure 1.1 compares the Departments of Defense and the Navy total obligational authorities for fiscal years 1985 through 1992 and the amounts projected through fiscal year 1997.

[4]All dollar amounts are expressed in fiscal year 1990 constant dollars unless otherwise noted.

Figure 1.1: Departments of Defense and Navy Total Obligational Authorities for Fiscal Years 1985 Through 1997



Source: Our analysis of DOD and GAO data.

Aircraft Carrier Battle Groups

The Navy's preferred carrier battle group generally has an aircraft carrier and its air wing of about 80 aircraft, 6 surface combatants (cruisers and destroyers) equipped with AEGIS antiair capability,[5] 2 nuclear attack submarines, and a fast combat support (logistics) ship.[6] This configuration, as shown in table 1.1, is referred to as a "notional" carrier battle group.[7] However, the actual composition of a carrier battle group varies,

[5]The AEGIS combat system is an integrated network of computers and displays linked to sensors and weapon systems capable of simultaneously detecting, tracking, and engaging numerous air, surface, and subsurface targets. It is currently carried on Ticonderoga-class cruisers and Arleigh Burke-class destroyers.

[6]Until the Navy has a sufficient number of fast combat support ships, battle groups may alternatively deploy with two logistics ships—a replenishment oiler and an ammunition ship.

[7]References to carrier battle groups in this report are based on this configuration, unless otherwise noted.

depending on such factors as the mission, likely threat, and availability of deployable ships and aircraft.

Table 1.1: Notional Configuration for a Carrier Battle Group

Battle group element	Number of elements
Aircraft carrier	1
Carrier air wing (with about 80 aircraft)	1
Cruisers	2 or 3
Destroyers	2 to 4
Nuclear attack submarines	2
Fast combat support ship (or a replenishment oiler and an ammunition ship)	1

Source: Our analysis of Navy data.

Other logistics support ships, commonly called the underway replenishment group, independently deploy to sustain the carrier battle group. These ships replenish the carrier battle group by shuttling fuel, ammunition, provisions, and general stores to the battle group's on-station logistics support ship or directly to combatant ships. Appendix III provides additional information on the elements that comprise a carrier battle group.

Cost of an Aircraft Carrier Battle Group

An aircraft carrier battle group, including associated logistics support ships, costs almost $1.5 billion[8] each year to acquire, operate, and support. Table 1.2 shows the annualized cost of a notional carrier battle group for fiscal year 1990. Operating and support costs accounted for about 60 percent (about $900 million) of the battle group's annual expenses, and annualized acquisition costs accounted for the other 40 percent (about $600 million). Over 45 percent of the battle group's annual operating and support costs were for performing major maintenance and repairs on the ships and aircraft in a battle group; another 35 percent were for the military personnel assigned to command, operate, and maintain the group. (Unless otherwise noted, force component costs are averaged composite

[8]Cost estimates in this report reflect costs likely to be incurred by naval forces over an extended period of time. Annualized acquisition costs represent the amortized cost to acquire the battle group ships and aircraft spread over their service lives. In this context, annualized acquisition costs cannot be directly related to annual defense budgets because procurement costs are basically incurred before the ships and aircraft enter service. Annualized aircraft costs also include an allowance for force assurance (i.e., the additional aircraft needed to sustain a force level over a period of time because of losses due to aging or peacetime attrition). Annual operating and support costs are estimates of incurred annual costs; however, the cost of maintenance is averaged over the maintenance cycle. See appendix I for more information on our methodology.

costs reflecting the force's composition in fiscal year 1990.) A notional carrier battle group in fiscal year 2000 will cost about $1.6 billion—an increase of about 6 percent. Appendix IV shows the annualized cost of a notional carrier battle group for fiscal year 2000. Carrier battle group costs used in this report represent the direct costs for an active force unit, for example, a ship or aircraft in the active fleet. The indirect costs of a force unit are not allocated or included, although these costs can be significant. Indirect costs include, for example, the Navy's physical infrastructure of bases and air stations and the personnel assigned to shore command and support functions (e.g., publications and financial management). Also, reserve units are not included in our carrier battle group costs.

Table 1.2: Notional Carrier Battle Group's Annualized Costs for Fiscal Year 1990

Fiscal year 1990 dollars in millions

	Number	Operating and support	Acquisition	Total
Aircraft carrier				
Aircraft carrier	1	$194	$54	**$248**
Carrier air wing	1	247	336	**583**
Subtotal		**441**	**389**	**830**
Battle group ships and ships' aircraft				
Cruiser	2	88	43	**131**
Destroyer	4	112	44	**156**
Submarine	2	99	41	**140**
Fast combat support ship or equivalent	1	44	12	**56**
SH-60B helicopter	4	9	12	**21**
SH-2F helicopter	2	5	3	**8**
CH-46 helicopter	2	5	2	**6**
Subtotal		**363**	**155**	**518**
Total carrier battle group		**$804**	**$544**	**$1,348**
Underway replenishment group		96	38	**134**
Total		**$900**	**$582**	**$1,482**

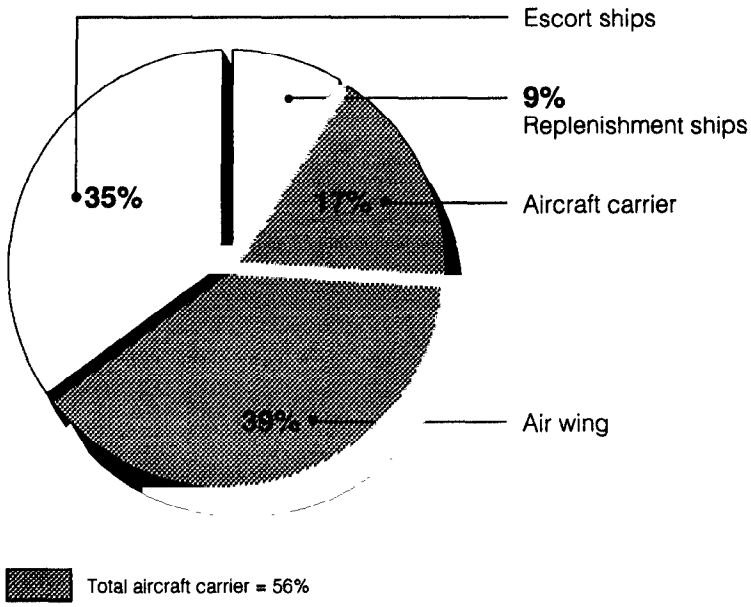
Note: Numbers have been rounded. Nuclear fuel costs are included under operating and support and not acquisition. Costs are a composite of the mix of ships and air wings in the fleet.

Source: Our analysis of Navy and GAO data.

Figure 1.2 shows the percentage of the battle group's annualized cost for each of its major components. The aircraft carrier and its air wing make up

about 56 percent ($830 million) of the costs of the group, with the air wing contributing the largest part of carrier costs.

Figure 1.2: Breakout of the Annualized Costs for a Fiscal Year 1990 Carrier Battle Group by Major Force Component



Source: Our analysis of Navy and GAO data.

Future Air Wing Configurations and Costs

In fiscal year 1990, the Navy had a mix of five different carrier air wings. By fiscal year 1996, the Navy plans to have only one type of air wing, the Power Projection. Appendix III shows the mix of air wings between fiscal years 1990 and 2000 and the composition of these wings.

The carrier air wing is the most expensive element of a carrier battle group, accounting for about 40 percent ($583 million) of a group's total annualized costs. The annualized cost for one of the Navy's current air wings range from $538 million for a Kennedy/Ranger air wing to $632 million for a Roosevelt air wing.

The annualized cost of a Power Projection air wing is about $608 million. When the carrier air wing force structure stabilizes in fiscal year 1996 with 11 active Power Projection air wings, the force will have total annualized costs of about $6.7 billion, $3.8 billion for annualized acquisition of aircraft

and $2.9 billion for operating and support. The cost of acquiring future carrier air wings is expected to be about 60 percent greater than the cost of current air wings—about $2.3 billion more in annualized acquisition costs for 12 aircraft carriers—because of the higher expected costs of upgrades and replacement aircraft, such as the AX advanced strike aircraft.

Our Review

Due to increasing budgetary pressures to reduce the size of the military and the potential opportunities for reducing costs offered by changes in the security environment, we reviewed the administration's rationale for future aircraft carrier force structure and examined options for meeting security requirements with fewer carriers. Our report provides the Congress with information on the implications of current and future carrier battle group force levels and possible force options that policymakers may consider when deciding on the size and makeup of future naval forces, particularly the number of carriers. Our objectives, scope, and methodology are discussed in appendix I.

DOD provided written comments on a draft of this report. Relevant portions of its comments are discussed at the end of each chapter. Appendix VIII presents DOD's comments in their entirety. DOD also offered suggestions for improving the technical accuracy of the report, and changes have been incorporated into the report where appropriate.

DOD Comments and Our Evaluation

DOD generally concurred with the discussion of the defense strategy and Base Force and partially concurred with the discussion of the impact of the Base Force on the future force structure. It provided further discussion of the changing national security environment and defense strategy, emphasizing what it believes to be substantial changes in the roles and deployment of naval forces. We understand that the elements of the defense strategy are interrelated. Although there have been some changes in the roles and employment of naval forces in recent years because of the new security environment and declining naval force structure, we believe the Navy continues to rely on carrier battle groups to provide the principal presence and crisis response capabilities in the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea regions. We demonstrate in this report that there are less costly alternatives to maintaining peacetime presence and providing an initial response to potential conflicts.

DOD also partially concurred with our methodology for estimating the annualized cost of a carrier battle group. However, it questioned the relevance of such notional costs for near-term budget decisions because these costs do not reflect sunk costs or the timing of replacement costs. DOD believes this method has some utility for showing rough, long-term costs of different types of forces.

We agree with DOD that annualized costs can have utility for showing long-term costs for different types of forces. Indeed, we chose that methodology for that purpose. We believe decisions regarding the number of aircraft carriers in the Base Force must consider the long-term implications those decisions have for the capital investment in aircraft and other components necessary to make the carrier effective, as well as the annual operating and support costs required to deploy and sustain a carrier battle group for several decades. We further believe that although prior investments are sunk costs in a near-term budget perspective, many future investments to support the Base Force, such as replacement carriers and tactical aircraft, will represent considerably greater relative costs for defense budgets and may limit the affordability of the overall Base Force concept. Our cost methodology permits comparisons to be made with other force alternatives over the long term; surface action groups, described in this report, is only one of these alternatives.

Overseas Presence and Crisis Response Capabilities Can Be Met With Other Naval Forces

Overseas naval presence in major world regions has primarily been met by carrier battle groups. The level of presence maintained is a major determinant of naval force requirements. As a result, the high presence levels maintained during the Cold War to address the threat posed by the former Soviet Union established significant requirements. A force of 15 carriers can maintain a continuous presence of a carrier in each of the major regions—the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea. At the proposed fiscal year 1995 level of 12 aircraft carriers, the Navy will still be able to provide a significant overseas presence by carrier battle groups but at lower levels than in the past.

The Navy believes carrier battle groups are the best force for fulfilling its presence and crisis response missions. However, as its force declines, the Navy is exploring new operational concepts using a reduced, yet highly capable naval force to meet national security requirements. These concepts include decreasing the number of combatant escorts assigned to a deployed carrier battle group to maximize their distribution in the force, coordinating and combining the deployments of carrier battle groups and amphibious readiness groups to improve force efficiencies, and dispersing the battle group over larger areas and not rigidly maintaining the group in a particular region to increase the flexibility and regional coverage of deployments.

The Navy could also shift its reliance now placed on carrier battle groups to other naval force configurations, such as groups centered around a cruiser, destroyer, or amphibious assault ship, for providing overseas presence and a crisis response capability. Identifying new approaches such as these will become increasingly important because various factors—reduced defense funding, high aircraft carrier acquisition and operating and support costs, the prospect of even higher carrier aircraft development and acquisition costs, and competition in defense priorities—may dictate an even smaller carrier force than now planned.

Lower Carrier Levels Will Reduce Presence Provided by Battle Groups

The carrier battle group has been the Navy's principal force for maintaining overseas naval presence. Since late 1979, the Navy has maintained a near-continuous presence of carrier battle groups in the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea regions. Appendix V shows the annual carrier deployment levels to these major regions since 1978.

The amount of carrier presence possible in overseas regions depends on the overall force level and the allocation of carriers to those regions.[1] Under current Navy employment policies for nuclear carriers (see app. VI for a discussion of employment factors and policies affecting carrier utilization), it takes about 15 carriers to maintain a continuous presence of 1 in each of the three major regions: Mediterranean Sea, 5.1 carriers; western Pacific Ocean, 1.6 carriers; and Indian Ocean/Arabian Sea, 7.9 carriers.[2]

As the number of carriers decreases below 15, maintaining a continuous carrier presence in more than two regions becomes increasingly difficult. Table 2.1 shows the possible annual presence provided at carrier force levels of 12, 10, 8, and 6 in the three major regions. At the planned level of 12, the Navy can meet a substantial amount of overseas presence with carriers, depending on their distribution among the regions. At 10, 8, and 6 carrier levels, the annual overall carrier presence progressively decreases but remains above 50 percent in the most extreme example.

[1]The President and the Secretary of Defense determine the amount of presence and type of forces required in various overseas regions during peacetime. They consider the advice of the Joint Chiefs of Staff, the unified and service commanders responsible for those regions, and officials from the Department of State and the Central Intelligence Agency in making these decisions. Within the constraints of a given available force structure, these officials also consider the following national security requirements in determining presence: threats to U.S. interests and regional stability, security commitments to other nations, and U.S. foreign policy objectives.

[2]The lower requirement for the western Pacific Ocean region is due to the permanent basing of a carrier in Yokosuka, Japan, that is considered continuously deployed. Since this carrier also partially meets Indian Ocean/Arabian Sea region requirements, carriers based in the United States provide presence in the western Pacific Ocean region during its absence. Without a carrier based in Japan, more than five and as many as nine carriers would be required from the United States to provide a continuous presence in the western Pacific Ocean and Indian Ocean/Arabian Sea regions, respectively.

Table 2.1: Examples of Peacetime Regional Presence at Selected Carrier Force Levels

	Regional presence (in average months per year)			
Carrier force level	Mediterranean Sea	Western Pacific Ocean	Indian Ocean/ Arabian Sea	Overall annual regional presence (in percent)
12	12	12	8.5	90
	9	12	10.2	87
	6	12	11.9	83
	3	12	13.6	75
	0	12	15.3	67
10	12	12	5.8	83
	9	12	7.5	79
	6	12	9.2	76
	3	12	10.9	72
	0	12	12.6	67
8	12	12	3.2	75
	9	12	4.9	72
	6	12	6.6	68
	3	12	8.3	65
	0	12	10.0	61
6	10	12	1.6	66
	9	12	2.2	64
	6	12	3.9	61
	3	12	5.6	57
	0	12	7.3	54

Note: Numbers have been rounded. The table assumes that only one carrier is providing presence in a region at a time up to 12 months. Therefore, maximum presence is reached at 12 months.

Source: Our analysis of Navy data.

Current employment factors (e.g., operational, maintenance, and personnel policies) for a nuclear aircraft carrier deployed from the continental United States were used in determining the presence possible at each force level. Although we included aircraft carriers in routine major overhauls in our calculations, we did not include those carriers temporarily removed from the active inventory for nuclear refuelings. We assumed that at least one carrier would be in the western Pacific Ocean region continuously, or a 12-month presence, because of the carrier home ported in Japan.

The Indian Ocean/Arabian Sea region places the greatest demand on the number of carriers because of the longer transit distances between the region and the continental United States than between the Mediterranean Sea or western Pacific Ocean regions.[3] As presence in the Mediterranean Sea region was reduced in our example, the amount of presence in the Indian Ocean/Arabian Sea region increased only modestly.[4]

Navy Strategies to Increase Fleet Utilization

The Navy is beginning to explore and implement alternatives using a smaller carrier force. These alternatives include decreasing the number of combatant escorts assigned to a deployed battle group, coordinating and combining the deployments of carrier battle groups and amphibious readiness groups, incorporating attack submarines into the training and deployment of the battle group, and increasing the flexibility and coverage of deployments by dispersing the battle group over larger areas and not rigidly maintaining the group in a particular region. Additionally, the Navy is adapting its deployment strategies to exploit the capabilities of available joint U.S. and allied forces to augment the dispersed naval presence.

The number of combatant escorts routinely assigned to a carrier battle group is declining. The Navy stated that these reductions were necessary to meet overseas commitments with a decreasing force. The smaller battle group is possible because of the changed security environment and increased capabilities of surface combatants now entering the fleet. The Navy has introduced greater flexibility into the number and types of ships assembled for each new battle group to better match the regional security situation.

The deployments of amphibious readiness groups, consisting of several amphibious warfare ships, are being coordinated and combined with those of carrier battle groups to reduce deployment requirements.[5] Also, the

[3]A battle group traveling from San Diego, California, to the north Arabian Sea will take about 34 days to reach its destination, assuming that it travels at 14 knots and does not make any stops. If port visits and training exercises while en route are included, the transit time can increase by about one-third, to about 45 days. Since battle groups deploy for 6 months, the time spent in the Arabian Sea deployment area will be about 3 months, or about 50 percent of the deployment time, when transit time and stops are considered. In contrast, carriers deployed to the Mediterranean Sea and western Pacific Ocean regions from the United States can spend more than 80 percent of their time in the deployment area.

[4]Our calculations assume that the Indian Ocean/Arabian Sea region deployments are being fulfilled by carriers based on the western coast of the United States and in Japan. Other carrier deployment schemes, such as deployments originating from the eastern United States, could improve the amount of presence possible in the region.

[5]During the 1980s amphibious readiness groups were regularly deployed to the Mediterranean Sea and western Pacific Ocean regions but were only infrequently deployed to the Indian Ocean/Arabian Sea region.

Navy plans to reduce the number of amphibious ships in a amphibious readiness group from five to three as newer, more capable ships enter the fleet.

Additionally, submarines are now fully integrated into carrier battle group deployments. In the past, submarines independently deployed and supported battle groups during their deployments. Under this change, submarines will train and deploy with the battle group.

During its deployment, the carrier battle group can be separated into smaller configurations of ships. This will permit the group to provide more extensive coverage of the region and operate at greater distances from other battle group elements than in the past. While remaining tethered to the carrier, these smaller configurations will operate independently to conduct presence, including port visits and exercises with U.S. and allied forces, and provide crisis response capabilities. When necessary, these configurations will reassemble with the carrier and/or amphibious ships, depending on the security situation.

Since 1991, the Navy has been implementing operational innovations in the Mediterranean Sea region to extend the geographic coverage provided by carrier battle groups. Two force configurations being evaluated are the maritime action group and sea control battle group. The maritime action group in its smallest configuration consists of two surface combatants and one attack submarine. The sea control battle group is configured the same as the maritime action group, except that it includes one or more amphibious assault ships, such as a Wasp- or Tarawa-class ship.

Upon reaching the region, part of the carrier battle group would split into one or more maritime action groups. The amphibious ships would also disperse to conduct individual mission tasks. If a potential threat increases during the deployment, the maritime action groups, amphibious ships, and the aircraft carrier and remaining battle group could be gradually brought together into more capable configurations. Joint U.S. and allied military assets could also be used to augment these configurations.

Aircraft Carrier Surge Capabilities

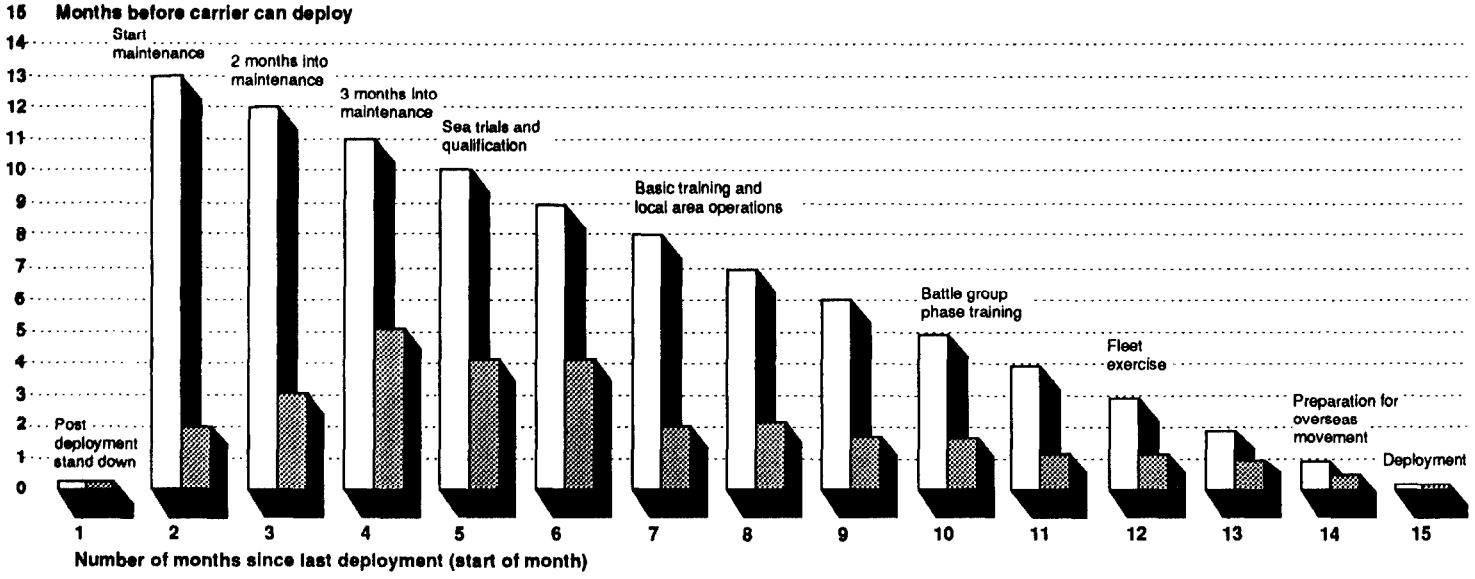
During crisis or war, the Navy can increase the number of carriers available for deployment by accelerating or deferring maintenance and

training activities during a ship's interdeployment phase.[6] This acceleration is often referred to as "surge." The minimum amount of time required before the carrier can safely surge will depend on the activity it is engaged in during this phase, as shown in figure 2.1. For example, a carrier in a major maintenance activity at a shipyard will require as much as 5 months before it is able to deploy, whereas one that is in the latter stages of its training activities can deploy within 1 month. As a result, a carrier may deploy at a slightly less-than-optimum readiness level, that is, with minor deficiencies that will not degrade the ship's and crew's overall ability to meet their mission requirements. Also, personnel tempo (PERSTEMPO) goals, such as limiting the length of a deployment, may be temporarily suspended[7] to surge a carrier. It may be possible to further accelerate the time before deploying by additionally curtailing maintenance and training, but this would have an adverse effect on safety and readiness.

[6]The interdeployment phase refers to the time between sequential deployments in which the ship undergoes maintenance and its personnel participate in training activities in preparation for the next deployment. Also, a ship already deployed is considered available for continued deployment in its area or another area.

[7]During Operations Desert Shield and Desert Storm, the Navy temporarily suspended PERSTEMPO goals as a result of the increased number of deployed ships and air wings and the length of the crisis. With the exception of its amphibious ships, the Navy indicated it was able to return to these goals within a relatively short time after the end of Operation Desert Storm.

Figure 2.1: Time Required to Deploy During a Carrier's Interdeployment Phase



Carrier must complete all scheduled maintenance and training and deploy with an overall readiness rating of "Fully Ready" (C-1).

Carrier curtails scheduled maintenance and training consistent with safety requirements, and can deploy with an overall readiness rating of "Substantially Ready" (C-2).

Note: The difference in the number of months at each increment is the time reduced from the normal interdeployment phase for the accelerated deployment.

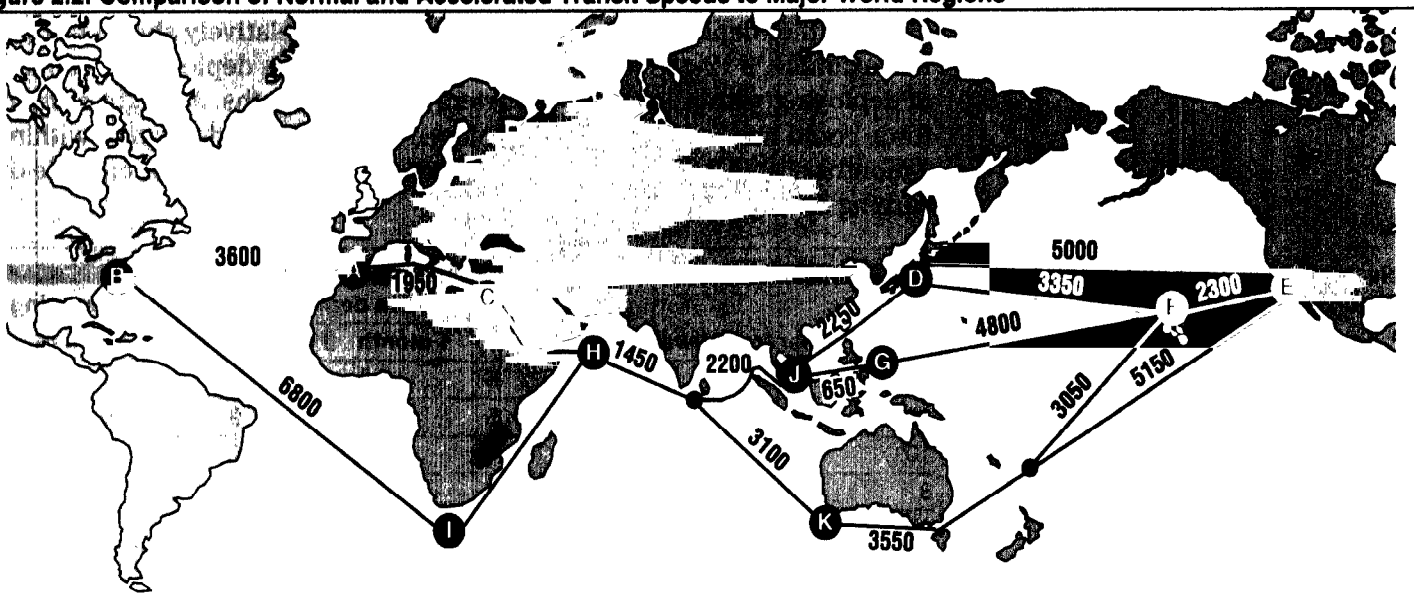
Source: Navy.

Another aspect of surge capability is how quickly the ship can reach its destination once it deploys, which depends largely on transit speed and distance. For example, if it takes 11 days without stops to reach the Mediterranean Sea region from Norfolk, Virginia, at the normal transit speed of 14 knots, the ship's speed could be increased to 30 knots and reach the region in less than half the time. Figure 2.2 shows the one-way distances to the major regions, the normal transit time without stops, and the transit times at illustrative accelerated speeds of 22 and 30 knots

without stops, and the approximate number of additional days for stops during peacetime deployments.[8]

[8]The Navy uses an average transit speed of 14 knots for determining transit times. This speed considers the maneuvers made by a carrier to turn into the wind to launch and recover practicing aircraft, fuel economy, the lesser wear on ship equipment than at higher speeds, and the slower speeds of battle group escorts. The Nimitz-class carriers are capable of speeds greater than 30 knots. We used 22 and 30 knots for illustrative purposes to show the effect of higher speeds on transit times to overseas regions.

Figure 2.2: Comparison of Normal and Accelerated Transit Speeds to Major World Regions



Region	Port of departure	Approximate number of nautical miles	Approximate number of days (without stops) 14 Knots	22 Knots	30 Knots	Approximate number of days for stops
Mediterranean Sea						
Gibraltar (A)	Norfolk, VA (B)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Suez Canal (C)	Norfolk, VA (B)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Western Pacific Ocean						
Yokosuka, Japan (D)	San Diego, CA (I)	5,650	17	11	8	3
through Hawaii (F)						
Philippines (G)	San Diego, CA (I)	7,100				
through Hawaii (F)			21	13	10	3
Indian Ocean/Arabian Sea						
North Arabian Sea (H)						
through Strait of Malacca (J)	Yokosuka, Japan (D)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
through Suez Canal (C)	Norfolk, VA (B)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
around Cape of Africa (I)	Norfolk, VA (B)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
through the Philippines (G) and Strait of Malacca (J)	San Diego, CA (I)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
around coast of Australia (K)	San Diego, CA (I)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Source: Our analysis of Navy data.

At force levels of eight or more carriers, a significant portion of the force can be either deployed or capable of surging in a relatively short period. For example, a 12-carrier force could have 6 carriers deployed or capable of deploying within 1 month, 9 carriers within 2 months. An eight-carrier force could have seven carriers deployed or capable of deploying within 2 months. Table 2.2 shows the number of carriers deployed or capable of surging at selected carrier force levels.

Table 2.2: Surge Capabilities at Illustrative Carrier Force Levels

	Number of carriers deployed or capable of surging at				
Active carrier force level[a]	0 months	1 month	2 months	3 months	6 months
14	6	8	9	9	12
12	5	6	9	9	11
10	4	5	8	8	10
8	3	4	7	7	7
6	1	1	4	4	6

[a]The number of carriers deployed or surged would include any carrier whose scheduled inactivation, or removal, from the fleet was postponed due to the need to surge. Therefore, the number may be greater than the active carrier force level. Also, the number of carriers available for deployment or surge at each force level was based on postulated inventory mixes at the end of a given fiscal year, 1991 through 2000.

Source: Our analysis of Navy and GAO data.

Our analysis is consistent with Navy policy on curtailing maintenance and training if a need to accelerate deployment arises. We considered the carrier based in Japan. New construction carriers and carriers scheduled for inactivation were also considered as possibly being available for surging during the 6-month period, although this had little effect on the number of carriers surged at each level. We did not include carriers already in the inactive reserve (carriers retired from the fleet and placed in storage) that also could be reactivated to augment the existing force over longer crisis periods.

Providing Overseas Presence With Other Naval Forces

The Navy can provide overseas presence and crisis response capabilities by using other naval force configurations. These configurations could be alternated with carrier battle group deployments or relied on solely for providing overseas presence and initial crisis response and have carriers augment these forces when necessary.

Both alternatives shift the reliance from carrier battle groups to groups centered around a major surface combatant or amphibious assault ship.

Essentially, these alternatives suggest deploying the battle group without the carrier. Neither alternative diminishes the important contribution provided by a carrier during major crises or war. However, the options imply that the carrier's capabilities may not always be necessary to provide a credible peacetime presence and an effective crisis response in overseas regions. Increased reliance on other naval forces could require fewer overseas carrier deployments and eventually a smaller carrier force.

Alternating Other Naval Forces With Carrier Battle Group Deployments

The Navy could assemble other groups centered around a major surface combatant or amphibious assault ship to fulfill presence requirements and provide crisis response capabilities. These independently deployed groups—such as the Navy's traditional surface action group and the amphibious readiness group configurations—could alternate with carrier battle group deployments in providing overseas naval presence.

The surface combatants, attack submarines, and amphibious ships now entering the fleet are significantly more capable both offensively and defensively than those that made up most of the force during the Cold War. Newer and upgraded surface combatants are increasingly capable of operating independently in almost every mission area (antiair, antisurfare, strike, and antisubmarine warfare). The most significant changes in surface combatant capability have been the additions of the Tomahawk cruise missile, the AEGIS antiair weapon system, and the Vertical Launching System.

Ticonderoga-, Long Beach-, and Virginia-class cruisers and the Spruance- and Arleigh Burke-class destroyers are equipped with Tomahawk antiship and land attack cruise missiles, giving them significant long-range strike mission capability. Ticonderoga cruisers and Arleigh Burke destroyers also have the AEGIS weapon system and the Vertical Launching System coupled with the Standard antiair missile that provides defense against enemy aircraft and cruise missiles. Additionally, the Navy has completed installation of improved combat systems, the New Threat Upgrade, on most older cruisers and some guided-missile destroyers. This upgrade has new sensors, weapons, and control systems to improve the ship's capability against antiair threats. Appendix VII provides information on some of the major capabilities of surface combatant and attack submarine classes.

The Navy has 46 surface combatants and 71 attack submarines equipped with Tomahawk cruise missiles. By fiscal year 2000, the Navy plans to

have 90 ships and 64 submarines with Tomahawk capability.[9] Table 2.3 shows the current number of Tomahawk-capable surface combatants and attack submarines and those expected in fiscal year 2000. One Ticonderoga-class cruiser with its 122 vertical launching system cells could carry almost as many Tomahawk missiles as were carried on all four battleships the Navy had in service until recently.[10]

[9]The current mix of Tomahawk-equipped ships and submarines could carry between 2,100 to 5,200 missiles depending upon missions and inventories. The 154 Tomahawk-equipped vessels in fiscal year 2000 could carry between 3,400 and 9,500 missiles.

[10]During the 1980s the Navy reactivated and operated four Iowa-class battleships—the USS Iowa, USS New Jersey, USS Wisconsin, and USS Missouri. All have been subsequently retired; the last was the Missouri during fiscal year 1992. Each of the battleships carried 32 Tomahawk missiles.

Table 2.3: Navy Ship Classes Equipped With the Tomahawk Cruise Missile

Ship class	Current number of ships in class	Planned number of ships in fiscal year 2000	Possible number of Tomahawk missiles per ship[a]	Likely notional number of Tomahawk missiles per ship[b]
Surface combatants				
Long Beach (CGN-9)	1	0	8	8
Virginia (CGN-38)	4	4	8	8
Ticonderoga (CG-47)[c]	17	22	0-122	19
Spruance (DD-963)[d]	23	31	0-61	54
Arleigh Burke (DDG-51)	1	33	0-90	12
Total	**46**	**90**		
Nuclear attack submarines				
Sturgeon (SSN-637)	21	5	0-19	8
Narwhal (SSN-671)	1	0	8-19	8
Los Angeles (SSN-688-718)	31	31	8-19	8
Los Angeles (SSN-719)[e]	18	27	12-31	20
Seawolf (SSN-21)	0	1	0-54	12
Total	**71**	**64**		

Note: As of September 1992.

[a]The launch systems on many ships can be alternatively configured with different weapon systems. The number of Tomahawk missiles carried will depend on the mix of other weapons.

[b]The actual number of missiles carried by each ship will depend upon the unified commander's requirements at the time of the ship's deployment. For example, a Ticonderoga-class cruiser currently deploys with more than 30 Tomahawk missiles.

[c]Tomahawk capability is installed on Ticonderoga-class cruisers beginning with the USS Bunker Hill (CG-52).

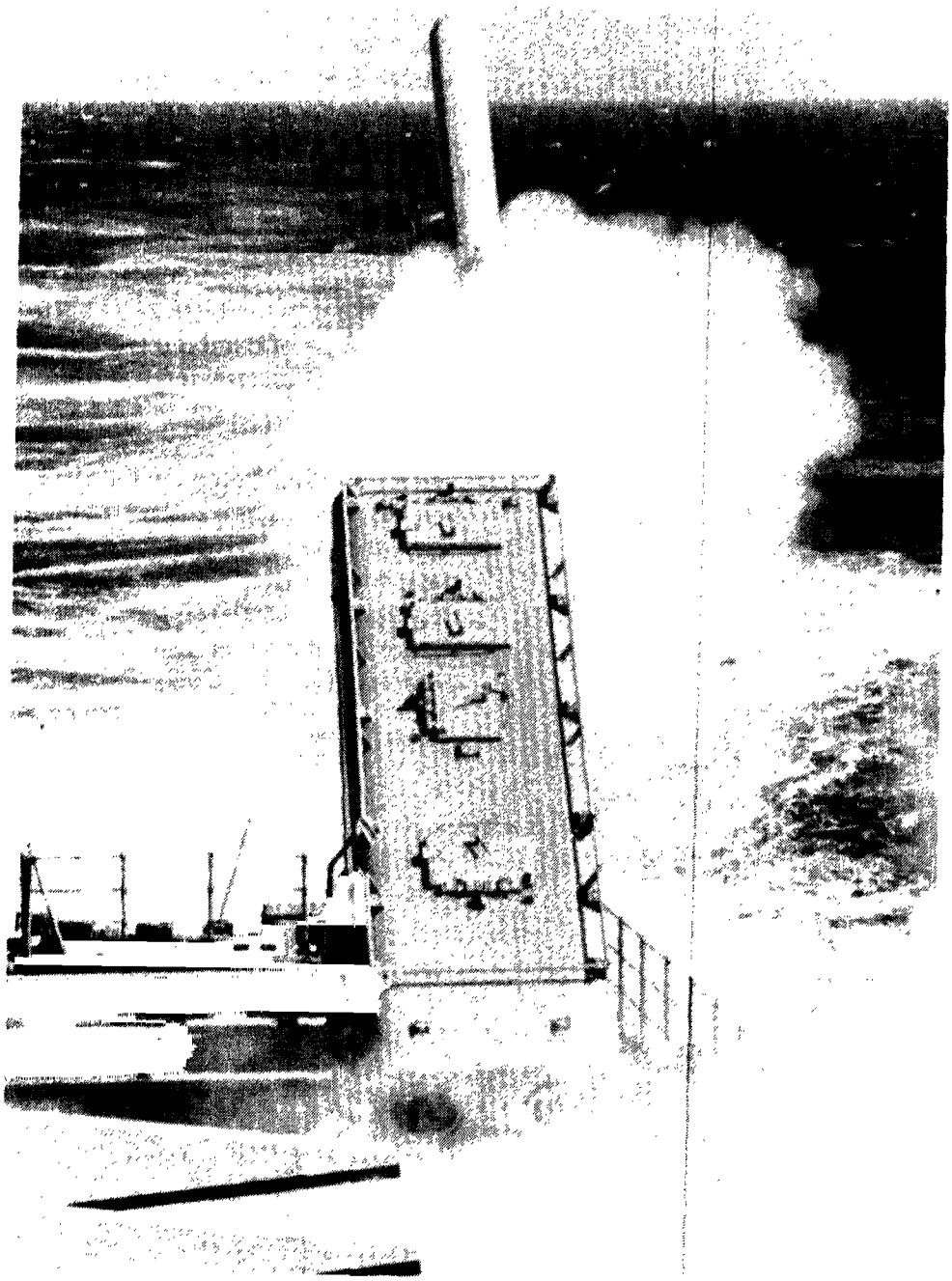
[d]Spruance-class destroyers with armored-box launchers carry 8 Tomahawk missiles, and those with the Vertical Launching System carry 54. All Spruance-class destroyers will have the Vertical Launching System by fiscal year 2000.

[e]Vertical-launched Tomahawk capability is installed on Los Angeles-class attack submarines beginning with the USS Providence (SSN-719).

Source: Our analysis of Navy data.

Operation Desert Storm was the first time the capability of the Tomahawk cruise missile in enhancing strike missions against long-distance and varied land targets was demonstrated in combat. During the war, 288 Tomahawks were fired against targets in Iraq—276 from 12 cruisers and destroyers and 2 battleships and 12 from 2 attack submarines. The missiles were launched from the Persian Gulf, Red Sea, and the eastern Mediterranean Sea against a wide array of targets, including chemical warfare and nuclear weapons facilities, surface-to-air missile sites, and command and control centers. According to DOD, the success rate of these launches against intended targets is being analyzed. However, the process is made difficult by the lack of complete battle damage assessment data and the difficulty of isolating the independent effects of multiple weapons attacks on the same targets. Figure 2.3 shows a Tomahawk cruise missile being launched from the nuclear-powered cruiser, USS Mississippi (CGN-40), during Red Sea operations in support of Operation Desert Storm.

Figure 2.3: The USS Mississippi Launches a Tomahawk Cruise Missile Against an Iraqi Target During Operation Desert Storm



Sixty-four percent of the 288 Tomahawk missiles were launched during the first 48 hours of Operation Desert Storm against heavily defended Iraqi areas to reduce the risks for manned aircraft.

Source: Navy.

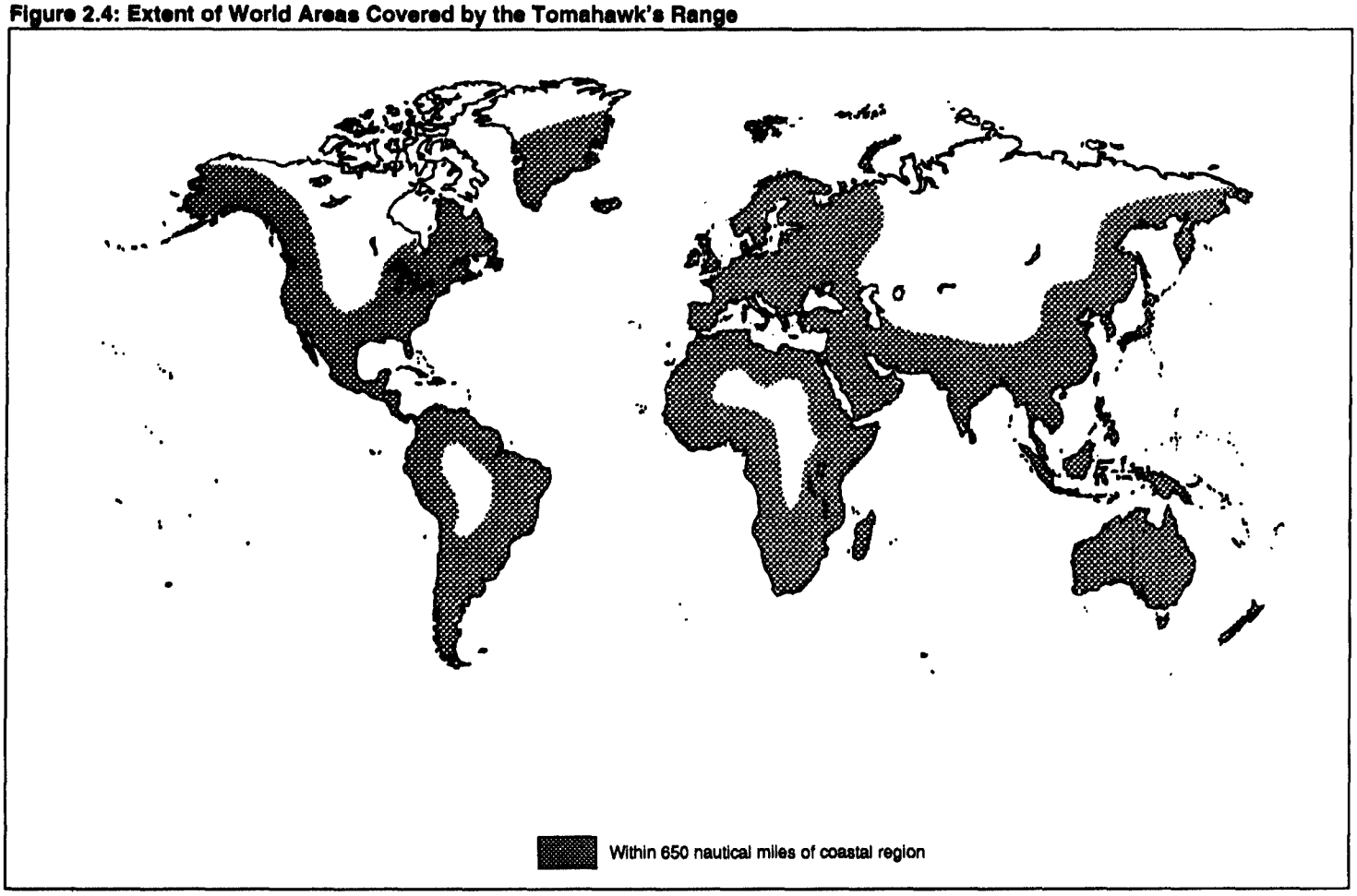
Launched from surface combatants and submerged submarines, the Tomahawk can provide a significant strike attack capability against tactical or strategic land- and sea-based targets while reducing the risks of seriously endangering expensive equipment and personnel.[11] The Chairman of the Joint Chiefs of Staff testified before the Subcommittee on Defense, House Committee on Appropriations, that the Tomahawk specifically can (1) increase strike flexibility and responsiveness capabilities by simultaneously attacking targets hundreds of miles apart; (2) maximize tactical leverage, particularly in smaller scale strikes; (3) lower the risk of pilot and equipment losses; (4) provide synergistic improvements to the effectiveness of combined arms in large-scale responses; (5) complicate enemy targeting and defensive allocation of forces; and (6) provide high launch rates.[12]

The all-weather Tomahawk travels at high subsonic speeds and extremely low altitudes at ranges greater than 650 nautical miles. According to the Navy, the Tomahawk's range permits launching against targets on over three-fourths of the world's land areas. Those areas outside the range are dense jungle, frozen steppes, rugged mountains, or uninhabitable desert. Figure 2.4 shows the extent of coastal regions within the range of the Tomahawk.

[11]Currently, there are four Tomahawk cruise missile variants: nuclear land attack (TLAM-N), conventional land attack (TLAM-C), submunitions land attack (TLAM-D), and conventional antiship (TASM). Only the conventional and submunitions land attack Tomahawks were employed during Operation Desert Storm.

[12]From the Chairman's September 25, 1991, testimony on the Base Force concept before the Subcommittee on Defense, House Committee on Appropriations.

Figure 2.4: Extent of World Areas Covered by the Tomahawk's Range



Source: Navy.

However, the Tomahawk has some operational limitations. For example, target planning may take hours, days, or possibly weeks, depending on the availability of planning materials, such as imagery data. Also, damage assessment information is limited or unavailable after strike missions.

The Navy plans or is implementing several near-term upgrades to enhance the conventional Tomahawk's capabilities. The missile's range is being increased to as much as 1,000 nautical miles by incorporating a new titanium warhead, which is about 300 pounds lighter than the current

warhead but equally lethal, and a new engine with 20-percent greater thrust and improved fuel efficiency. Other upgrades will include capabilities to navigate by the Global Positioning Satellite system, do mission planning afloat as well as ashore using the Afloat Planning System, and control the missile's time of arrival to its target. Some of these upgrades will begin appearing in the fleet in early 1993. Possible future improvements include a transition to a single antiship/land attack missile, which will facilitate logistics; a forward-looking sensor and data link, which will simplify mission planning, assist in battle damage assessment, and provide the capability to retarget after launch; and an improved ability to penetrate hardened targets.

Possible Surface Action Group and Amphibious Readiness Group Configurations

A surface action group is centered around a cruiser or destroyer and has two or more surface combatants. It can also include attack submarines. Similar to carrier battle groups, the actual number and type of ships assembled for each deployment will depend on the likely threats and available assets. Table 2.4 shows an illustrative configuration of a surface action group, including an attack submarine, which has considerable offensive and defensive capabilities for addressing a wide range of potential regional threats.

Table 2.4: Illustrative Surface Action Group Configuration

Ship type	Ship class	Number
Guided-missile cruiser	Ticonderoga (CG-47)	1
Guided-missile destroyer	Arleigh Burke (DDG-51)	1
Destroyer	Spruance (DD-963)	1
Guided-missile frigate	Perry (FFG-7)	1
Attack submarine	Los Angeles (SSN-688)	1
Total		**5**

The surface combatants in this group have a notional capability to launch about 85 Tomahawk cruise missiles, more than 25 Harpoon antiship cruise missiles, and about 200 Standard antiair missiles. Two of the ships are AEGIS-equipped. The number of Tomahawk missiles can be increased on the Ticonderoga-class cruisers and Arleigh Burke-class destroyers by decreasing the number of Standard missiles or other weapons, depending on mission requirements. A Los Angeles-class attack submarine increases the strike capability of the group with its complement of Tomahawk missiles—between 8 and 31, depending on the submarine and the mix of other weapons—and provides additional antisubmarine and antisurface

warfare capabilities. It also provides the group with covert surveillance and intelligence collection capabilities.

Another naval configuration, an amphibious readiness group, is centered around a Tarawa- or Wasp-class aircraft carrying amphibious assault ship.[13] This group includes three or more amphibious ships and one or more surface combatants equipped with the AEGIS weapon system and Tomahawk capability. An attack submarine could also be assigned to the group. The amphibious assault ships can provide a limited, but effective, strike capability with Harrier vertical/short takeoff and landing aircraft and armed helicopters and expanded command and control facilities. An illustrative amphibious readiness group for independent presence and crisis response deployments could consist of three amphibious ships, including a Tarawa- or Wasp-class; two major combatants, such as a Ticonderoga cruiser or Spruance or Arleigh Burke destroyer; and one attack submarine.

Alternative Force Mixes

Table 2.5 shows the possible number of alternative naval groups at selected carrier levels. We maintained the total number of each mixed force of carrier battle groups and surface action groups at 14 to maintain capability of providing a near-continuous presence in the three major regions. As discussed earlier, a 12-carrier force could achieve a 90-percent overall presence in the regions (see table 2.1). Supplementing that force with two surface action groups would increase the overall naval presence.

Table 2.5: Alternative Force Mixes of Carrier Battle Groups and Surface Action Groups

Number of		
Carrier battle groups	Surface action groups	Total groups
12	2	14
10	4	14
8	6	14
6	8	14

Note: The number of surface action groups required for regions other than the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea regions are not included. Also, the permanent surface action group stationed in the Persian Gulf since the late 1940s, the Middle East Force, is not included.

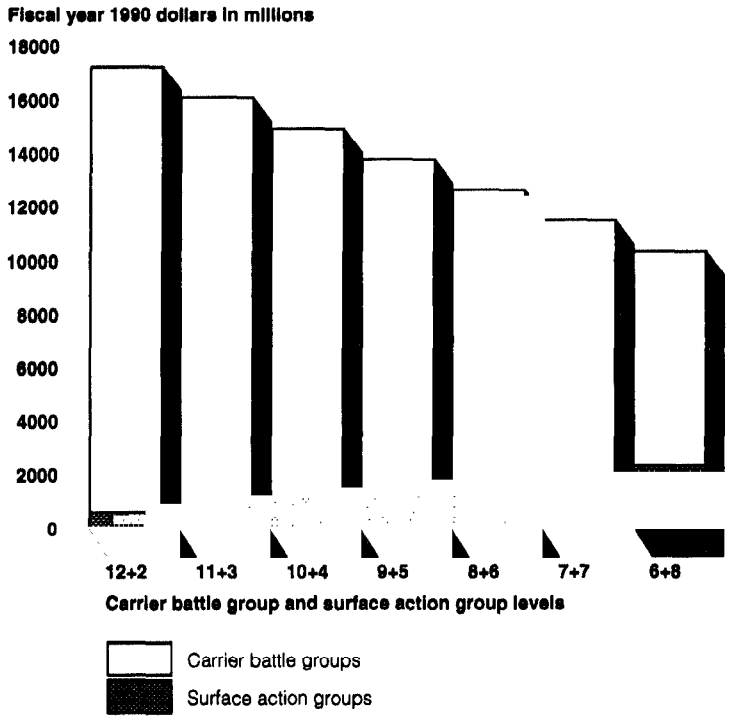
[13]The newest and largest class of these ships, the Wasp, is capable of carrying up to 20 Harrier aircraft, in addition to Marine Corps helicopters. It is the first amphibious ship specifically designed with dual missions of amphibious warfare and sea control. Another class of amphibious assault ship, designated the LX, is being developed to replace several older classes. The LX, as currently envisioned, will carry an assault force and support material and could have enhanced defensive and offensive capabilities. It is expected to begin entering the fleet around the year 2000.

As the number of carriers is reduced, the assets formerly assigned to the battle group could be used to form the surface action groups. Therefore, the number of surface combatants and submarines in the force structure would remain the same or decrease slightly. If lower levels of presence in these three regions were possible, the number of carrier battle groups or surface action groups could be reduced. Naval force requirements for other world areas, such as the Caribbean Sea, are not included.

Cost of Alternative Force Mixes

Surface action groups cost significantly less than carrier battle groups. Figure 2.5 shows the costs of various carrier battle groups and surface action groups alternative force mixes. At a 8-carrier force level with 6 surface action groups, for example, the annualized cost of the force, including aircraft, would be about $4.6 billion less than at a 12-carrier force level with 2 surface action groups.

Figure 2.5: Comparison of Annualized Costs of Carrier Battle Group and Surface Action Group Force Mixes



Carrier battle groups		Surface action groups		Total cost of forces
Number	Cost	Number	Cost	
12	$16,634	2	$582	**$17,216**
10	13,756	4	1,164	**14,920**
8	10,879	6	1,745	**12,624**
6	8,001	8	2,327	**10,328**

Note: The cost of a Roosevelt air wing was used in determining carrier battle group force costs. It is used for illustrative purposes rather than the more expensive future air wing configured with F/A-18E/F and AX aircraft. The annualized acquisition cost of a future air wing is about $200 million more than a Roosevelt air wing. Our calculations do not include the cost of the underway replenishment group.

Source: Our analysis of Navy and GAO data.

Relying Solely on Other Naval Groups

The Navy could rely solely on the employment of naval groups such as surface action groups and similar non-carrier configurations to provide regional U.S. naval presence and crisis response capabilities. Under this option, aircraft carriers would remain near their U.S. home ports in varying states of readiness to enable rapid deployment to join with naval

forces already in a crisis area. Although the carriers would make less frequent peacetime deployments to regions, they would primarily be kept as a crisis response force.

Carriers would be scheduled to train and exercise with surface action groups before each group's deployment. This would maintain proficiency and readiness of the carrier and air wing crews and provide battle group cohesiveness. However, the carriers would remain behind to continue training and exercising with other forces. If required by the security situation, carriers could make selective deployments with a battle group to overseas regions. Other carriers would be kept in increasing states of readiness for quick deployment. When required, nuclear carriers could transit at speeds greater than 30 knots to reach the crisis area. Once in the area, the carrier would join with other naval forces to form battle force configurations and provide additional warfare capabilities.

With fewer overseas presence requirements placed on carriers, lower carrier force levels than currently planned would be possible. The number of surface action groups necessary to support a near-continuous naval coverage in each of the three major regions would be about 14, including those assets formerly assigned to carrier battle groups. If the Navy were to maintain 6 to 8 carriers (without battle groups) and 14 surface action groups, the annualized costs of these forces would range from about $8.9 billion to $10.7 billion, respectively.

DOD Comments and Our Evaluation

DOD concurred with our discussion of the Navy's efforts to explore and implement alternatives to a smaller carrier force and increase fleet utilization. DOD generally disagreed with major aspects of this chapter, particularly with our discussion of carrier surge capabilities and the use of alternative naval configurations to meet overseas security requirements traditionally met by carrier battle groups.

DOD stated that the overall size of the carrier force continues to be driven by the combination of presence, crisis response, and war-fighting requirements. It believes that the Base Force of 12 carriers reflects a balance between the mandate to maintain naval forces in three important world regions and fiscal constraints. Additionally, the Joint Chiefs of Staff have adopted a "flexible forward presence"—meaning there will be occasional gaps in carrier presence—because 12 carriers cannot meet a full-time presence in each of these areas. DOD believes these gaps in carrier coverage are an acceptable risk. However, DOD stated that a force of less

than 12 carriers will be unable to meet current requirements for flexible forward presence.

DOD agreed that surface combatants, attack submarines, and amphibious ships have become significantly more capable over the last decade. However, it did not believe we addressed those capabilities in any type of operational context or adequately addressed the varying degree of risk associated with reduced numbers of carriers or alternative battle group employment concepts and patterns. It cited the lack of an organic air capability as the major risk in deploying these alternative forces without a carrier. Further, DOD partially concurred with the alternative to rely on surface action groups to provide overseas presence, particularly in low-threat areas. It stated that presence cannot be discussed in isolation from crisis response and warfighting missions because the transition from presence to crisis response or combat can occur virtually instantaneously. According to DOD, those forces cannot accomplish all the tasks that will have to be carried out early in a serious crisis, and carriers and other air forces deploying to augment these forces may not arrive soon enough to make a difference in many situations. That is, forces assigned to the presence mission must be evaluated in terms of how quickly they can transition to a crisis response role. DOD used Operation Desert Shield to illustrate its point.

We recognize that there are increased risks associated with alternative naval forces compared with those of carrier battle groups as the seriousness of the threat increases. However, carrier battle groups place considerable strain on naval resources. Although alternative naval forces lack the air capabilities provided by a carrier, they do possess considerable offensive and defensive capabilities to counter air, surface, and undersea threats. The Navy's recent maritime strategy[14] recognizes that a shift to a regional, littoral, and expeditionary focus requires greater flexibility and new ways of employing its forces. The strategy recognizes that the response to every situation may not be a carrier battle group but rather other naval forces, such as an amphibious readiness group and a surface action group with Tomahawk cruise missiles, or a joint or combined force. It also acknowledges that these forces can be moved—shared between unified commands—across theater boundaries, as necessary, to forestall or respond to crises. We believe that interchanging deployments of alternative naval forces and carrier battle groups merits consideration in the new security environment. Our

[14]...From the Sea: Preparing the Naval Service for the 21st Century, Department of the Navy, September 1992.

discussion of relying on alternative naval forces for overseas deployments was presented as an alternative, when and where prudent.

DOD also did not concur with our discussion of carrier surge capabilities, saying our discussion was based on unrealistic assumptions and presented an overly optimistic picture. According to DOD, the number of carriers that can be surged is a function of several factors, including maintenance and training cycles. The ability to sustain operations is also important. A 12-carrier force permits battle groups to rotate between forward operating areas and home ports periodically. This is important during a prolonged crisis as the fighting edge of the crew and the material condition of the ships and aircraft degrade over time. According to DOD, the ability to maintain carriers in an overseas region before, during, and after hostilities can be as important as being able to surge a large number of carriers for a short period of time.

DOD's comments on carrier surge capabilities were based on including the average of transit times to major world regions in its calculation of the number of carriers that could be surged. Our analysis, based on the same Navy data, estimates the number of carriers that could be incrementally deployed after a surge decision is made but does not include the time required to arrive in a region. As a result of this fundamental difference in methodology, the number of carriers we show available to surge at each time interval is slightly higher than those in DOD's analysis.

Our methodology for estimating carrier surge capabilities is consistent with DOD's analysis and those of other analyses conducted within DOD, is based on valid assumptions, and considers the important employment and force structure factors affecting carrier availabilities and crew proficiencies for deployment (see app. I for our methodology). Although our analysis considered carriers in the final phase of construction or scheduled for inactivation, the inclusion of those carriers did not change the overall results in our illustration.[15] Additionally, the training carrier was considered available for surge only after 12 or more months. We adjusted our illustration to only reflect surge intervals up to 6 months rather than to 12 months because the majority of the force would have been surged at that point and longer periods postulate the unlikelihood of global warfare.

[15]In our analysis, none of the new construction carriers considered was available to surge at any force level because of the time required to prepare the carrier for deployment. Also, only at the eight-carrier force level did a carrier hypothetically scheduled for inactivation affect our estimate of surge capability. It results in an availability of seven carriers instead of six carriers at the 2-month interval.

Utilizing a surge capability increases the number of assets available for deployment during a serious crisis or war and implicitly suspends normal peacetime operations and employment cycles, resulting in possible deviations from PERSTEMPO, maintenance, and training goals. In fact, the Navy did that during Operations Desert Shield and Desert Storm. PERSTEMPO goals were temporarily suspended, and, in some cases, maintenance was deferred or training was accelerated to permit a higher tempo of operations.

DOD again did not agree with our use of annualized costs for comparing alternatives to carrier battle groups, saying the conclusions derived from them were invalid. DOD believes that our hypothetical comparison of the costs for a force of 8 carrier battle groups and 6 surface action groups and a force of 12 carrier battle groups and 2 surface action groups exaggerates potential savings of reducing four carrier battle groups. DOD believes the comparison uses a different, more expensive total force structure than used in other sections of the report and overstates possible savings by the amount of the sunk acquisition costs. According to the DOD, reducing a 12-carrier force to 8 carrier battle groups plus 6 surface action groups would annually save "only" $2.13 billion in annual operating and support costs for 4 carriers, 5 air wings, and 2 submarines.

As stated earlier, we chose to use an annualized amortized cost approach because it provided a long-term perspective of the requirements for acquiring, operating, and supporting major naval force assets. Over extended periods, the avoidance of new acquisition costs for major elements, such as aircraft carriers and air wings, and the cumulative savings in operating and support costs of a smaller force will more than surpass the amount of sunk acquisition costs in the current force structure. These annualized acquisition costs are also of concern in the near term as the Navy sustains its current plans for a force structure centered around 12 carrier battle groups, for example, the acquisition of expensive nuclear carriers (CVN-76), tactical aircraft (F/A-18C/D, F/A-18E/F, and AX), surface combatants (DDG-51), attack submarines (Seawolf and Centurion), and so forth. We added an appropriate number of surface action groups at each carrier level to maintain equal forces of 14 groups, which could provide continuous presence in each of the three world regions. We could have similarly maintained the total number of groups at a lower force level—such as 12 groups—but the differences in

the comparisons of costs between force structures would remain consistent.[16]

DOD did not concur with our alternative that emphasized the use of other naval groups for meeting traditional naval missions of overseas presence and crisis response while the carriers are maintained as a crisis response force. DOD states that this alternative misleadingly hides an overall loss of capability and a less capable overall force, creates a false comparison of unequal battle groups, and overstates potential savings. DOD specifically cited the alternative of 8 carriers plus 14 surface action groups. DOD did not agree that the concept of operations associated with this approach would be practical. DOD also believes that the additional ships necessary to get equal capability to the carrier battle group would increase the cost of the carrier and surface action group by $230 million.

We presented the alternative to rely largely on other naval forces for overseas presence and initial crisis response as another force consideration. As DOD shows in its comments, this alternative results in a smaller and less capable overall force than a mix of carrier battle groups and surface action groups or the Navy's planned force structure. We acknowledge that a carrier with a surface action group (described in our illustration) would not provide the same capability as a full carrier battle group. However, as the Navy's recent strategy acknowledges, the capability of the carrier battle group may not always be required. Other surface action groups, as well as other naval forces such as amphibious readiness groups, could be added to enhance the alternative group's capabilities when necessary in a crisis. Although DOD points out that assembling the additional naval assets to comprise a full battle group represents a more costly individual force, this alternative results in a less expensive overall force structure. Further, this alternative may provide a viable and affordable force structure in the long term as threats to our national security become more defined and additional budget resources become more constrained.

[16]Surface combatants have shorter maintenance periods than carriers, resulting in a shorter time between deployments. Therefore, it takes fewer surface combatants to meet a given level of presence than carriers. For illustrative purposes, however, we decided to maintain a one-to-one ratio between surface action groups and carrier battle groups at a force mix of 14 groups.

Important Budget Decisions Will Depend on Future Carrier Force Levels

A number of costly decisions regarding carrier force structure have to be made over the next several years. In the Navy's fiscal year 1993 budget, the Congress appropriated advance procurement funding for the next new nuclear carrier—the ninth Nimitz-class—which is scheduled to begin construction during fiscal year 1995. If built, the carrier will cost about $4.2 billion (then-year dollars), and a conventional carrier, the USS Kitty Hawk, will be retired earlier than its expected useful service life to maintain a 12-carrier force. The Congress also appropriated long-lead funding for the nuclear refueling and overhaul of the USS Nimitz, which is scheduled to take 2-1/2 years and begin in fiscal year 1998 at a cost of $2.3 billion (then-year dollars). Beginning with the USS Nimitz, at least one nuclear carrier will be in a shipyard for refueling through about fiscal year 2026.

Most importantly, a number of new naval aircraft will be acquired to replace and upgrade the aging inventory. With acquisition costs expected to be much higher than current aircraft, we estimate that future active air wings for a 12-carrier force will cost about 60 percent more than those for the same force level today. As a result, 7 future active air wings for 8 carriers will cost about the same as 11 active air wings for 12 carriers today. Our analysis of the Navy's fiscal year 1993 budget request indicates that it intends to invest between $11.5 billion and $15.1 billion (then-year dollars) in fiscal year 1993 for carrier battle group elements, including ships, aircraft, and weapons.

Reducing the frequency and duration of operations and training, referred to as operating tempo (OPTEMPO), of carrier battle groups will not provide significant reductions in operating and support costs. The Navy will only achieve substantial budget savings by reducing the number of carriers, carrier-based aircraft, and escort ships.

Several Decisions Depend on the Carrier Force Level

The future size of the carrier force affects decisions on procurement of a ninth Nimitz-class carrier, the retirement of conventional carriers, the refuelings of the Nimitz-class carriers, and the procurement of new carrier-based aircraft. These decisions have significant consequences on future Navy budgets and on the affordability of maintaining a 12-carrier force, particularly later this decade and into the 21st century. Given the cumulative costs of these decisions, the Navy may not be able to sustain a 12-carrier force.

Authorization Request for Construction of the Next Nuclear Carrier

The Navy has two nuclear aircraft carriers under construction—the John C. Stennis, CVN-74, and the United States, CVN-75.[1] The Congress appropriated $832.2 million (then-year dollars) in the Navy's fiscal year 1993 budget for long-lead procurement items (primarily nuclear components) for construction of the ninth Nimitz-class carrier, the CVN-76. The Navy intends to request full authorization for the carrier in fiscal year 1995. The CVN-76 is currently expected to cost about $4.2 billion (then-year dollars). Procurement of the CVN-76 would bring the number of nuclear aircraft carriers to 10 when it enters the fleet during fiscal year 2003.[2]

The Navy believes that building another Nimitz-class nuclear carrier as planned will allow it to maintain a highly capable carrier force as the number of carriers is reduced. More importantly, it has argued that construction of the CVN-76 is critical to maintaining the nuclear shipbuilding industrial base. It believes that canceling or delaying the carrier would adversely affect a large number of jobs and companies throughout the country and would particularly affect the nuclear construction capability at Newport News Shipbuilding and Drydock Company—the only shipyard capable of building Nimitz-class nuclear carriers—and nuclear propulsion vendors. Further, the Navy believes that delaying construction will result in increased costs for the new carrier.

Conventional carriers will be retired to reduce the force to 12 carriers and as new nuclear carriers are delivered to the fleet. Several conventional carriers will be removed before the end of their useful service lives. For example, when the CVN-76 is delivered, the Navy plans to retire the USS Kitty Hawk 4 years before the end of its useful service life. Table 3.1 shows the expected life and planned inactivation[3] dates for conventional carriers. If the number of carriers is reduced below the planned 12, procurement of the next Nimitz-class carrier can be deferred and inactivations of conventional carriers accelerated.

[1]Construction of the USS George Washington, CVN-73, has been recently completed, and the carrier is in the active fleet.

[2]A nuclear carrier takes about 9 years to complete from advance procurement of material, construction, until its delivery to the active fleet.

[3]Inactivation refers to the process by which a ship prepares for decommissioning and for the eventual disposition of the ship, i.e., safe storage in the Navy's Reserve Fleet, disposal, and so forth.

Table 3.1: Remaining Service Life of Conventional Aircraft Carriers

Aircraft carrier	Planned fiscal year of inactivation	Remaining years of service life at[a] End of fiscal year 1992	Inactivation
USS Forrestal[b]	1992[c]	8	8
USS Ranger	1993	-5	-5
USS Saratoga[b]	1995	9	7
USS America	1996	3	0
USS Independence[b]	1998	12	7
USS Kitty Hawk[b]	2003	14	4
USS Constellation[b]	2008	14	1
USS John F. Kennedy[d]	2010[c]	21	4

Note: As of August 1992.

[a]Negative numbers indicate those carriers that will have exceeded their expected service life.

[b]These carriers are undergoing or have completed service life extension program overhauls. These overhauls lengthen the carriers' planned 30-year life and add about 15 years of service life after the overhauls have been completed.

[c]The USS Forrestal was converted to the aviation training ship during fiscal year 1992.

[d]The Navy has decided to perform an extended complex overhaul on this carrier rather than undergo a service life extension program. Other work to extend the service life will be incrementally accomplished during future overhauls.

Source: Our analysis of Navy data.

Under current force structure plans to maintain a 12-carrier level, the Navy will request advance procurement for two additional nuclear carriers in fiscal year 1999 and advance procurement for another carrier in fiscal year 2005.

Nuclear Refuelings of the Nimitz-Class Carriers

The Navy is overhauling and refueling the USS Enterprise, its first nuclear carrier.[4] When the carrier reenters the fleet during fiscal year 1994, it will have about 20 additional years of operating life. In fiscal year 1998, the Navy will begin an overhaul and refueling of the USS Nimitz, which is scheduled to take about 2-1/2 years to complete and planned to cost about $2.3 billion (then-year dollars). The Congress appropriated $6.8 million (then-year dollars) in the Navy's fiscal year 1993 budget for advance procurement of long-lead items for the refueling. Other Nimitz-class

[4]The USS Enterprise is a one-of-a-kind nuclear carrier and predecessor of the Nimitz class. Its overhaul and refueling is expected to cost over $2 billion (then-year dollars).

carriers will follow so that at least one nuclear carrier will be undergoing a nuclear refueling in a shipyard for about the next 20 years.

Cost of New Naval Aircraft Could Affect the Affordability of Carriers

As DOD and Navy budgets decline during the next decade, naval aviation will be under intense scrutiny as large development and procurement budgets are proposed and since billions of dollars in past expenditures have not resulted in substantive force structure changes or modernization. Several costly Navy aircraft development programs during the 1980s, such as the A-12 Advanced Tactical Aircraft, Navy Attack Tactical Fighter, F-14D fighter aircraft upgrade, Advanced Tactical Surveillance Aircraft, A-6F/G medium-attack aircraft upgrade, P-7A long-range antisubmarine patrol aircraft, and several P-3 antisubmarine patrol aircraft upgrades, were canceled. These cancellations have delayed introduction of newer, more capable aircraft into the fleet.

The cost of replacing large quantities of older carrier-based aircraft with similar or modernized versions, such as the F/A-18E/F fighter/attack aircraft and the AX advanced strike aircraft,[5] could affect the affordability of carrier forces or hinder carriers from deploying with full complements of aircraft. For example, each F/A-18E/F is currently estimated to cost about $49 million. The Navy plans to purchase about 1,000 aircraft. The total development and acquisition costs for these aircraft would be about $54 billion, not including anticipated, but not yet defined, upgrades and modifications. Moreover, the Navy estimated that the AX would cost about $11 billion to develop through fiscal year 2004. On the basis of Congressional Budget Office estimates, procurement unit costs[6] for each aircraft will be at least $108 million, or about $65 billion to procure AX aircraft for future carrier air wings. Also, the Navy is planning a number of life extension programs for existing tactical and support aircraft.

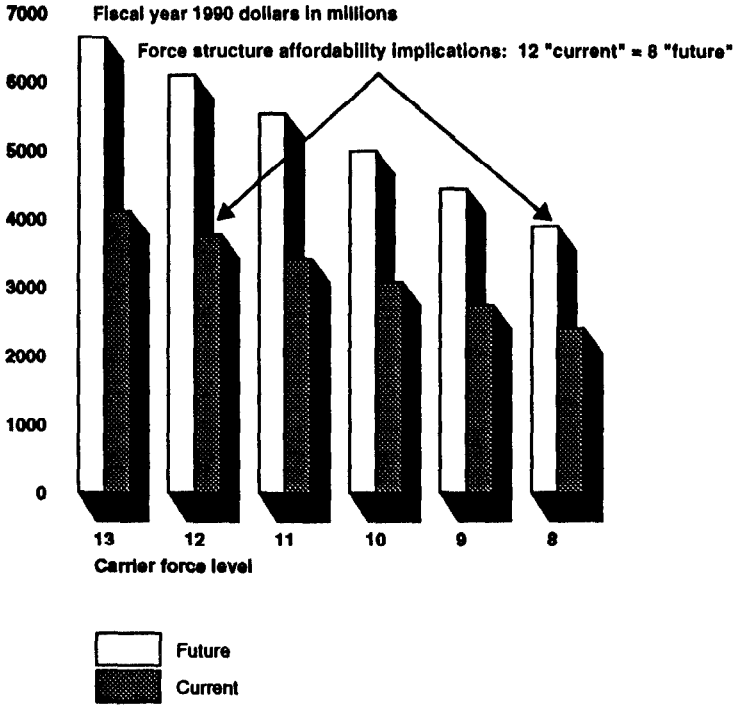
Figure 3.1 shows that the acquisition costs of 11 future active carrier air wings (which supports a 12-carrier force level) comprised of F/A-18E/F and AX aircraft will cost about 60 percent more than 11 active air wings today. It also shows that if the Navy were to sustain air wings at current

[5]The Navy's long-term plans are to replace its three primary combat aircraft—the A-6E, F-14, and F/A-18C—with only two types, the AX and F/A-18E/F. The AX is intended to replace the A-6E medium attack aircraft after the turn of the century and is expected to have stealth characteristics and be capable of carrying large quantities of varied weapons over relatively long distances. The F/A-18E/F Strike Fighter aircraft is a major upgrade to provide additional endurance, payload, and growth capability and is expected to begin entering the fleet in the late 1990s. It will replace F-14 and older F/A-18 aircraft.

[6]Procurement costs do not include research and development costs.

funding levels, it would only be able to afford enough air wings for an eight-carrier force (seven active) in the future. Although the acquisition costs of two reserve air wings are not included, future reserve air wings will be similarly more costly than those today because they will use the same aircraft. Thus, unless the Navy decreases the number of carriers, increases funding for carrier aviation, or develops more affordable replacement aircraft, it will have increasing difficulty in the future deploying its carriers with full complements of aircraft.

Figure 3.1: Annualized Acquisition Costs of Current and Future Active Air Wings at Different Carrier Force Levels



Note: Active current air wings consist of F/A-18C/D fighter/attack, F-14 fighter, and A-6E medium attack aircraft (about 20 each). Active future air wings include 40 F/A-18E/F fighter/attack and 20 AX advance strike aircraft. Both wings also have other attack and support aircraft included in this estimate, but their costs are held constant. The number of active air wings for carrier force levels of 13, 12, 11, 10, 9, and 8 are 12, 11, 10, 9, 8, and 7, respectively. Reserve air wings are not included in the current and future air wings at each carrier force level.

Source: Our analysis of Navy and GAO data.

During its deliberations on the fiscal year 1993 DOD budget request, the House Armed Services Committee leadership proposed a restructuring of defense tactical aircraft acquisition priorities. They recognized that the Navy and the Air Force would need more than $350 billion (then-year dollars) over the next two decades to develop and procure four new aircraft: the Navy's AX and F/A-18E/F and the Air Force's F-22 Air Superiority Fighter and Multiple Role Fighter. In a House Armed Services Committee news release of May 8, 1992, the Committee leadership found two problems with the Pentagon's plans. The leaders stated that the Pentagon "won't give us the planes we need when we need them and even if they did, we wouldn't have the money to pay for them" and that the plans "may have worked when we had lots of money and a relentless Soviet threat to match" but "we have neither now."

We have several ongoing assignments that are examining the Navy's needs for carrier-based aircraft, including the A-6E medium attack, F-14D superiority fighter, F/A-18E/F, and AX aircraft programs. Our focus is to determine what aircraft are needed to counter remaining threats to our national security, the capabilities these aircraft offer, when the development programs could make them available, and whether they are affordable under fiscal climate constraints and in view of competing priorities.

Reducing OPTEMPO Has Less Potential for Cost Savings Than Reducing Forces

The greatest potential for realizing cost savings is by reducing forces rather than reducing OPTEMPO because (1) the most significant operating and support costs are fixed expenses (major maintenance and military personnel) and (2) reductions in force mitigate long-term replacement costs and reduce requirements for undergraduate pilot training. For example, one aircraft carrier (not including the air wing) costs between $180 million and $210 million to operate and support annually, but a 20-percent reduction in OPTEMPO for a force of 12 carriers reduces costs by less than $40 million annually. Moreover, reducing the overall force level lessens requirements to immediately acquire new carriers, such as the $4.2 billion (then-year dollars) to construct the fiscal year 1995 nuclear carrier, CVN-76.

Fleet OPTEMPO describes the frequency and duration of operations and training involving ships and aircraft, commonly called the steaming day and flying hour programs. The programs, which primarily pay for fuel and other consumables, enable the fleet to gain proficiency through training. These programs are annually funded by the Navy's operations and

maintenance appropriation. The OPTEMPO programs do not include major maintenance and modernization (operations and maintenance appropriation); nuclear refuelings of carriers and cruisers (shipbuilding and conversion appropriation); or the pay, benefits, and other costs for military personnel (military personnel appropriation).

The budget for the steaming day program is based on a formula that considers the numbers and types of ships; the number of operating and maintenance months; and utility, fuel, repair parts, and other estimated costs. In recent years the OPTEMPO goals for ships have been 50.5 underway days per quarter for deployed forces and 29 underway days per quarter for nondeployed forces.

The aircraft flying hour program budget is based on a formula that includes the average number of operating aircraft, planned crew-to-seat ratios, the number of assigned aircrews, budgeted flying hours per crew each month, total budgeted flying hours, and cost per flying hour. The program for active forces provides for 85-percent Primary Mission Readiness;[7] the Navy does not budget for 100 percent of required flying hours because all pilots do not sustain the same rate of flying throughout the year. The amount of flying depends on whether aviators are deployed or in various stages of training while preparing for deployment.

Ship Operating and Support Costs and OPTEMPO

Personnel, major maintenance and modernization, and nuclear fuel[8] are a ship's most significant operating and support costs. These are also relatively fixed costs and do not vary with changes in OPTEMPO. A ship's variable costs include fossil fuels and other consumables, such as training devices, and only account for about 5 to 20 percent of ship operating and support costs.

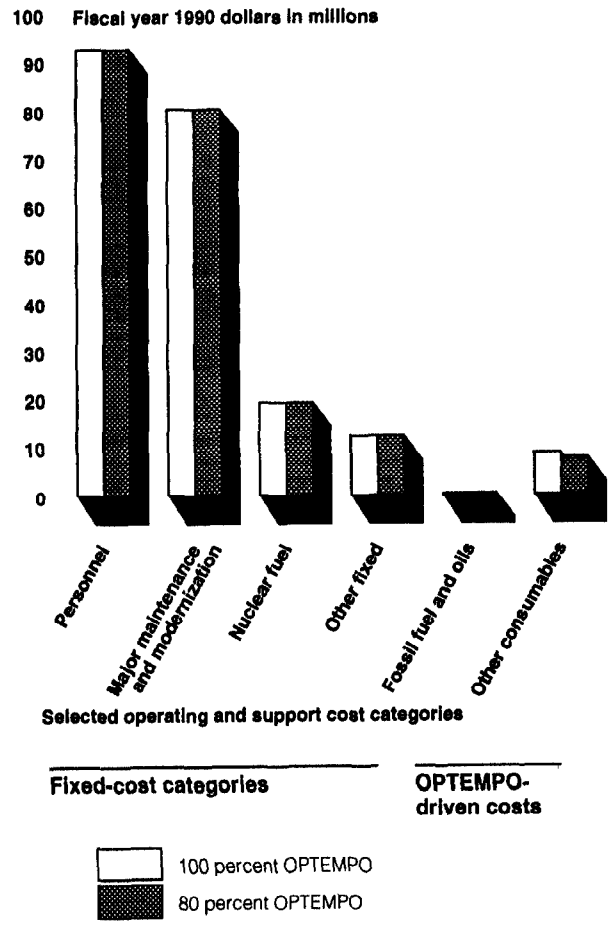
Figures 3.2 through 3.4 show that a 20-percent reduction in OPTEMPO for a Nimitz-class nuclear carrier, conventional carrier, and a surface combatant results in only marginal (1 to 3 percent) overall reductions in operating and support costs. This is because most operating and support costs are fixed. For a carrier battle group's ships, including the carrier, costs would be reduced by about $17 million annually, or just over $200 million for a 12-carrier battle group force. In contrast, a reduction of one carrier battle

[7]Primary Mission Readiness is the degree of readiness achieved by a flight crew member or unit as measured by the qualifications attained and maintained at any given time.

[8]As of October 1992, the Navy operates 131 nuclear-powered ships: 7 aircraft carriers, 9 guided-missile cruisers, 85 attack submarines, and 30 fleet ballistic missile submarines.

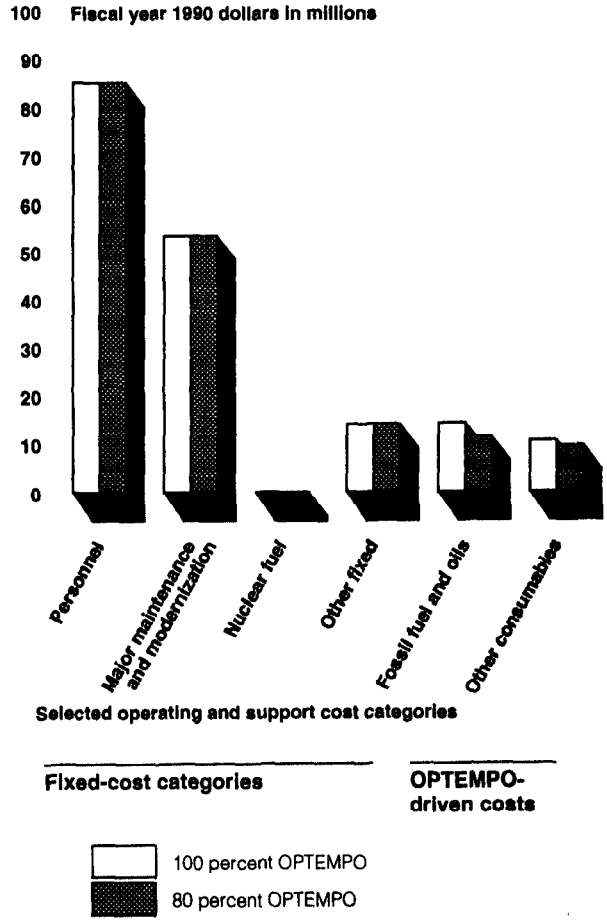
group would reduce ship operating and support costs by about $525 million (not including the costs of ship-based aircraft).

Figure 3.2: Effect of a 20-Percent Reduction in OPTEMPO on the Operating and Support Costs for a Nimitz-Class Nuclear Carrier



Source: Our analysis of Navy and GAO data.

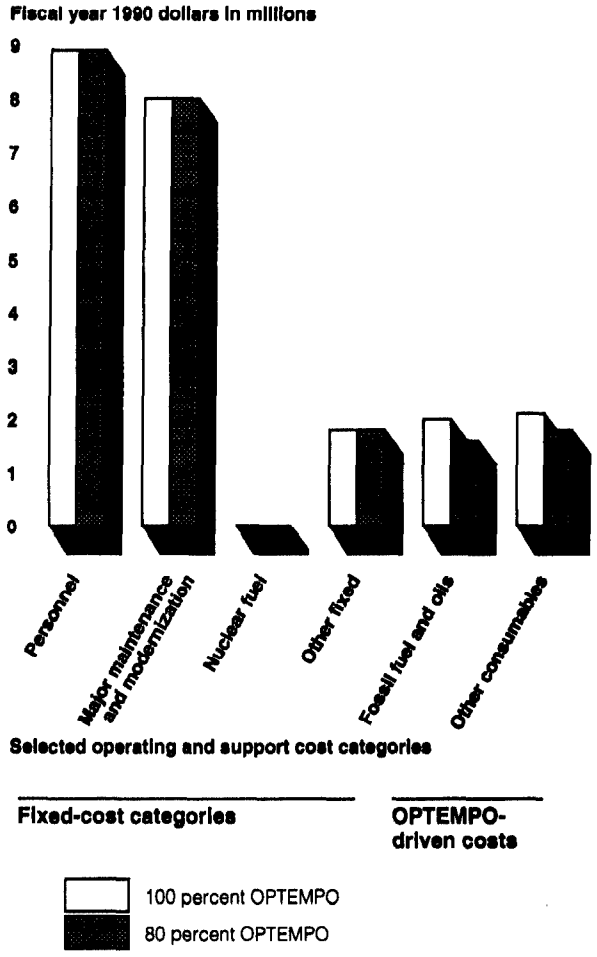
Figure 3.3: Effect of a 20-Percent Reduction in OPTEMPO on the Operating and Support Costs for a Conventional Carrier



Note: Our calculations are based on operating and support costs for a Kitty Hawk/Kennedy-class conventional carrier.

Source: Our analysis of Navy and GAO data.

Figure 3.4: Effect of a 20-Percent Reduction in OPTEMPO on the Operating and Support Costs for a Surface Combatant



Note: Operating and support costs are an average of guided-missile surface combatants.

Source: Our analysis of Navy and GAO data.

OPTEMPO reductions of this magnitude, however, have the potential to significantly affect the force's ability to deploy because a 20-percent reduction results in an average of 29 underway days each quarter for both deployed and nondeployed forces. For deployed forces, this means a total of 58 underway days over a 6-month deployment, including travel time between destinations. A roundtrip without stops from Norfolk, Virginia, to the Suez Canal is about 34 days and from Norfolk to the north Arabian Sea

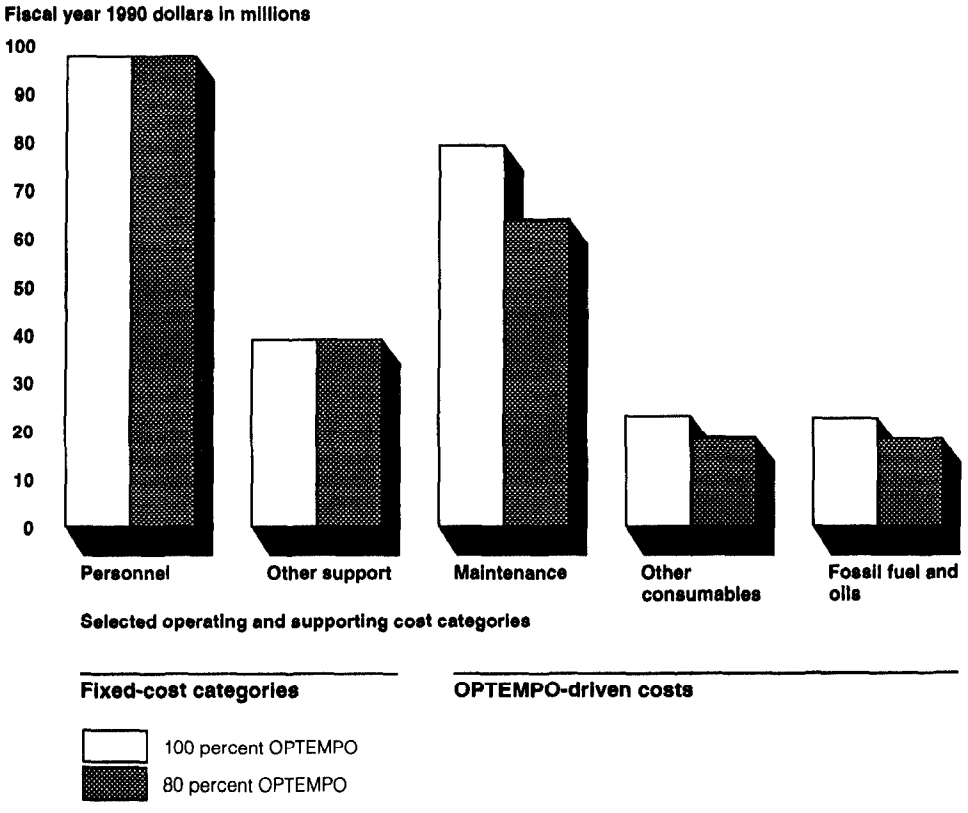
is about 48 days, leaving only 24 and 10 days of operations in the eastern Mediterranean Sea and north Arabian Sea, respectively. This results in a significantly reduced amount of time for conducting fleet exercises and other ship operations. For conventional carriers, the ability to support flight operations would be greatly impaired, and training exercises would be sharply curtailed.

Aircraft Operating and Support Costs

In contrast with ships, total aircraft operating and support costs are more sensitive to changes in OPTEMPO. Personnel costs account for almost 40 percent of total operating and support costs. Also, at current operating tempos, about 50 percent of aircraft operating and support costs are fixed. One reason a larger portion of an aircraft's costs are more sensitive to changes in OPTEMPO is because aircraft maintenance philosophies changed in the 1980s in a way that relates maintenance more directly to intensity of operations rather than to a calendar schedule.

A 20-percent reduction in OPTEMPO for aircraft operations would result in about a 9-percent overall reduction in operating and support costs (see fig. 3.5). For an illustrative Transitional carrier air wing, annual costs would be reduced $25 million, from about $260 million to $235 million, or about $270 million for a 12-carrier force level (11 active air wings). In contrast, a reduction of one carrier air wing would reduce operating and support costs by about $260 million. OPTEMPO reductions of this magnitude could affect pilot proficiency, particularly for perishable skills such as the ability to perform nighttime carrier operations. However, it is not clear to what extent overall readiness would be diminished once an aviator has become an experienced pilot.

Figure 3.5: Effect of a 20-Percent Reduction in OPTEMPO on the Operating and Support Costs for a Transitional Air Wing



Source: Our analysis of Navy and GAO data.

Reductions in OPTEMPO Versus Reductions in Forces

Evaluating the potential for cost reductions resulting from changes in OPTEMPO alone does not consider a significant cost of fielding a force—the need to develop and acquire replacement forces. The inactivation of one carrier battle group has the potential of saving about $900 million annually in operating and support costs. However, to accomplish similar savings would require reductions in OPTEMPO of over 30 percent across a force of 12 battle groups.

Further, OPTEMPO reductions of over 50 percent would be required when annualized acquisition costs are considered. OPTEMPO reductions at either level would create a hollow force with a low level of readiness and crew safety at jeopardy. Moreover, as future acquisition costs for carrier battle

groups continue to increase, greater reductions in OPTEMPO would be required.

DOD Comments and Our Evaluation

DOD agreed that important budget decisions depend on future carrier levels, but they added that the Navy budgets for fiscal year 1994 and future years took this critical issue into account. DOD said our estimate of $11 billion that will be spent on research and development and procurement for battle group elements in fiscal year 1993 was highly uncertain, since the definition of "battle group elements" could vary considerably. It also noted that the AX aircraft had not yet reached milestone I in the acquisition process,[9] and any estimate of its ultimate cost was highly uncertain at that time. In addition to reiterating its concerns about our cost methodology, DOD said we did not sufficiently consider the life extension programs the Navy is undertaking for existing carrier aircraft as a relatively low-cost way of maintaining aircraft force levels.

We believe our estimate of the cost of battle group elements reflects reasonable allocations of research, development, test, and evaluation and procurement funding requested for battle groups. We allocated all, a portion, or none of an item in the budget request to carrier battle group elements based on reasonable judgments of the item's purpose and utility in support of the group and its proportionate share in the Navy's fleet. For example, we allocated all of the funding requested for the F-14 aircraft to the battle group because it is only used on aircraft carriers but allocated only a portion of the request for the F/A-18 aircraft because it is used by both the Navy and the Marine Corps. Other estimates could be higher or lower depending upon the force planning assumptions used (see app. I for more detail on our methodology).

We believe that the Navy's assumptions for the affordability of carrier battle group elements, particularly for replacement naval aircraft, are highly optimistic considering the likelihood of smaller defense budgets. We also believe that possible cost, schedule, and performance problems with the AX, as well as the F/A-18E/F, could likely increase the estimated projected Navy costs of future air wings. In addition, we believe that although life extension programs for existing aircraft help to reduce the near-term funding requirements for naval aviation, they do not change the long-term requirements and cost of replacement tactical and support

[9]Milestone I, Concept Demonstration Approval, in the DOD acquisition process establishes a new acquisition program and a concept baseline containing initial program cost, schedule, and performance objectives.

aircraft. Therefore, our estimate of future air wings costing 60 percent more than current air wings could be conservative.

We also believe that the share required for naval aviation—largely for two new tactical aircraft—may be difficult to sustain in future Navy budgets. For example, the Navy recently told us that acquisition plans for new tactical naval aircraft were based on a flat Navy budget level of $75 billion in constant fiscal year 1992 dollars, with the aircraft procurement and research, development, test, and evaluation accounts receiving between 8.1 to 10.1 percent through fiscal year 2010 and likely beyond. The larger share for naval aviation in the Navy's budget would come from reductions in other Navy programs, such as antisubmarine warfare. It would also be achieved through budget savings by extending the service lives and limiting modernization of many existing aircraft types (such as the A-6E attack and S-3 surveillance aircraft), delaying other new naval aircraft (such as the E-2C airborne early warning aircraft replacement), and participating in joint aircraft and weapons programs (such as the Advanced Medium Range Air-to-Air Missile and the improved Sidewinder missile programs).Savings would also come from integrating some Marine Corps squadrons into carrier air wings to maintain the composition and size of the wings and permit decommissioning of four Navy squadrons. Further, the roles and missions of naval reserve wings would be expanded from a mobilization force to a more frequent supporter of daily fleet operations, such as counternarcotics and electronic warfare support missions.

Despite DOD's concerns about our use of amortized acquisition costs, it still generally concurred with our analysis of the impact on ship operating and support costs by reducing overall OPTEMPO by 20 percent. Our analysis concluded that (1) the greatest potential for realizing cost savings is by reducing forces rather than reducing OPTEMPO and (2) reductions in OPTEMPO of 20 percent or more would provide relatively small savings but risk adverse impacts on readiness and safety. However, DOD stated that larger reductions in OPTEMPO would be required to realize an annual operating and support savings of $900 million—equal to the savings of reducing one carrier battle group. DOD's claim that larger reductions in OPTEMPO would be required to achieve the savings we estimated results from its more narrow analysis of the Navy's Flying Hours program. DOD's analysis does not include engine and airframe depot repair costs; our analysis includes those costs. In subsequent discussions, Navy officials concurred with our analysis that lower intensity of operations would

result in lesser requirements for engine and airframe depot repairs and thus would provide larger OPTEMPO-related savings.

Conclusions

For the Navy, the security environment is changing from the threat of open ocean conflict with the former Soviet Union to the likelihood of regional conflicts involving smaller nations possessing advanced weaponry. Carrier battle groups with their multimission capabilities will continue to be an important naval asset in helping to provide an overseas naval presence and crisis response capability. However, they are expensive to acquire, operate, and support, and their cost will increase as the force is modernized. The number of carrier battle groups influences the size and composition of the rest of the fleet and the resources remaining to operate and support other naval forces.

Even as the number of carriers is reduced to the planned level of 12 by the end of fiscal year 1995, the Navy can still provide a significant level of overseas carrier presence under current operating, maintenance, and personnel policies. However, gaps in carrier presence begin to occur at the level of 12 because of the relatively large number of carriers required to maintain presence, particularly in the Indian Ocean/Arabian Sea region. The Navy is beginning to develop deployment schemes and operational concepts to maintain presence by shifting carriers between operating areas during a deployment and using other combatants and amphibious ships for some presence missions.

Surface combatants recently introduced into the fleet, such as Ticonderoga-class cruisers, Arleigh Burke-class destroyers, and retrofitted New Threat Upgrade cruisers and destroyers, are increasingly capable of conducting both offensive and defensive missions in future regional contingencies. An increasing number of these ships, as well as attack submarines, carry the Tomahawk cruise missile, which provides a significant strike capability against targets on the majority of the world's land areas. More ships and attack submarines with this capability will be entering the fleet so that by the end of the decade over 150 platforms will be Tomahawk-capable. A new class of multipurpose amphibious assault ships, the Wasp, is also expanding the flexibility of amphibious forces in providing naval presence and a crisis response capability. The Navy is working toward replacing other amphibious ships reaching the end of their service lives with a proposed new design, the LX, that could also have increased offensive and defensive capabilities.

Relying more on surface combatant and amphibious assault ships, which are formed into surface action groups and amphibious ready groups, for presence and crisis missions could allow carriers to remain closer to their home ports and permit a smaller carrier force. In the event of a serious

crisis, comparable numbers of carriers to that deployed in support of Operations Desert Shield and Desert Storm could be deployed overseas relatively quickly, even at smaller force levels. For example, an eight-carrier force could immediately deploy or have deployed three carriers at the beginning of a crisis and up to seven carriers deployed within 2 months.

Under current plans, the 12-carrier force will remain at that level for at least the next two decades and gradually evolve to an all-nuclear active force around the end of that period. To maintain a force of that size will require a substantial long-term investment in acquisition and operating and support costs, the early retirement of conventional carriers, and completion of the ongoing overhaul and reactor refueling of the USS Enterprise. Also, the Navy will have to begin refueling Nimitz-class nuclear carriers now in the force in the late 1990s. Further, a new nuclear carrier, CVN-76, which the Navy believes is vital for maintaining the industrial base, will have to be authorized and funded so construction can begin in fiscal year 1995. The Navy also plans to request full funding for two other nuclear carriers in fiscal year 2001 (advance procurement funding would be requested in fiscal year 1999).

As the Navy's budget declines in response to continued fiscal pressures, carrier battle group acquisition and operating and support costs will consume a larger share of that budget. Growing development costs and projected acquisition costs for new and replacement carrier-based aircraft could increase that share and eventually limit the number of fully capable air wings or affect the affordability of maintaining a 12-carrier force. Reducing the OPTEMPO of ships and aircraft only results in marginal operating and support cost savings; significant savings can only be achieved by reducing the size of the force. Therefore, the size and affordability of the carrier force necessary to meet the national defense strategy needs to be more clearly defined before making pending procurement decisions.

Matters for Congressional Consideration

We believe it is essential that the Congress and DOD reach early agreement on the size and affordability of the carrier force needed to meet future national defense requirements. Reaching such an agreement during deliberations on the fiscal year 1994 budget submission is important because the number of carriers and their role in the new security environment directly affect (1) the Navy's plans to acquire carriers, surface combatants, attack submarines, and combat logistics ships and

(2) the affordability of developing and procuring a full complement of costly new tactical aircraft.

In the context of this agreement on the size and affordability of the carrier force, the Congress should consider the extent that other, less costly force options could satisfy many national security needs and reduce the requirements for carrier battle groups before approving full funding for the new nuclear carrier in the planned fiscal year 1995 request.

DOD Comments and Our Evaluation

A draft of this report provided to DOD for comment contained a Matter for Congressional Consideration concerning release of advance procurement funds requested for CVN-76. The suggestion was based on the belief that approval of the funding represented a significant commitment to fund the remainder of the ship in fiscal year 1995, which would, in turn, require early retirement of a conventional carrier to maintain a 12-carrier force. We further suggested that, given the declining defense budget, changing security environment, increasingly capable surface combatants and amphibious ships, high cost of upgrading and replacing carrier-based aircraft, and long-term costs of maintaining the planned carrier force level, the Congress and DOD needed to reach early agreement on the size and affordability of the carrier force needed to meet national defense requirements.

DOD did not concur with the suggestion concerning the release of the advance procurement funds, stating that there are defense industrial base imperatives that require the advance procurement funds. Further, DOD believes that the Congress and Defense agree on the size of the future carrier force. Subsequently, the funds were authorized and appropriated by the Congress and obligated by the Navy. The report has been revised to reflect that action.

We still believe, however, that the reasons cited for the need for the Congress and DOD to reach early agreement on the size and affordability of the carrier force remain valid. We also believe that other options, such as the increased use of surface action groups and other force configurations, to meet some of the roles and missions traditionally met by carrier battle groups need to be fully examined before making a commitment to build another carrier. The Conference Report on the National Defense Authorization Act for Fiscal Year 1993 underscored this need by requiring the Secretary of Defense to conduct an analysis of the capacity of alternative groups of naval forces, including aircraft carriers, large

amphibious ships, and large surface combatants, to fulfill the forward presence mission.

Objectives, Scope, and Methodology

We reviewed the administration's rationale for the number of aircraft carrier battle group forces because of the significant changes in the security environment largely resulting from the dissolution of the Soviet threat, the evolving political and economic trends in global regions, and the increasing pressures to reduce the U.S. budget deficit. Our objectives were to provide the Congress with information on (1) the policy, cost, and budget implications of current and alternative carrier battle group force levels and (2) possible force options for meeting future security requirements with fewer carriers.

To accomplish our objectives, we obtained information on the missions, capabilities, cost, and composition of aircraft carrier battle group forces; U.S. security commitments and the changing threat environment; carrier employment activities and deployments; and options for carrier operations and force structure from officials from various U.S. government agencies and U.S. organizations. We discussed with these officials the arguments for and against alternative carrier battle group force structures regarding the number and type of carriers, mix and type of battle group elements, and the changing nature of deployments. For the most part, the officials were reluctant to address the impacts of specific carrier levels and generally preferred to discuss the effects of fewer carriers only on a broad basis.

We reviewed pertinent documentation, including policy directives, guidance, and strategies; threat assessments; operational histories, statistics, and schedules; and principal studies and analyses on naval force structure at various U.S. government agencies. We also obtained cost data on the carrier battle group force structure and analyzed the cost to acquire, operate, and maintain a carrier battle group. Additionally, we conducted a literature search to identify potential issues related to future carrier battle group force structure decisions.

We visited three aircraft carriers to observe training and operations at sea and discuss carrier operations with ship officers and crew. Additionally, we visited inactivated aircraft carriers and surface combatants. We also reviewed studies related to inactivation and reactivation of carriers maintained in the Navy's mobilization fleet, including the cost and work requirements of maintaining these ships.

We visited the North Atlantic Treaty Organization headquarters in Brussels, Belgium, and 11 countries in Europe, the Mediterranean, the Middle East, the Pacific, and East and Southeast Asia. During our visits,

we interviewed U.S. embassy officials and foreign government and military officials on the importance of U.S. carrier battle group deployments and the impact that possible changes in battle group force structure, deployment scheduling, and operations could have on the stability of world regions. We also contacted several foreign embassies in Washington, D.C., but many declined to meet with us or respond to our questions. We believe their reluctance to comment may reflect their sensitivity in discussing an important area of U.S. policy and foreign relations, particularly during the crisis and war with Iraq.

We contacted various experts and academicians from both public and private organizations to obtain additional perspectives on areas covered in our visits with U.S. and foreign government officials. The following is a list of the U.S. government agencies, U.S. organizations, international organizations, and foreign governments and organizations contacted during our review:

U.S. Government

Department of Defense

Office of the Secretary of Defense, Washington, D.C.
- Under Secretary of Defense for Policy
- Comptroller
- Assistant Secretary of Defense for Program Analysis and Evaluation

Office of the Chairman, Joint Chiefs of Staff, Washington, D.C.
- Strategic Plans and Policy Directorate
- Operational Plans and Interoperability Directorate
- Force Structure, Resource, and Assessment Directorate

Commander-in-Chief, U.S. Atlantic Command, Norfolk, Virginia

Commander-in-Chief, U.S. European Command, Stuttgart-Vaihingen, Germany

Commander-in-Chief, U.S. Central Command, MacDill Air Force Base, Florida

Commander-in-Chief, U.S. Pacific Command, Honolulu, Hawaii
- Commander, U.S. Forces Korea
- Commander, U.S. Forces Japan

Commander-in-Chief, Combined Forces Command, Korea

Department of the Navy

Office of the Secretary of the Navy, Washington, D.C.
Comptroller
Office of the Chief of Naval Operations, Washington, D.C.
- Deputy Chief of Naval Operations for Manpower, Personnel, and Training
- Assistant Chief of Naval Operations for Undersea Warfare
- Assistant Chief of Naval Operations for Surface Warfare

Deputy Chief of Naval Operations for Logistics
- Assistant Chief of Naval Operations for Air Warfare
- Deputy Chief of Naval Operations for Plans, Policy, and Operations
- Deputy Chief of Naval Operations for Naval Warfare
- Deputy Chief of Naval Operations for Navy Program Planning
- Naval Center for Cost Analysis
- Naval Historical Center
- Director, Naval Reserve

Headquarters, U.S. Marine Corps, Washington, D.C.
Commander-in-Chief, U.S. Atlantic Fleet, Norfolk, Virginia
- Commander, Naval Air Force, U.S. Atlantic Fleet, Norfolk, Virginia
- Commander, Naval Surface Force, U.S. Atlantic Fleet, Norfolk, Virginia
- Commander, Surface Warfare Development Group, Naval Surface Force, U.S. Atlantic Fleet, Norfolk, Virginia
- Commander, Cruiser-Destroyer Squadron 26, Naval Surface Force, U.S. Atlantic Fleet, Norfolk, Virginia
- Commanding Officer, USS John F. Kennedy, U.S. Atlantic Fleet, Norfolk, Virginia

Commander-in-Chief, U.S. Pacific Fleet, Pearl Harbor, Hawaii
- Commander-in-Chief, Third Fleet, Pearl Harbor, Hawaii
- Commander-in-Chief, Seventh Fleet, Yokosuka, Japan
- Commander, Naval Air Force, U.S. Pacific Fleet, San Diego, California
- Commander, Naval Surface Force, U.S. Pacific Fleet, Coronado, California
- Commander, Training Command, U.S. Pacific Fleet, San Diego, California
- Commander, Naval Forces, Korea
- Commander, Naval Forces, Japan
- Commander, Fighter Airborne Early Warning Wing, U.S. Pacific Fleet, San Diego, California
- Commander, Carrier Air Wing Reserve Thirty, U.S. Pacific Fleet, San Diego, California
- Commanding Officer, USS Midway, U.S. Pacific Fleet, Yokosuka, Japan

Commanding Officer, USS Nimitz, U.S. Pacific Fleet, Bremerton, Washington
Commander-in-Chief, U.S. Naval Forces, Europe, London, England
Commander, Sixth Fleet, Gaeta, Italy
Naval Air Systems Command, Washington, D.C.
Naval Sea Systems Command, Washington, D.C.
Chief of Naval Air Training, Naval Education and Training Command, Corpus Christi, Texas
Naval Inactive Ship Maintenance Facility, Bremerton, Washington
Detachment Planning and Engineering for Repairs and Alterations Aircraft Carriers, Naval Sea Systems Command, Bremerton, Washington
Puget Sound Naval Shipyard, Bremerton, Washington

Department of the Air Force

Office of the Secretary of the Air Force, Washington, D.C.
Seventh Air Force, Korea

Department of State

Headquarters, Washington, D.C.
U.S. Embassy, Canberra, Australia
U.S. Embassy, Paris, France
U.S. Embassy, Tel Aviv, Israel
U.S. Embassy, Rome, Italy
U.S. Embassy, Tokyo, Japan
U.S. Embassy, Kuala Lumpur, Malaysia
U.S. Embassy, Singapore
U.S. Embassy, Bangkok, Thailand
U.S. Embassy, Ankara, Turkey
U.S. Embassy, London, United Kingdom

U.S. Organizations

Department of International Relations, Claremont Graduate School, Claremont, California
East/West Center, Honolulu, Hawaii
Center for Naval Analyses, Alexandria, Virginia
Institute for Defense Analyses, Alexandria, Virginia
Institute on Global Conflict and Cooperation and School of International Relations and Pacific Rim Studies, University of California, San Diego, California

International Organizations

North Atlantic Treaty Organization
U.S. Military Delegation
U.S. Mission to the North Atlantic Treaty Organization

Foreign Governments and Organizations

Australia	Department of Defence Australian Defence Force Department of Foreign Affairs and Trade Research School of Pacific Studies, Strategic and Defence Studies Centre, Canberra, Australia Peace Research Centre, Canberra, Australia
France	General Secretary of National Defense French Navy Defense Study Group Ministry of Defense Foundation for the Studies in National Defense
India	Embassy of India, Washington, D.C.
Israel	Office of the Prime Minister Ministry of Defense Ministry of Foreign Affairs Jaffa Center for Strategic Studies
Italy	Defense General Staff Italian Navy International Affairs Institute
Japan	Defense Agency Ministry of Foreign Affairs

Korea	National Ministry of Defense Ministry of Foreign Affairs
Malaysia	Institute of Strategic and International Studies, Kuala Lumpur University of Malaysia, Kuala Lumpur
Singapore	Ministry of Defense National University of Singapore
Thailand	Royal Thai Armed Forces, Ministry of Defense Supreme Command Headquarters Ministry of Foreign Affairs Royal Thai Navy
Turkey	Ministry of Foreign Affairs Foreign Policy Institute Bilkent University
United Kingdom	Ministry of Defence International Institute for Strategic Studies Chatham House Royal United Services Institute for Defense Studies

Although our report addresses the policy, operational, and force structure aspects of carrier battle groups, it focuses on the aircraft carrier, since it is the Navy's principal capital ship on which most of naval operational and force structure decisions are based. Changes in carrier levels will affect the levels of aircraft, surface combatant and combat logistics force ships, attack submarines, personnel, and facilities to support carrier battle group operations, although not on a one-to-one correlation.

Our calculations of the various amounts of overseas presence possible in the three major regions—the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea—at selected aircraft carrier force levels were based on rationales and employment factors used by the Navy. Although there is a wide range of deployment schemes and employment variations possible, our calculations were consistent with the Navy's

model discussed in appendix VI. This model is intended as a planning tool for determining carrier requirements for peacetime overseas deployments.

We assumed that only one carrier is providing presence at a time in each of the three major regions. Increasing the number of carriers in one region would likely necessitate adjustments in the level of presence in other regions. For example, the large number of carriers deployed during Operations Desert Shield and Desert Storm necessitated a less-than-continuous presence, or gaps, in both the Mediterranean Sea and western Pacific Ocean regions.

We used current employment factors (i.e., transit distances and speed and time spent in major maintenance) for nuclear carriers and the Navy's operating tempo (OPTEMPO) and personnel tempo (PERSTEMPO) goals (i.e., maximum length of deployments). Changing these factors and goals would affect the number of carriers required to meet a given level of overseas presence. For example, conventional carriers have a slightly higher operational availability than nuclear carriers (because of their shorter lifetime maintenance time) and thereby yield slightly lower requirement levels than comparable presence levels provided by nuclear carriers. We did not include conventional carriers in our calculations because of their declining numbers in the carrier force structure over the next decades. Further, changing employment factors such as the length of deployment and amount of transit time will similarly affect the number required. For example, under current planning factors, it takes about 15 carriers to maintain a continuous presence of 1 carrier in each of the three major regions. If the current 6-month deployment length was increased by 1 month, about 12 carriers could meet a similar presence.

We also included the carrier based in Japan in our presence calculations. This carrier provides most of the presence in the western Pacific Ocean region and some in the Indian Ocean/Arabian Sea region and employs different deployment, operating, and maintenance strategies than for carriers based in the United States. It significantly lowers the number of carriers required for these regions by being counted as continuously deployed. The remaining carriers deployed to these two regions for presence were assumed to originate from the home ports in the western United States, such as San Diego, California. We did not consider the deployment of carriers from the Atlantic Fleet to meet some part of the Indian Ocean/Arabian Sea regional presence. If carriers originating from eastern U.S. home ports were included, the number of carriers required to meet presence levels for the Indian Ocean/Arabian Sea region would be

lower because of the shorter distances. For calculating presence in the Mediterranean Sea region, we assumed carriers originated from home ports in the eastern United States.

Distances to the regions for our calculations were measured from the carrier's U.S. home port to the outermost boundary of the region. The one-way distance from the east coast of the United States to the Strait of Gibraltar (Mediterranean Sea region) is 3,600 nautical miles. The one-way distances from the west coast of the United States to the western Pacific Ocean region and the Arabian Sea (Indian Ocean/Arabian Sea region) are 3,900 and 11,400 nautical miles, respectively. We included the approximate number of days for stops in our calculations.

In our analysis of the potential aircraft carrier surge capability, we used two principal source documents provided by the Navy: the Navy's estimates on the time required to deploy during different activities in a carrier's interdeployment phase (see fig. 2.1) and the Ship Availability Advanced Planning Schedule. The time to deploy estimates provide the number of months it would take to accelerate a carrier's deployment from its scheduled maintenance or training activity. The advanced planning schedule projects carrier maintenance periods for about 10 years. We used the last day of the fiscal year to determine a ship's status in its employment cycle. For force levels of 10 and lower, we decreased about one carrier each year, which is about the rate the Navy might inactivate carriers, if required. In our analysis, we did not include the transit times required to reach a location because these times vary depending on the distance and the transit speed used to reach the location. The results of our analysis are generally consistent with other analyses within the Navy that we obtained, although our analysis was more conservative in the treatment of major overhauls.

Besides the alternative of using other naval force configurations to provide overseas naval presence and crisis response (see ch. 2), we also examined several other alternatives for meeting security requirements with fewer carriers. These other options included overseas home porting of additional carrier battle groups to reduce travel distances, improve crisis response time, and reduce the number of carrier battle groups required to maintain presence in a region; relying on allies to complement or provide regional security; and changing carrier employment factors, such as extending the length of deployments, to increase the availability of carriers for deployment. These options proved to be either cost or politically prohibitive, involved an overreliance on other countries to promote U.S.

foreign policy, or were costly in terms of personnel retention or ship maintenance requirements. We also briefly examined other options for providing presence and crisis response with other types of military forces, such as tactical land-based aircraft from overseas or U.S. bases. Although these forces contribute to U.S. capabilities overseas, we decided to limit our discussion to naval forces.

The impact of new carrier construction on the shipbuilding industrial base was not within the scope of this review. The shipbuilding industrial base is a much broader issue involving the entire Navy shipbuilding program, particularly the nuclear propulsion vendor base. The impact of the Navy's shipbuilding program on the shipbuilding industrial base has also been the subject of congressional hearings on the fiscal year 1993 defense budget.

We performed our review between March 1990 and September 1992 in accordance with generally accepted government auditing standards. Our field work was conducted before and during Operations Desert Shield and Desert Storm. When appropriate, we included data on these operations and their possible impact on carrier maintenance scheduling, deployment operations, and Navy policies.

Aircraft Carrier Battle Group Cost Model

Because of the significant decline expected in future defense budgets, we placed a major emphasis on developing an aircraft carrier battle group cost model using Department of Defense (DOD) and Navy data and models to identify the (1) cost of a baseline carrier battle group and various alternative configurations, (2) significant cost categories for the battle group components, and (3) effects of changes in OPTEMPO on the cost of a battle group.

Our model uses composite costs to characterize the cost of different force components (i.e., ship types and carrier air wings) based on the Navy's force structure in fiscal year 1990 and its projected force structure for fiscal year 2000. These cost estimates reflect costs likely to be incurred by naval forces but should not be used to estimate future budget expenditures directly. The cost estimates are annualized to reflect the average cost each year for the force component over its expected service life. Current peacetime OPTEMPOs and consumption rates were assumed, and no wartime ordnance inventories, such as missiles, torpedoes, guns, and munitions, were allocated as indirect costs of a carrier battle group. Carrier battle group costs used in this report represent the direct costs for an active force unit, for example, a ship or aircraft in the active fleet. The

indirect costs of a force unit are not allocated or included, although these costs can be significant. Indirect costs include, for example, the Navy's physical infrastructure of bases and air stations and the personnel assigned to shore command and support functions (e.g., publications and financial management). Also, reserve units are not included in our carrier battle group costs. All costs are expressed in fiscal year 1990 dollars, except as noted (e.g., future budget estimates of specific end items).

Ship Acquisition Costs

Ship acquisition costs are class averages of the original ship acquisition costs divided by the expected service life for the ship class. Acquisition costs were obtained from the Naval Sea Systems Command's Cost Estimating and Analysis Division, and ship life estimates were obtained from the Assistant Chief of Naval Operations for Surface Warfare, except when the expected service life was adjusted based on actual inactivation data. Ship acquisition cost estimates should not be interpreted as replacement costs, which could vary for many reasons, including production rates, learning curve, specifications, and expected service life assumptions.

Ship Operating and Support Costs

Ship operating and support costs are based on 10-year ship class averages, for fiscal years 1980 through 1989, which we obtained from the Naval Sea Systems Command's Cost Estimating and Analysis Division's Visibility and Management of Operating and Support Costs-Ships (VAMOSC-Ships) data base. Estimates for ship classes, which are not covered fully in the data base's class averages, and for nuclear attack submarines were obtained from the Division. We obtained estimates for T-class combat logistics force ships[1] from the Assistant Chief of Naval Operations for Surface Warfare.

Selected ship operating and support cost category data elements were modified or added, including personnel, depot-level maintenance, and nuclear fuel, because the data base was not adequate for the scope of our estimates. For example, the data base's personnel element does not capture the costs for accrued retirement or report the costs of Marine Corps detachments, nuclear fuel costs are only partially reported, and depot-level maintenance costs reported can be under- or overreported based on the point in the life cycle of the vessel. We modified the personnel data element by using composite pay rate factors for officers

[1]T-class combat logistics force ships are operated by the Navy's Military Sealift Command. These ships use civilian instead of military crews but may have a small military attachment aboard.

and enlisted personnel that we obtained from the Department of the Navy's Justification of Estimates, Military Personnel, Navy. The pay rates were multiplied by the authorized personnel for the ship class (instead of the wartime personnel requirement). We obtained the costs of initial and replacement nuclear fuel for nuclear carriers, cruisers, and submarines from the Naval Sea Systems Command's Nuclear Propulsion Office. The procurement-related costs for nuclear fuel components were subtracted from the acquisition costs of the ships and from the data base's elements, as appropriate, to preclude double-counting. Depot-level maintenance estimates were derived by factoring the ship class' notional days of scheduled shipyard maintenance over its life by the average shipyard daily cost rates for the ship type.

Aircraft Acquisition Costs

Aircraft acquisition costs represent the annualized average costs to acquire and sustain one active aircraft of a specific type for 30 years in the aircraft squadrons in a carrier's air wing. These costs are calculated by factoring aircraft requirements and program unit acquisition cost.

The active aircraft assigned to the air wing's squadrons and the aircraft required to sustain one active unit is a sum of factors accounting for aircraft requirements in the active squadrons, fleet readiness squadrons (training), pipeline, attrition, force level sustainability (force assurance), and other aircraft. Aircraft requirements data and programming factors, including air wing and squadron compositions, were obtained from naval aviation requirements officials in the Office of the Assistant Chief of Naval Operations for Air Warfare and from the Naval Aviation Plan.

The program acquisition unit costs we used included the weapon system's unit cost and a program factor allowance for research, development, test, and evaluation; military construction unique to the weapon system; and aircraft modifications. Weapon systems unit costs, obtained from the Naval Center for Cost Analysis, are an average of historical and planned purchases obtained from the Historical Aircraft Procurement Cost Archive and the fiscal year 1991 President's budget submission. Research, development, test, and evaluation; military construction; and aircraft modifications program factor allowances were determined by analyzing several years of budget data and Selected Acquisition Reports. Aircraft acquisition cost estimates should not be interpreted as either marginal unit replacement costs of aircraft or "fly-away" costs, which are both more narrowly defined. These estimates could also vary for several reasons,

including production rates, learning curve, specifications, pipeline factors, and expected service life assumptions.

Aircraft Operating and Support Costs

Aircraft operating and support costs are based on models developed for the Naval Center for Cost Analysis. The models use cost-estimating relationships for approximating the costs of the elements included in the Office of the Secretary of Defense's Cost Analysis Improvement Group guidelines for operating and support cost analysis. The cost-estimating relationships were derived from data compiled and analyzed from several data collection systems. Data from the Naval Air Systems Command's Cost Analysis Division were used to supplement the Center's model. An allocation for Fleet Readiness Squadrons is also included because these squadrons are a direct function of the active squadrons. Additionally, we modified the personnel data element using the methodology described above for ship personnel, except that we obtained authorized squadron personnel levels from the Deputy Chief of Naval Operations for Manpower, Personnel, and Training.

Estimate of Fiscal Year 1993 Navy Budget Request to Acquire Carrier Battle Group Elements

We examined the Navy's Fiscal Year 1993 budget request for procurement and research, development, test, and evaluation by budget line item to determine the allocation of the budget for carrier battle group elements. We determined whether each item was for direct or general support of the major elements in the battle group. For example, items requested for direct support of the group included the F-14, E-2C, F/A-18C/D, and SH-60 Carrier Variant aircraft in the Aircraft Procurement, Navy appropriation account; the Automatic Carrier Landing System and Catapults and Landing Gear in the Other Procurement, Navy account; Advanced Tactical Aircraft (AX) and F/A-18 Squadrons (F/A-18E/F) in Research, Development, Test and Evaluation, Navy account; Carrier Advance Procurement (CVN-76) and Arleigh Burke (DDG-51) destroyer class in the Shipbuilding and Conversion, Navy account; and the Standard missile and Advanced Medium Range Air-to-Air Missile in the Weapons Procurement, Navy account. General support items mostly included those in the Other Procurement, Weapons Procurement, and Research, Development, Test, and Evaluation accounts and included a range of items such as communications and intelligence equipment, equipment modifications, tactical sensor systems, and nuclear reactor development.

We allocated all, some, or none of the item request to carrier battle group elements based on reasonable judgments of the item's purpose and utility

in support of the group and its proportionate share in the Navy's fleet. For example, we allocated all of the F-14 fighter aircraft, which is used only on carriers, to the battle group. However, for the F/A-18 aircraft, which is also used by the Marine Corps, and the DDG-51 destroyer, which is also used for escort missions, we reduced the allocation for the battle group to reflect these other uses.

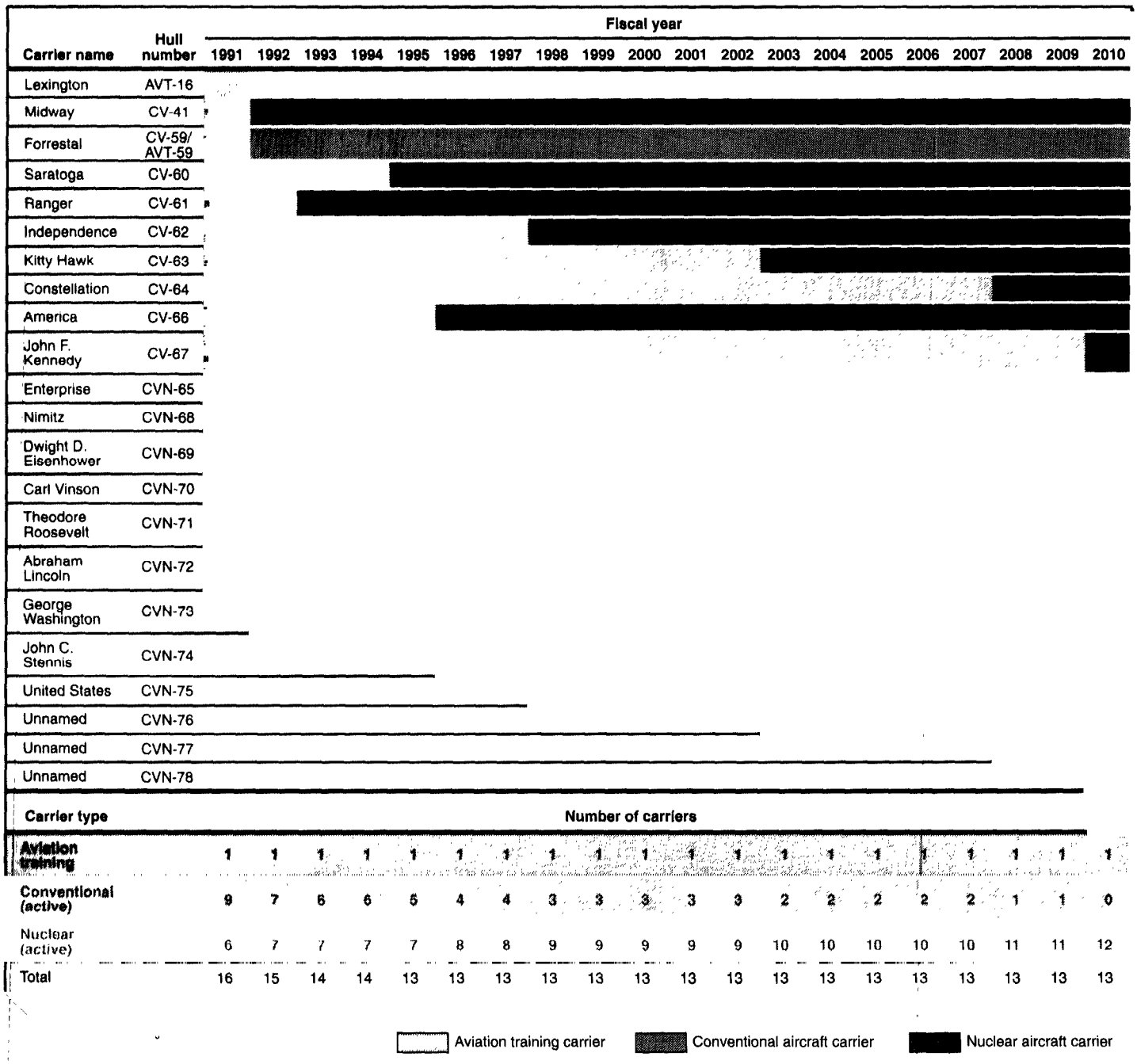
Our estimate provides a general measure of the level of resources being committed by the Navy to support its investment in carrier battle groups for fiscal year 1993. It ranges from a low of $11.5 billion (then-year dollars) for items that directly support the battle group to a high of $15.1 billion (then-year dollars) for items that directly and generally support the group. Other estimates could be higher or lower depending upon the force planning assumptions used.

Navy Aircraft Carrier Force Structure Plans

The Navy had 15 active aircraft carriers—9 conventional and 6 nuclear—and an aviation training carrier at the end of fiscal year 1991. With the retirement of a conventional carrier, USS Midway, the conversion of the USS Forrestal as a training carrier to replace the retired USS Lexington, and the delivery of the USS George Washington, the Navy had 14 active carriers and a training carrier at the end of fiscal year 1992.

The Navy plans to reduce the active carrier force to 12 by the end of fiscal year 1995. The Navy intends to replace its conventional carriers with nuclear carriers on a one-to-one basis to maintain a 12-active carrier force. Under current inactivation and acquisition plans, five nuclear carriers will be added to the force through fiscal year 2010. By the end of fiscal year 2010, the Navy will achieve its goal of an all-nuclear active aircraft carrier force. Additionally, an aviation training carrier will continue to be maintained in the long-term force structure. Figure II.1 shows the planned aircraft carrier force structure through fiscal year 2010.

Figure II.1: Current Navy Aircraft Carrier Force Structure Plan Through Fiscal Year 2010



Note: As of August 1992. Only those carriers in the inventory on the last day of a fiscal year are counted for force level purposes.

Source: Our analysis of Navy data.

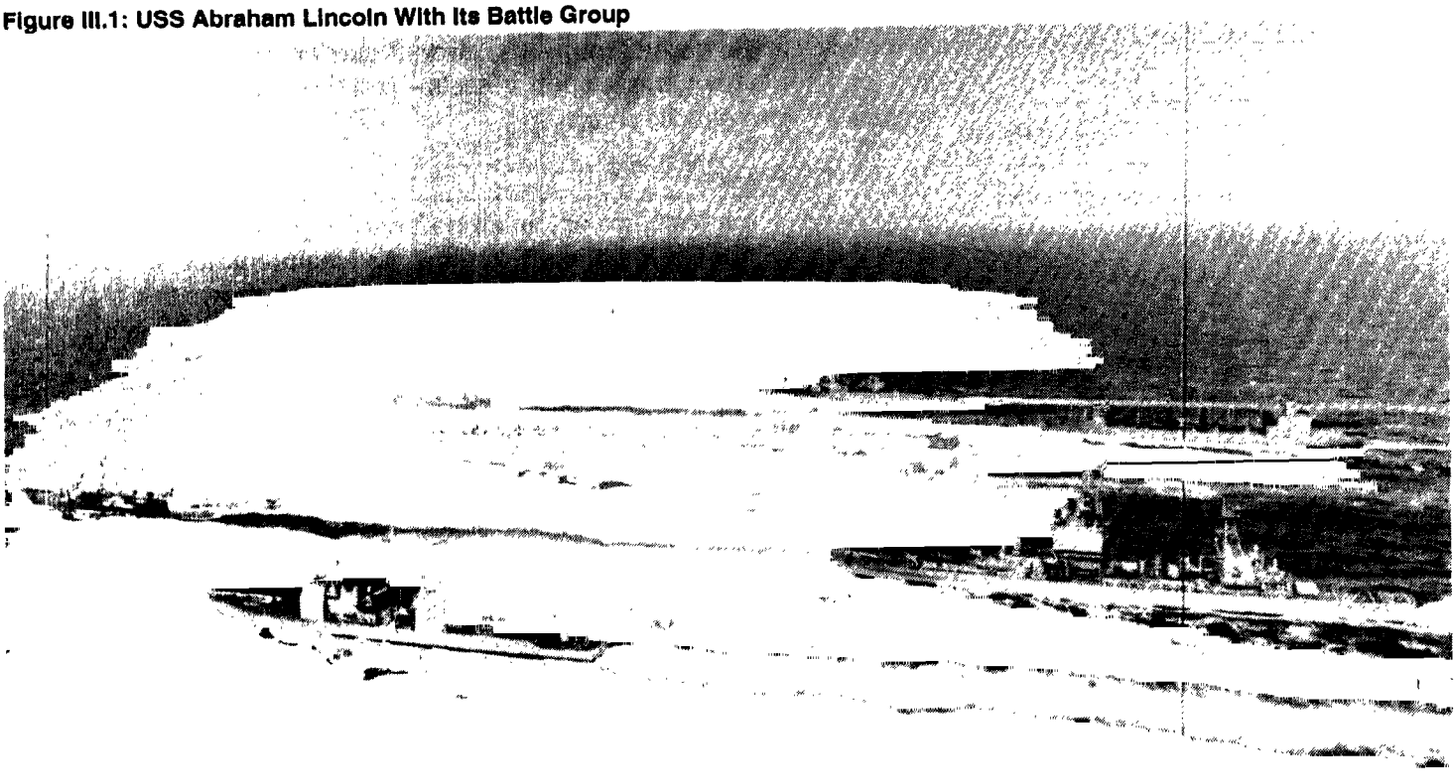
Information on Carrier Battle Group Elements

This appendix provides additional information on the elements that comprise a carrier battle group—the aircraft carrier, its associated air wing, and combatant and support vessels—and the associated combat logistics support shuttle ships.

Aircraft Carriers

As the heart of the battle group, an aircraft carrier provides the necessary space and facilities for the takeoff, landing, and maintenance of various types of aircraft in its associated air wing. Figure III.1 shows the USS Abraham Lincoln, one of newest nuclear carriers in the Navy's inventory, with its battle group.

Figure III.1: USS Abraham Lincoln With Its Battle Group



The USS Abraham Lincoln (CVN-72) is at the center. The other ships, clockwise from left: guided-missile frigate USS Ingraham (FFG-61), the guided-missile frigate USS Gary (FFG-51), the destroyer USS Merill (DD-976), the replenishment oiler USS Roanoke (AOR-7), the nuclear-powered guided-missile cruiser USS Long Beach (CGN-9), and the guided-missile cruiser USS Lake Chaplain (CG-57).

Source: Navy.

In fiscal year 1992, the Navy had 14 active carriers, 2 of which were temporarily not deployable because they were undergoing extended

overhauls.[1] An additional carrier, the USS Forrestal was used specifically for aviation training. Table III.1 shows the Navy's aircraft carriers, including those under construction, as of August 1992.[2]

Table III.1: Status of Navy Aircraft Carriers

Carrier name	Hull number	Fiscal year commissioned	Planned fiscal year of inactivation[a]	Fleet	Home port	Status
Conventional						
John F. Kennedy	CV-67	1968	2010	Atlantic	Norfolk, Va.	Deployable
America	CV-66	1965	1996	Atlantic	Norfolk, Va.	Deployable
Constellation	CV-64	1961	2008	Pacific	San Diego, Calif.	Service life extension [b]
Kitty Hawk	CV-63	1961	2003	Pacific	San Diego, Calif.	Deployable
Independence	CV-62	1959	1998	Pacific	Yokosuka, Japan[c]	Deployable
Ranger	CV-61	1957	1993	Pacific	San Diego, Calif.	Deployable
Saratoga	CV-60	1956	1995	Atlantic	Mayport, Fla.	Deployable
Forrestal	AVT-59	1955	1992	Atlantic	Pensacola, Fla.	Training[d]
Midway	CV-41	1945	1992	Reserve	Bremerton, Wash.	Inactivation[c]
Nuclear						
United States	CVN-75	1998[e]	2050	Atlantic	Norfolk, Va.	Under construction
John C. Stennis	CVN-74	1996[e]	2048	Pacific	Bremerton, Wash.	Under construction
George Washington	CVN-73	1992	2044	Atlantic	Norfolk, Va.	Deployable
Abraham Lincoln	CVN-72	1990	2042	Pacific	Alameda, Calif.	Deployable
Theodore Roosevelt	CVN-71	1986	2038	Atlantic	Norfolk, Va.	Deployable
Carl Vinson	CVN-70	1982	2034	Pacific	Alameda, Calif.	Deployable[f]
Dwight D. Eisenhower	CVN-69	1977	2029	Atlantic	Norfolk, Va.	Deployable
Nimitz	CVN-68	1975	2027	Pacific	Bremerton, Wash.	Deployable
Enterprise	CVN-65	1961	2014	Atlantic	Norfolk, Va.	Nuclear refueling[g]

(Table notes on next page)

[1]A carrier is considered to be deployable if it can be employed reasonably quickly to meet scheduled commitments or respond to crises. An extended overhaul is when (1) a conventional carrier is undergoing extensive repair, refurbishment, and modernization to extend its service life or (2) a nuclear carrier is being overhauled and its nuclear fuel replaced. Because these overhauls require considerably more time than a complex overhaul and so much of the ship is disassembled during the overhaul, the Navy does not count these assets as readily deployable.

[2]The Navy also has 13 amphibious assault ships capable of carrying several helicopters and, on some, AV-8B Harrier vertical/short takeoff and landing aircraft. These ships perform sea control and limited power projection missions to support Marine Corps amphibious force operations. Since these ships are (1) not capable of launching and recovering conventional fixed-wing aircraft, (2) limited to the number of aircraft they can carry, and (3) configured for the amphibious warfare mission, the Navy does not include these ships as part of its aircraft carrier force structure.

Note: As of August 1992.

[a]Inactivation dates beyond fiscal year 2010 are estimates based on the expected service life of the carrier.

[b]The Constellation is currently undergoing a service life extension, which will extend the life of the ship by about 15 years. The overhaul is expected to be completed during fiscal year 1993.

[c]The Independence has been assigned to the home port in Japan to replace the Midway, which was inactivated in early fiscal year 1992.

[d]The Forrestal was removed from the active fleet and became the training ship during fiscal year 1992. It replaced the Lexington, which was inactivated in November 1991.

[e]This is the currently planned date for commissioning.

[f]The Carl Vinson is counted as a deployable asset, although it is undergoing a complex overhaul at Puget Sound Naval Shipyard, Washington.

[g]The Enterprise, the Navy's first nuclear carrier, is undergoing an extended overhaul to replace its nuclear fuel. This will extend the ship's life by about 20 years. The overhaul is expected to be completed during fiscal year 1994.

Source: Navy.

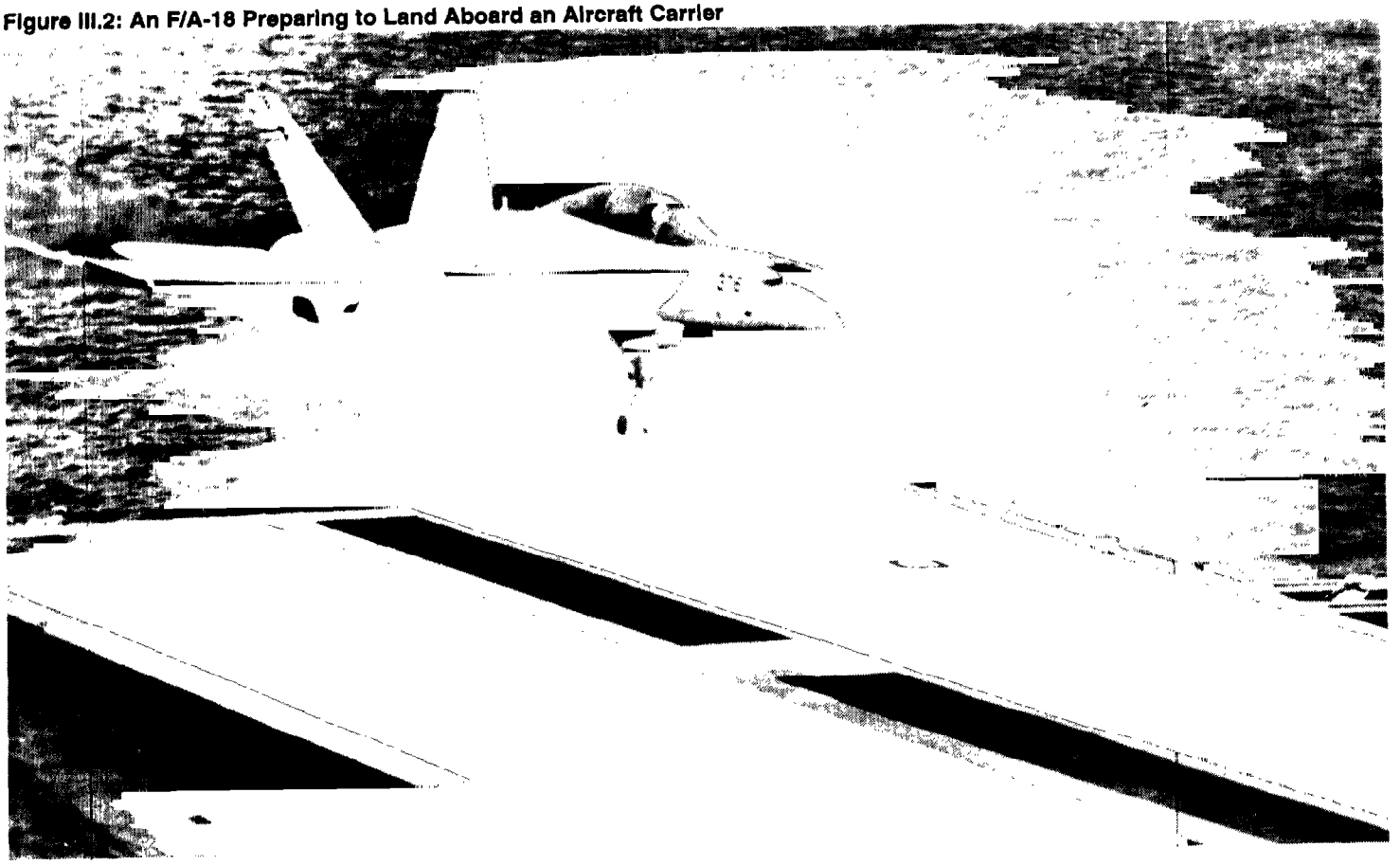
Aircraft Carrier Air Wings

The air wing provides the principal means for conducting offensive operations against enemy targets, supports other forces, and maintains an early warning and aerial defense umbrella above the entire battle group and any other friendly forces operating in the area. The defensive portion of the umbrella can extend over a 1,000-mile diameter around the battle group. A carrier air wing includes fighter, attack, electronic countermeasure, antisubmarine, refueling, strike rescue and special warfare support, and surveillance aircraft.[3]

Carrier air wings are tailored for the specific aircraft carrier from which they operate. The composition of aircraft in the air wing will vary according to mission requirements and the individual capabilities and characteristics of the carrier from which it operates. Generally, a carrier air wing will have about 80 aircraft—60 tactical and 20 support aircraft—that operate on the carrier during a deployment and about half that number that remain on shore to provide training and maintenance support. Figure III.2 shows an F/A-18 preparing to land aboard an aircraft carrier.

[3]Several surface ships in the carrier battle group and the underway replenishment group also deploy with their own attack or utility helicopters.

Figure III.2: An F/A-18 Preparing to Land Aboard an Aircraft Carrier



Source: Navy.

In fiscal year 1992, the Navy operated 12 active and 2 reserve air wings in one of the following air wing configurations: the Kennedy, Conventional, Transitional, Roosevelt, Power Projection, and Reserve. The Transitional air wing currently is the predominant air wing. However, during fiscal years 1993 through 1996, the Navy plans to adopt a single standard air wing configuration, the Power Projection, for all its carriers. Tables III.2 and III.3 show the number of each type of air wing through fiscal year 2000 and the current mix of aircraft in those air wings, respectively.

Table III.2: Carrier Air Wing Force Structure for Fiscal Years 1990-2000

	End of fiscal year										
Active air wing	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Coral Sea/Midway	2	0	0	0	0	0	0	0	0	0	0
Kennedy/Ranger	1	1	1	0	0	0	0	0	0	0	0
Conventional	7	4	2	0	0	0	0	0	0	0	0
Transitional	2	6	8	8	4	2	0	0	0	0	0
Roosevelt	1	1	1	1	1	1	0	0	0	0	0
Power Projection	0	0	0	2	6	8	11	11	11	11	11
Subtotal	**13**	**12**	**12**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**
Reserve[a]	2	2	2	2	2	2	2	2	2	2	2
Total	**15**	**14**	**14**	**13**	**13**	**13**	**13**	**13**	**13**	**13**	**13**

Note: As of June 1992.

[a]The two Reserve air wings currently have the Conventional configuration, with the addition of two HH-60H helicopters and the exclusion of S-3 aircraft. These air wings are available for mobilization during national emergencies. The Navy plans to reconfigure these air wings to the Transitional type during fiscal year 1994.

Source: Navy.

Table III.3: Composition of Carrier Air Wings by Aircraft Type and Mission

		Number of aircraft					
Aircraft type	**Mission**	**Coral Sea/ Midway**	**Kennedy/ Ranger**	**Conventional**	**Transitional**	**Roosevelt**	**Power Projection**
A-6	Medium attack	16	24	10	16	20	16
F-14	Fighter	0	24	24	20	20	20
F/A-18	Fighter/light attack	36	0	24	20	20	24
KA-6	Refueling	0	4	4	0	0	0
E-2	Surveillance	4	4	4	5	5	4
EA-6	Electronic warfare	4	4	4	5	5	4
S-3	Antisubmarine	0	6	6	6	6	6
SH-3 or SH-60F	Antisubmarine	6	6	6	6	6	6
HH-60H	Strike rescue/special warfare support	0	0	0	2	2	2
Total		**66**	**72**	**82**	**80**	**84**	**82**

Note: As of June 1992.

Source: Navy.

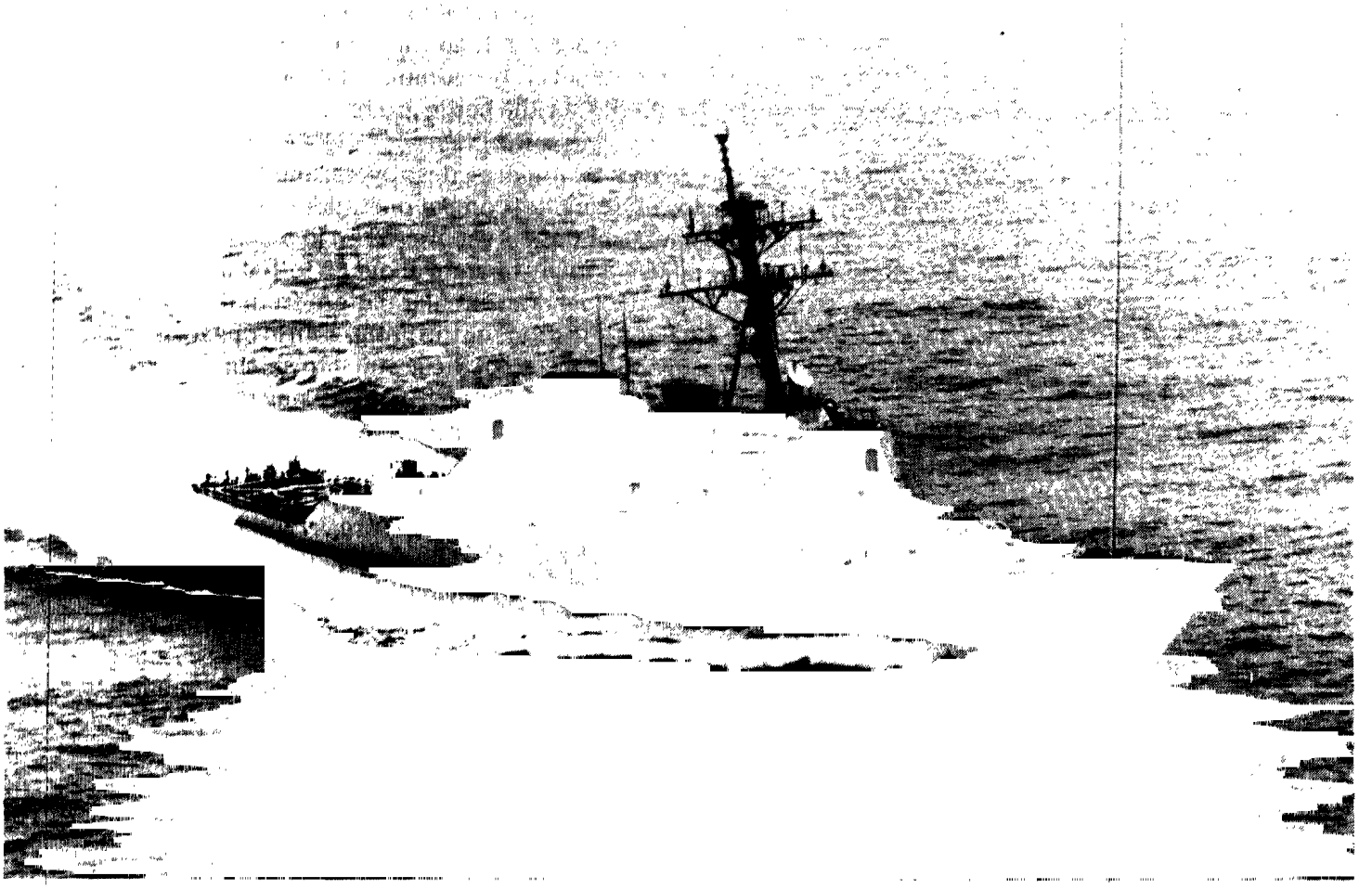
Other Battle Group Elements

The carrier battle group also includes surface combatants, nuclear attack submarines, and fast combat support ships. The Navy also employs shore-based maritime patrol aircraft and space-based satellite surveillance systems to provide additional early warning, intelligence, communication, and navigation capabilities for the battle group.

Surface combatants include cruisers, destroyers, and frigates.[4] These heavily armed ships can conduct combat operations against submarines, surface ships, aircraft, and targets ashore. When in a battle group formation, these ships normally operate about 50 to 100 nautical miles from one another in an expanding circular pattern from the carrier to provide a wide area of protection for the group. During peacetime presence, these ships will split from the group into smaller formations to conduct specific missions in the region. An increasing number of cruisers and destroyers can assist in strike missions by launching large numbers of Tomahawk cruise missiles. Figure III.3 shows one of the Navy's newest destroyers, the USS Arleigh Burke (DDG-51). This class of destroyers can simultaneously operate in all major warfare areas (antiair, antisurface, strike, and antisubmarine warfare). They are equipped with AEGIS, Vertical Launching System, and an advanced antisubmarine warfare system and are capable of launching Standard, Harpoon, and Tomahawk missiles. Figure III.4 shows the USS Chancellorsville (CG-62) guided-missile cruiser firing a Standard missile from its vertical launching system. Guided-missile crusiers are multimission surface combatants capable of supporting carrier battle groups, amphibious forces, or of operating independently and as flagships of surface action groups.

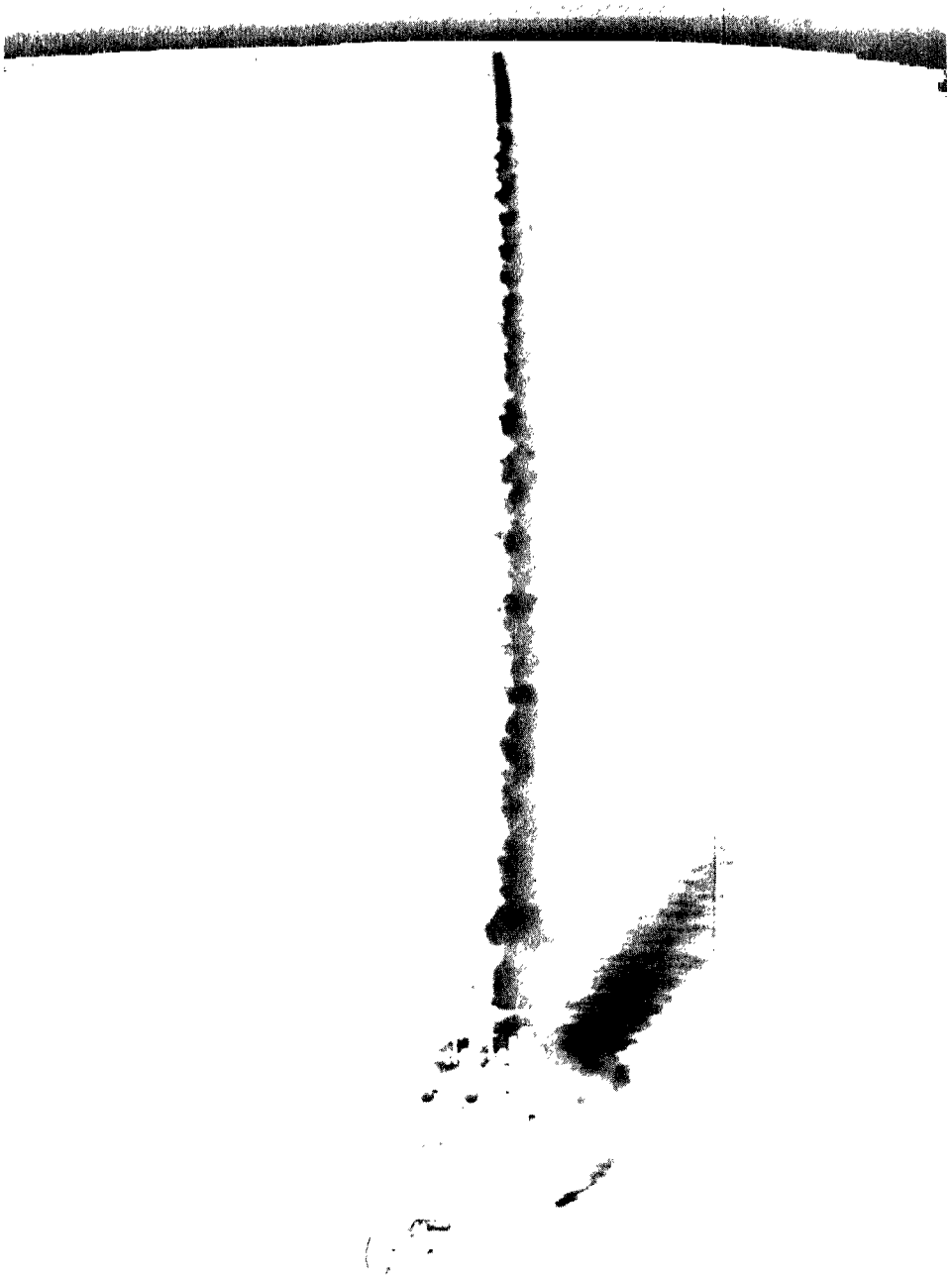
[4]Cruiser and destroyers are normally assigned to a carrier battle group. However, frigates may also be assigned as required.

Figure III.3: USS Arleigh Burke Guided-Missile Destroyer



Source: Navy.

Figure III.4: The USS Chancellorsville Fires a Standard Missile From Its Vertical Launching System



Source: Navy.

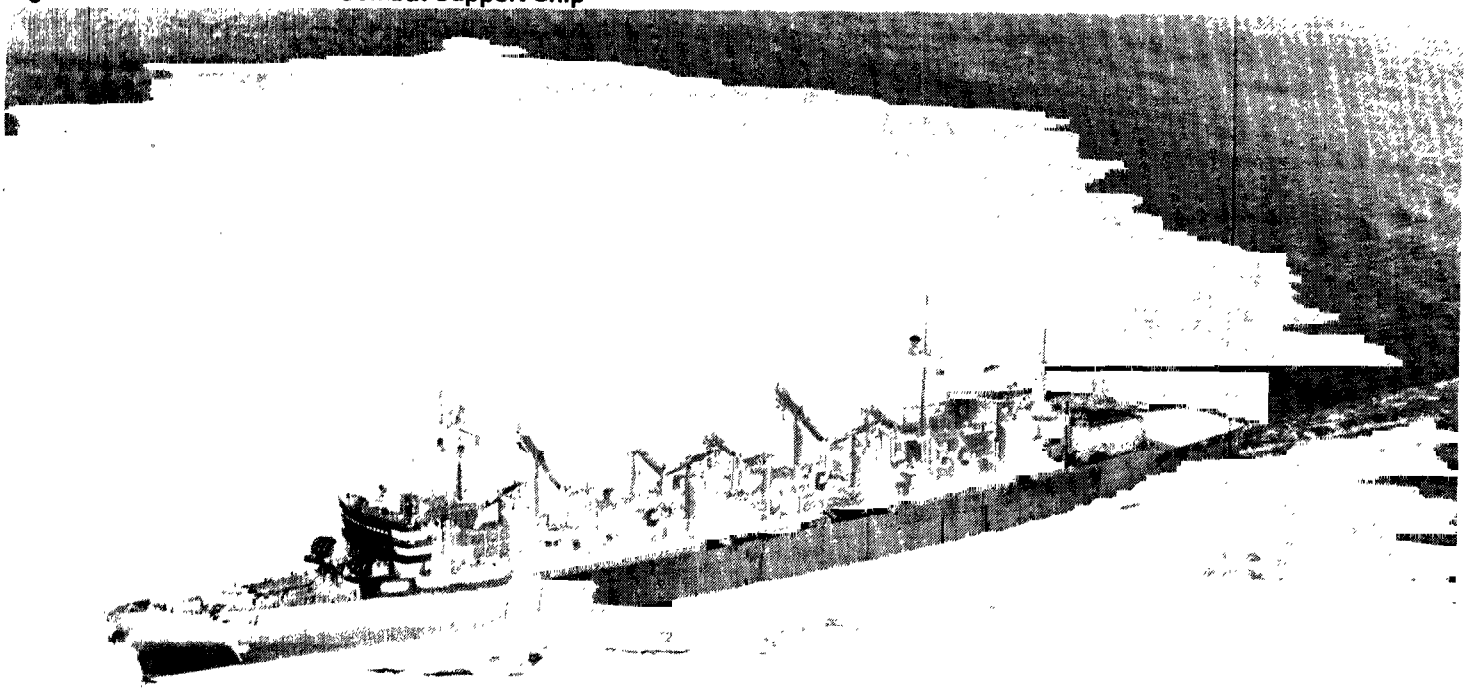
Nuclear attack submarines operate in support of the group by providing protection, intelligence gathering, and surveillance. Like some cruisers and destroyers, they complement the strike mission of carrier-based aircraft with their capability to launch Tomahawk cruise missiles against enemy targets. They also have significant antisubmarine and antisurface warfare capabilities with their long-range torpedoes and Harpoon and Tomahawk antiship missiles.

Fast combat support ships are the Navy's largest logistics ships that are specifically designed to operate as an integral unit of the carrier battle group. Figure III.5 shows the USS Detroit, one of the Navy's four fast combat support ships. When a fast combat support ship is unavailable, a replenishment oiler[5] and an ammunition ship may be assigned to the battle group. These logistics ships are critical for allowing battle group forces to operate largely independent of shore-based support for extended periods of time.[6] They provide the battle group with aircraft and diesel fuel and other petroleum products, repair parts, ammunition, provisions, and other supplies while deployed. The Navy prefers deploying the fast combat support ship with a battle group rather than the replenishment oiler and ammunition ship because of its faster speed, armament, and ability to carry larger quantities of multiple products.

[5]Although the replenishment oiler is smaller than the fast combat support ship, it can still carry a multiproduct mix of petroleum, munitions, and dry and refrigerated stores.

[6]According to an April 1988 Congressional Budget Office study of the Navy's Combat Logistics Force, a typical carrier battle group, exclusive of its logistics ship, has enough supplies for about 5 days of combat before it needs to be resupplied. With its logistics ship, the group can operate for about 15 days before requiring replenishment.

Figure III.5: USS Detroit Fast Combat Support Ship



Source: Navy.

Combat Logistics Force Shuttle Ships

The Navy also deploys combat logistics shuttle ships, sometimes called underway replenishment groups, that resupply products to the battle group's fast combat support ship during a deployment. These shuttle ships consist of oilers, ammunition, and/or stores ships and operate from various overseas bases. When traveling to the battle group or other naval forces, these ships may be escorted by a few surface combatants. If necessary, these ships can transfer products directly to the battle group elements rather than to its fast combat support ship.

Annualized Cost of a Notional Carrier Battle Group for Fiscal Year 2000

The estimated annualized cost of a notional carrier battle group for fiscal year 2000 is almost $1.6 billion (see table IV.1), compared with just under $1.5 billion for a fiscal year 1990 group. The higher costs for fiscal year 2000 reflect a newer mix of the same types of ships and aircraft. For example, the destroyer mix in 1990 includes 15 Charles F. Adams-class (DDG-2) destroyers but no AEGIS-equipped Arleigh Burke-class (DDG-51) destroyers (none had yet entered the fleet). In contrast, the fiscal year 2000 mix includes 32 Arleigh Burke-class destroyers but no Charles F. Adams-class ships (all Charles F. Adams-class destroyers are planned to be decommissioned by fiscal year 2000).

Table IV.1: Notional Battle Group's Annualized Costs for Fiscal Year 2000

Fiscal year 1990 dollars in millions

	Number	Operating and support	Acquisition	Total
Aircraft carrier				
Aircraft carrier	1	$208	$61	$269
Carrier air wing	1	263	345	608
Subtotal		**470**	**406**	**877**
Battle group ships and ships' aircraft				
Cruiser	2	85	48	133
Destroyer	4	120	61	180
Submarine	2	96	50	146
Fast combat support ship or equivalent	1	45	12	57
SH-60B helicopter	4	9	12	21
SH-2F helicopter	2	5	3	8
CH-46 helicopter	2	5	2	6
Subtotal		**365**	**187**	**552**
Total carrier battle group		**$835**	**$593**	**$1,428**
Underway replenishment group		98	45	143
Total		**$933**	**$638**	**$1,571**

Note: Numbers may not add due to rounding. Nuclear fuel costs are included under operating and support and not acquisition. Costs are a composite of the mix of ships and air wings in the fleet.

Source: Our analysis of Navy and GAO data.

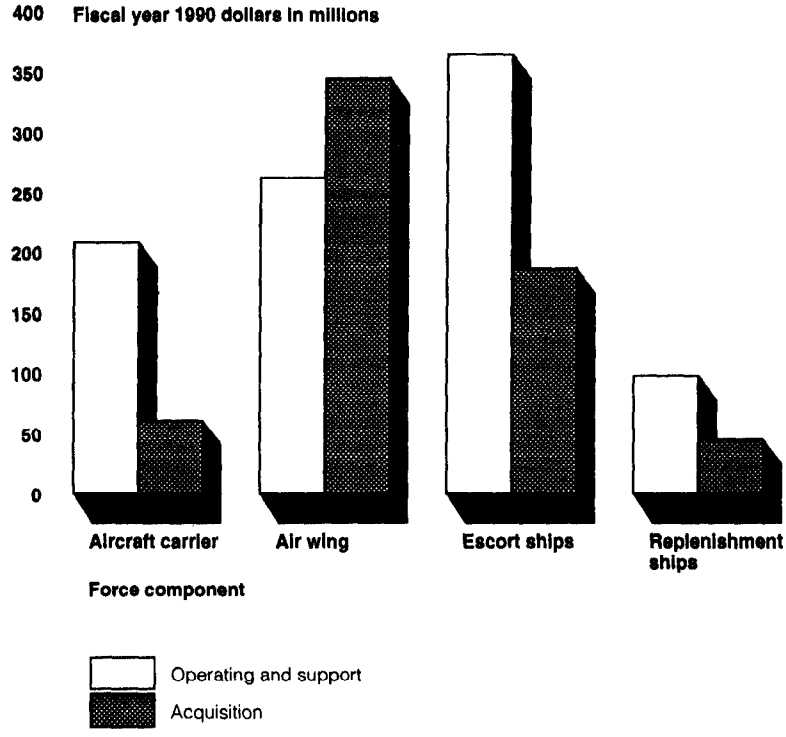
The total cost of a ship or an aircraft over its life, known as life-cycle cost, includes acquisition, operating and support, and disposal costs. Acquisition costs include the development, procurement, system-specific

military construction costs, and acquisition-related operations and maintenance necessary to acquire the weapon system. Acquisition costs have been annualized to reflect the average annual costs of the ship or aircraft over its life (see app. I for more information on our cost methodology). Operating and support costs are directly or indirectly attributable to operating, maintaining, and supporting the specific system over its life. Examples of major categories of operating and support costs include personnel, maintenance and repairs, and fuel. Disposal costs include the costs of inactivation and disposal, less any salvage value. We did not include disposal costs in our estimates of carrier battle group costs because estimates for most ship classes were generally not available.[1]

Figure IV.1 shows the projected annualized acquisition and operating and support costs for the major force components in a fiscal year 2000 carrier battle group, including the underway replenishment group.

[1]The Navy, in testimony before the Congress in 1989, estimated it would incur a near-term cost of roughly $600 million (then-year dollars) to inactivate the nuclear-powered aircraft carrier USS Enterprise.

Figure IV.1: Annualized Acquisition and Operating and Support Costs for a Fiscal Year 2000 Carrier Battle Group by Major Force Component



Note: Nuclear fuel costs are included under operating and support and not acquistion.

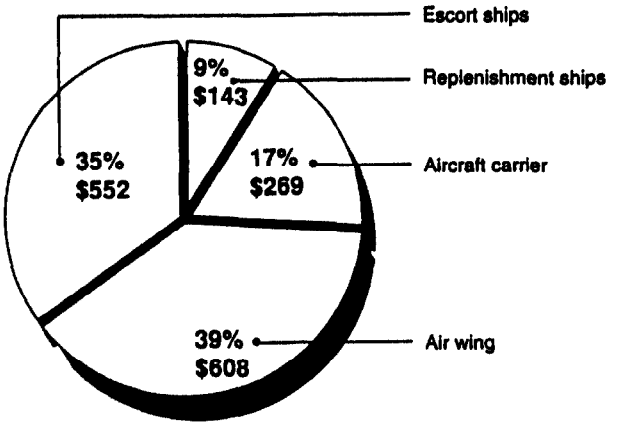
Source: Our analysis of Navy and GAO data.

Of the carrier battle group's major components, the carrier air wing has the largest combined acquisition and operating and support costs for the battle group, about 39 percent. The combatant escort ships, including their aircraft, also comprise a large share of the group's costs, about 35 percent annually (see fig. IV.2). However, the air wing has the largest annualized acquisition cost, and the combatant escorts have the largest annual operating and support costs.

Figure IV.2: Percentages of Total Annualized Costs for Fiscal Year 2000 Carrier Battle Group Components

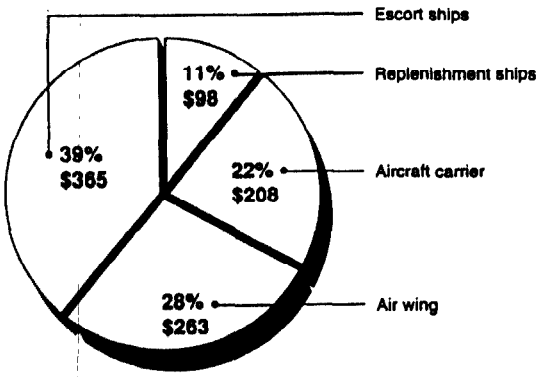
Fiscal year 1990 dollars in millions

Total operating and support and acquisition



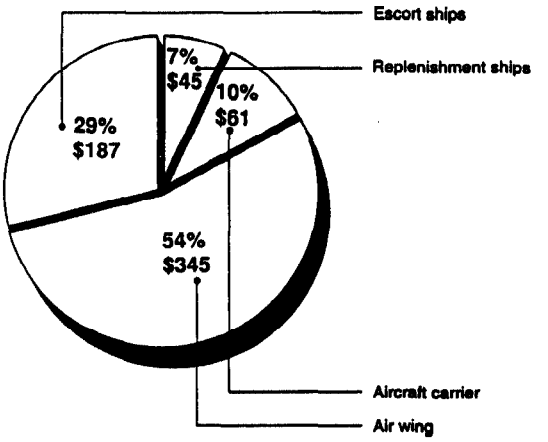
Total = $1571

Operating and support



Total = $933

Acquisition



Total = $638

Note: Numbers may not add due to rounding. Nuclear fuel costs are included under operating and support and not acquisition.

Source: Our analysis of Navy and GAO data.

Information on Past Carrier Deployments to Major Overseas Regions

Since the late 1940s, the Navy has principally deployed its carrier battle groups to the Mediterranean Sea and western Pacific Ocean regions to maintain a U.S. presence.[1] These deployments have been made largely to address the threat posed by the Soviet Union to the security and stability of these regions. While maintaining presence in the regions, the battle groups are positioned to respond quickly to crises.[2]

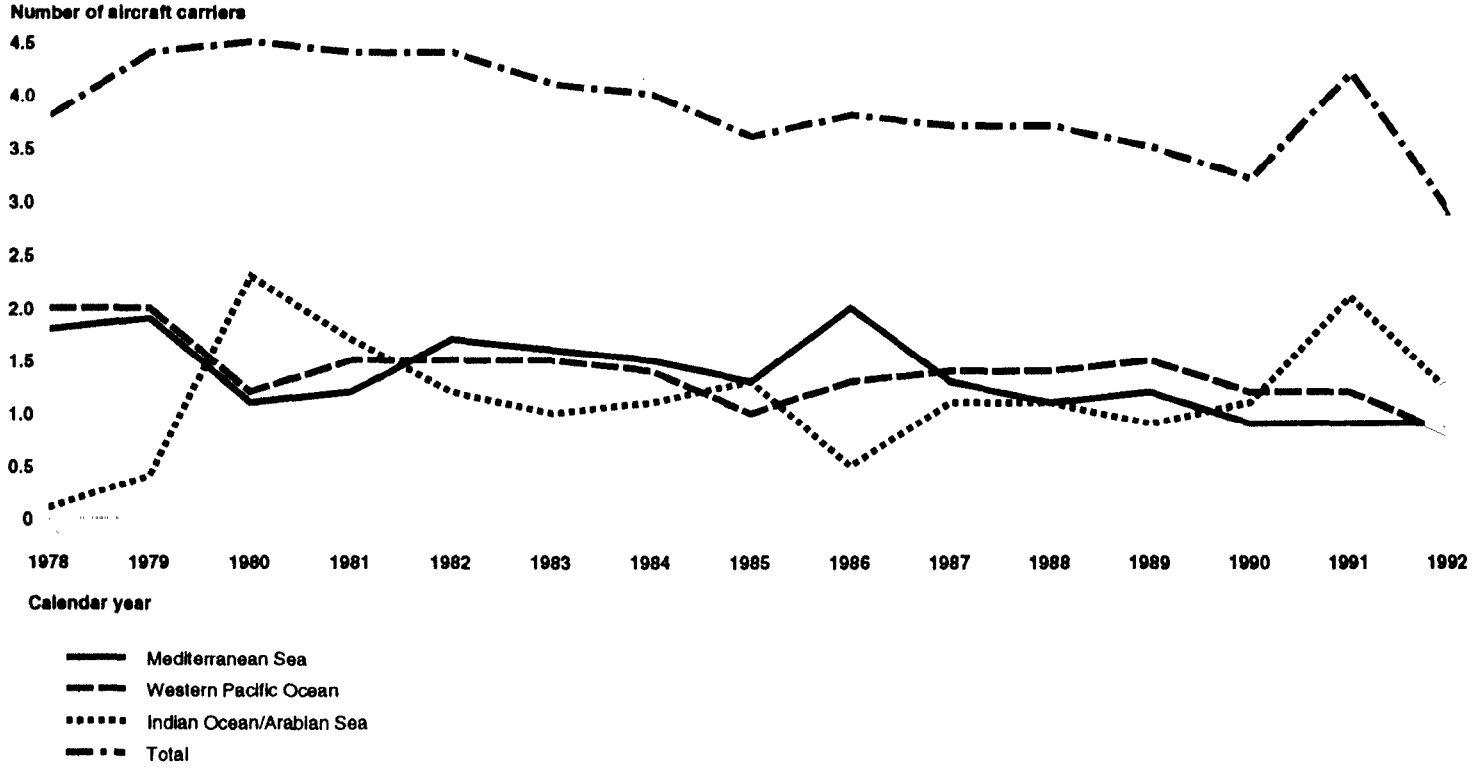
Before 1979, the Navy deployed battle groups to the Indian Ocean/Arabian Sea region for an average of about 3 months each year. In 1979, the Navy began to maintain a battle group on a near-continuous basis in this region due to the increasing instability and volatility of the region. These deployments have focused on maintaining a battle group near or in the north Arabian Sea to provide an immediate U.S. military response to crises and protect major sea routes.

Throughout the 1980s, an average of four aircraft carriers were deployed annually to the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea regions, as shown in figure V.1. In addition, the Navy deploys battle groups, although less frequently and for shorter durations, to other regions, such as the north Atlantic Ocean and the Caribbean Sea, for peacetime presence, training, or crisis operations.

[1]Presence is the most common peacetime mission of the Navy. It involves positioning carrier battle groups, or other naval forces, in areas that are important to U.S. national security interests. The goal of presence is to maintain a positive influence to promote American influence and regional access, enhance stability and cooperation, lend credibility to alliances and security commitments, and provide a capability to respond to potential threats. While in the region, naval forces conduct combined exercises and operations, port visits, and military-to-military relations.

[2]According to a 1989 report by the Navy's Center for Naval Analyses, since the end of World War II, naval forces have played a major role in at least 187 U.S. military responses to international incidents and crises. Aircraft carriers were used in 67 percent of these responses.

Figure V.1: Annual Aircraft Carrier Deployment Levels Since 1978



Note: Because these deployment levels include the amount of time it takes to arrive and return from a region, the actual number of carriers that operated in a region during the year is somewhat lower.

Source: Our analysis of Navy data.

Aircraft Carrier Employment Cycle Factors and Requirements

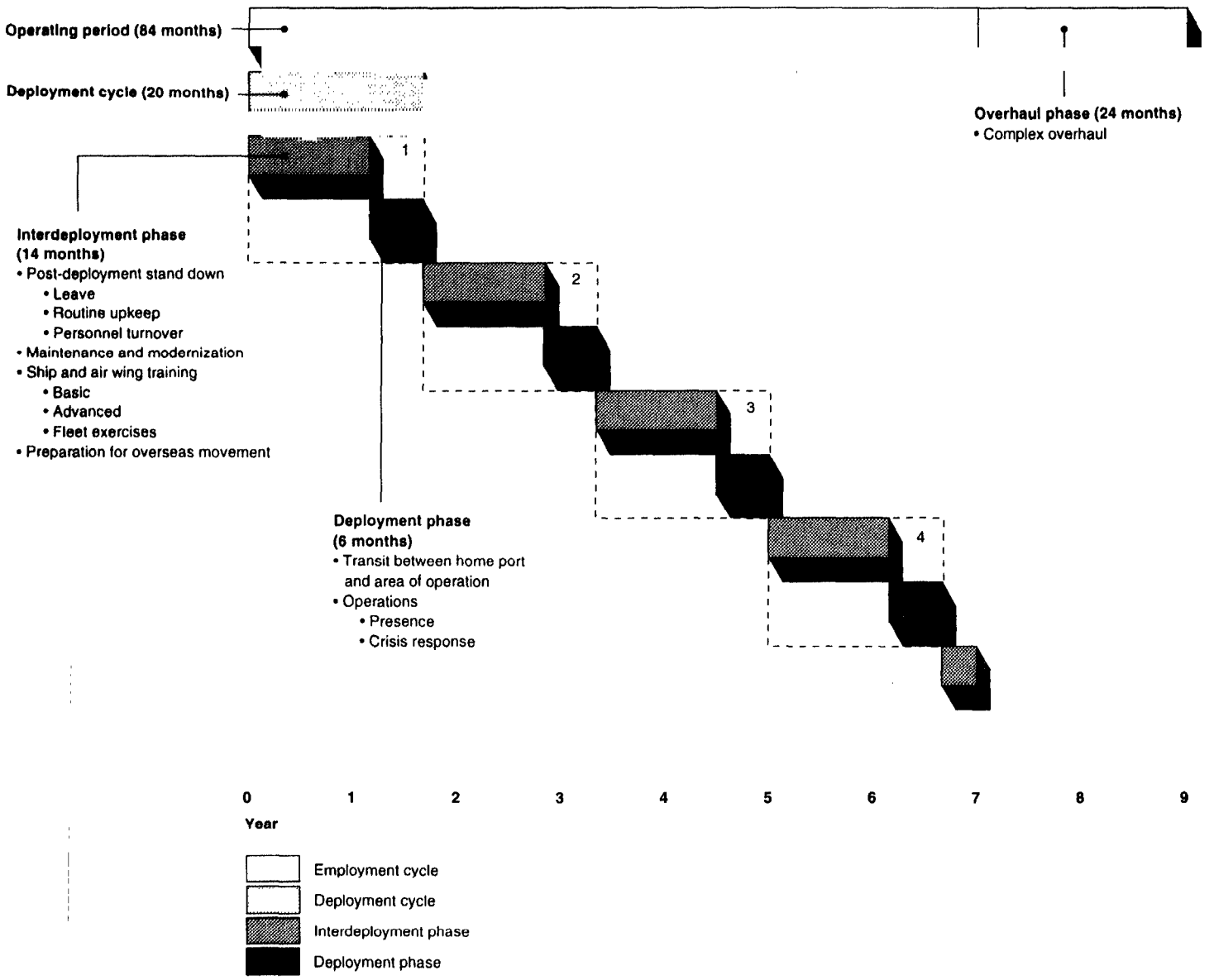
Aircraft carrier requirements are influenced by several factors that reflect the Navy's operational, maintenance, and personnel policies. These factors include the length of a deployment, transit times, the time between deployments, and the ship's maintenance requirements. They can affect the availability of carriers for deployment, which, in turn, determines the overseas presence that can be maintained.

Employment Cycle

The operational availability of an aircraft carrier is determined by its employment cycle, which the Navy uses as a planning baseline for its operating forces. The cycle begins after the carrier is built or has completed a major overhaul or nuclear refueling and continues through completion of the next major overhaul. The cycle will repeat several times during the operational life of the ship, and its length will vary depending on the type of ship. The employment cycle for a nuclear carrier is 9 years, as shown in figure VI.1.[1]

[1]Since the carrier force is shifting to mostly nuclear-powered ships, we have limited the concepts and analyses discussed in this appendix to nuclear carriers. However, the concepts and analyses can also be applied to conventional carriers.

Figure VI.1: Employment Cycle for a Nuclear Aircraft Carrier



Note: The Navy plans an extra 4-month interdeployment phase after the last deployment for local area operations, which includes fleet readiness squadrons qualifications, special national celebration operations, and operational test and evaluation requirements. In actual practice, this time is spread throughout the operating period.

Source: Navy.

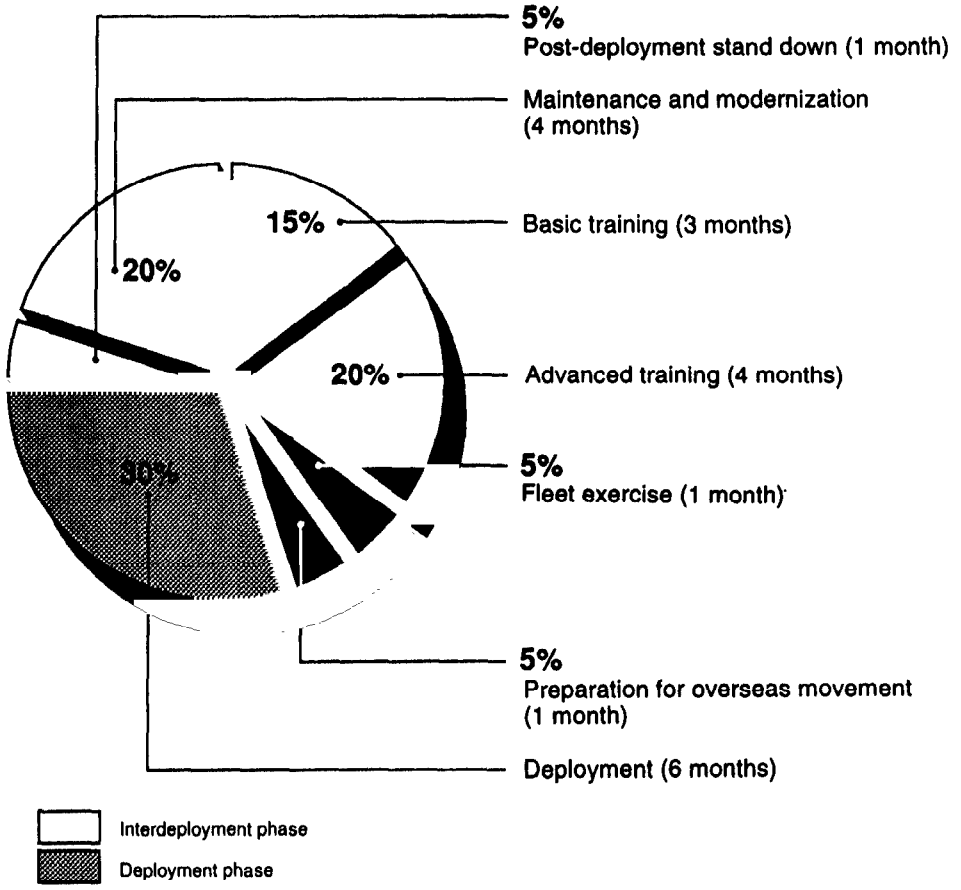
The employment cycle is divided into two activities: the operating period and the overhaul phase. Seven of the 9 years of a nuclear carrier's employment cycle will be spent in the operating period; 2 years will be spent in the overhaul phase. The operating period has four deployment cycles, during which the carrier is readily available for successive deployments.[2]

Each deployment cycle has an interdeployment phase followed by a deployment phase. During the interdeployment phase, which lasts about 14 months, the ship undergoes maintenance and its personnel participate in training activities so that both the ship and its personnel are ready for a subsequent deployment. Additionally, this phase allows the ship's personnel to take leave and spend time in their home port. Once the ship reaches the necessary level of operational readiness, the ship deploys for up to 6 months.[3] According to the Navy, maintenance and training requirements and human resource considerations during the interdeployment phase limit the length and frequency of deployments. Figure VI.2 shows the major activities of the deployment cycle and the average time spent in each.

[2]The employment cycle for a conventional carrier is 6 years, which consists of an operating period of 5 years and an overhaul phase of 1 year. The operating period has three deployment cycles.

[3]A ship is considered deployed when it operates away from its home port continuously for at least 56 days, beginning when the ship leaves its home port and ending when it returns.

Figure VI.2: Activities Associated With an Aircraft Carrier's Deployment Cycle



Source: Navy.

During the first month after a carrier returns from a deployment (post-deployment stand down), up to one-half of the crew may take leave, and the remaining crew will continue to perform their normal duties and assist in the upkeep of the ship. Also, some of the ship's personnel will begin rotating to other assignments, and new personnel will begin reporting to the ship.

After the post-deployment stand down, the carrier will normally be placed in a shipyard for 3 to 6 months for maintenance and modernization, which include preventive maintenance, repairs, and equipment upgrades to the

ship's capabilities.[4] Additionally, throughout the ship's life, personnel will continuously perform routine maintenance to keep equipment that does not require extensive repair or overhaul in an operable condition.

As maintenance and modernization nears completion, the ship's personnel will undergo about 8 months of basic and advanced training to increase their readiness for the next deployment. Because about one-third of the battle group's personnel will rotate to other assignments between deployments, training at schools and at sea is necessary to ensure personnel proficiency. The training is progressively accomplished at the individual, unit, and battle group levels and is designed to gradually increase in complexity as individuals learn and practice their jobs within their units and as units are assembled into the battle group. Before deployment, the entire battle group will conduct a fleet exercise at sea to demonstrate its operational readiness for deployment.

After preparing for overseas movement, which includes provisioning, inspections, and repairs, the carrier battle group will begin its deployment. Once the deployment has been completed, this cycle will repeat three more times. In addition, at the completion of the nuclear carrier's last cycle, the Navy plans an extra 4 months of local area operations, which include fleet readiness squadrons qualifications, special national celebration operations, and operational tests and evaluation requirements. In actual practice, these 4 months are spread throughout the operating cycle, which provides an average of 15 months rather than 14 months for each interdeployment phase.

After the operating period is completed, the carrier enters the overhaul phase.[5] This phase includes a complex overhaul, which is conducted in a shipyard to perform significant repairs and modernization. The overhaul is necessary to ensure the operational reliability, war-fighting capability, and sustained overall readiness of the ship during its subsequent operating period. One complex overhaul during the life of the ship will be extended by several months so the ship's nuclear fuel can be replaced.[6]

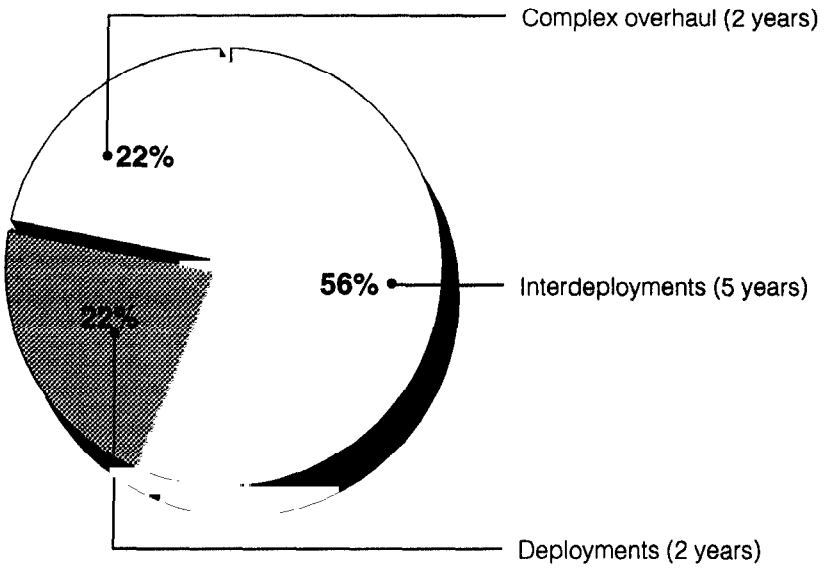
[4]After the first and second deployments, a nuclear carrier will undergo a short shipyard overhaul, called Selected Restricted Availability, lasting about 3 months. After the third deployment, the ship will undergo another shipyard overhaul, called Docking Selected Restricted Availability, lasting about 6 months. These short shipyard periods allow the ship's overall maintenance and modernization to be spread over the employment cycle without significantly affecting the ship's operational availability.

[5]A nuclear carrier will spend almost one-third of its life in a shipyard for major maintenance and modernization. In contrast, a conventional carrier will spend less than one-fourth of its life in a shipyard.

[6]The Navy currently predicts that a Nimitz-class carrier may require only one nuclear refueling during its expected operating life of about 50 years. This refueling will occur around the 25th year.

Figure VI.3 shows the percent of time and the total number of years spent by a nuclear carrier in the overhaul, deployment, and interdeployment phases of the employment cycle.

Figure VI.3: Time Spent by a Nuclear Aircraft Carrier in Phases of Its Employment Cycle



Source: Our analysis of Navy data.

PERSTEMPO Policy

During peacetime, the availability of a carrier during its operating period is affected by the Navy's policy on PERSTEMPO. PERSTEMPO refers to the minimum amount of time during the ship's operating period that personnel must spend in their home ports compared with the time they spend at sea and in other ports. Time spent in the overhaul phase is not included in PERSTEMPO time.

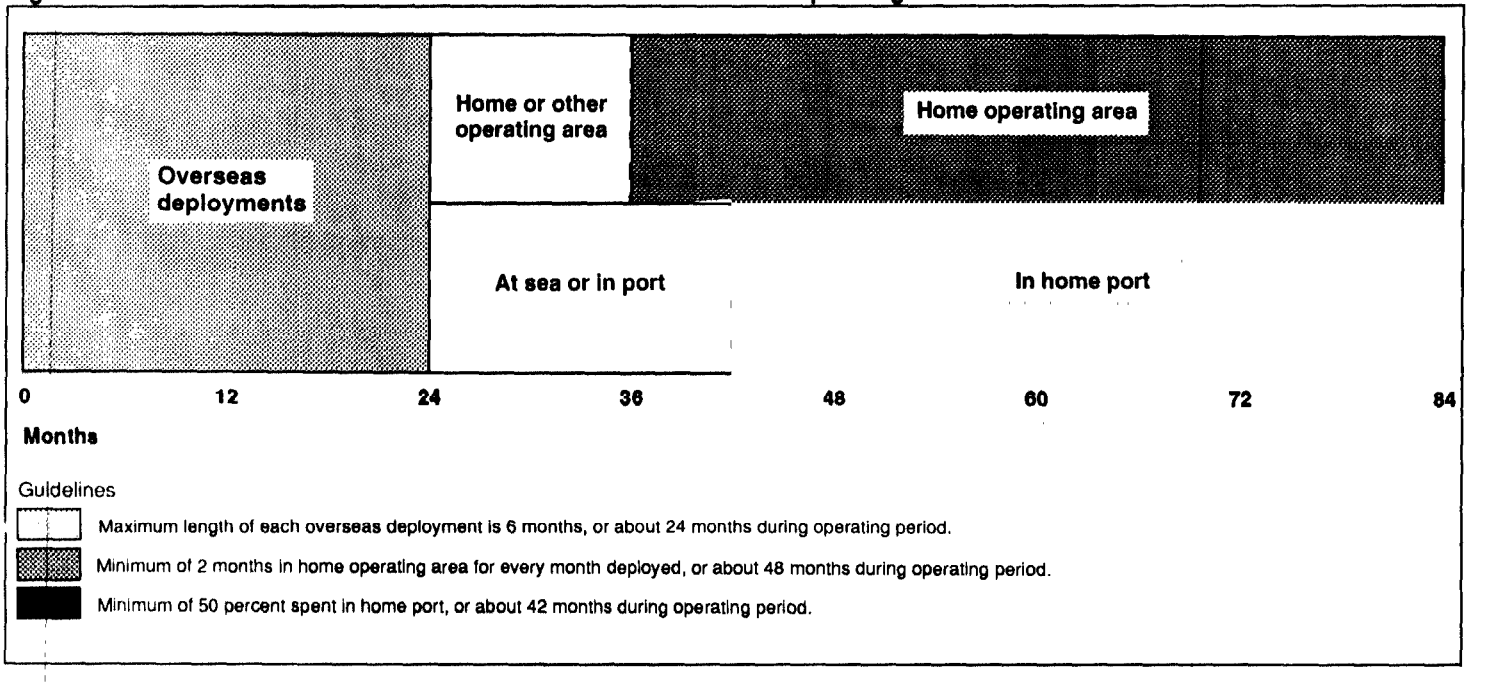
In October 1985, the Chief of Naval Operations established the current PERSTEMPO guidelines in response to concerns about excessive periods at sea. The guidelines have three specific goals, which are as follows:

- The length of any deployment, including transit time, will not exceed 6 months.

- Before beginning a new deployment, ship personnel will spend a minimum of 2 months in their home port operating area for every month the ship was deployed.
- The ship and its personnel will spend a minimum of 50 percent of the time during a recurring 5-year period in their home port. The 5-year period will be continuously monitored and consist of the 3 prior years and 2 future years.[7]

According to Atlantic Fleet officials, these goals help to keep up the morale of Navy personnel and maintain acceptable retention levels in an all-volunteer military. Figure VI.4 shows how the PERSTEMPO guidelines influence the amount of time during a nuclear carrier's operating period.

Figure VI.4: Effect of PERSTEMPO Guidelines on a Nuclear Carrier's Operating Period



Source: Our analysis of Navy data.

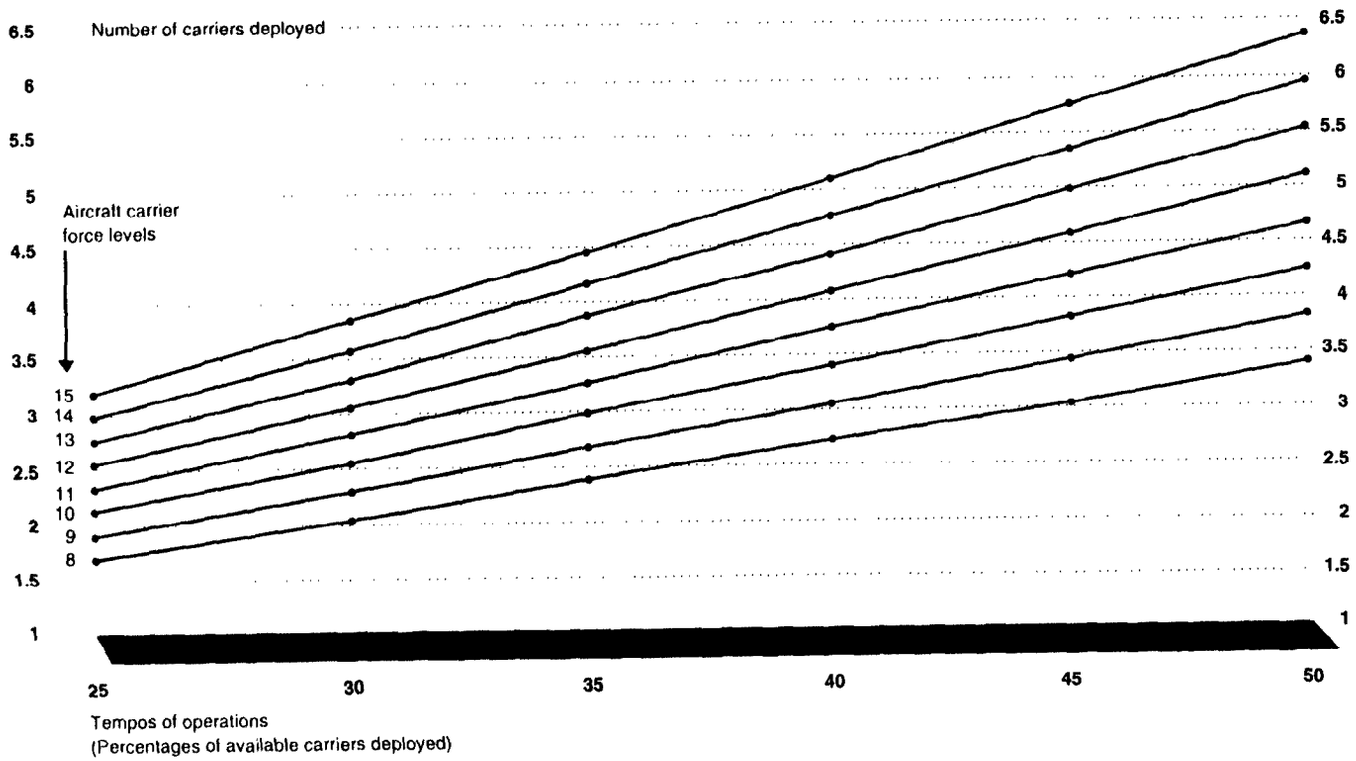
[7]The carrier battle group based in Japan has the same PERSTEMPO goals as those based in the continental United States.

Except during Operations Desert Shield and Desert Storm, the Navy has adhered to the PERSTEMPO goals since their implementation. During Operations Desert Shield and Desert Storm, the Navy temporarily suspended the goals because of the increased number of deployed ships and air wings. The Secretaries of Defense and the Navy have unequivocally expressed support for the Navy's PERSTEMPO goals as force structure changes are made.

PERSTEMPO goals influence the tempo of operations—the number of ships in the force deployed at a given time—by limiting the length of deployments and requiring a minimum time in home port and home operating area for its personnel. On the basis of the PERSTEMPO goals, the Navy has established the tempo of operations for its deployable units[8] during peacetime at about 30 percent. At this tempo, slightly more than 3 carriers would be deployed at a force level of 12 carriers. The number would drop to about two carriers at a force level of eight carriers. Although an increase in the tempo of operations would increase the number of carriers deployed, it would reduce the time between deployments. Significant increases in tempo would require changes in PERSTEMPO goals. Figure VI.5 shows the impact of changing the tempo of operations at various force levels on the number of carriers that are deployed.

[8]The Navy considers about 85 percent of the active carrier force available for deployment, or deployable. The remaining carriers —on average about 15 percent—are undergoing major maintenance and modernization at any given time. For example, at a force level of 12 active carriers, about 10 are considered deployable.

Figure VI.5: Tempos of Operations at Various Aircraft Carrier Force Levels



Source: Our analysis of Navy data.

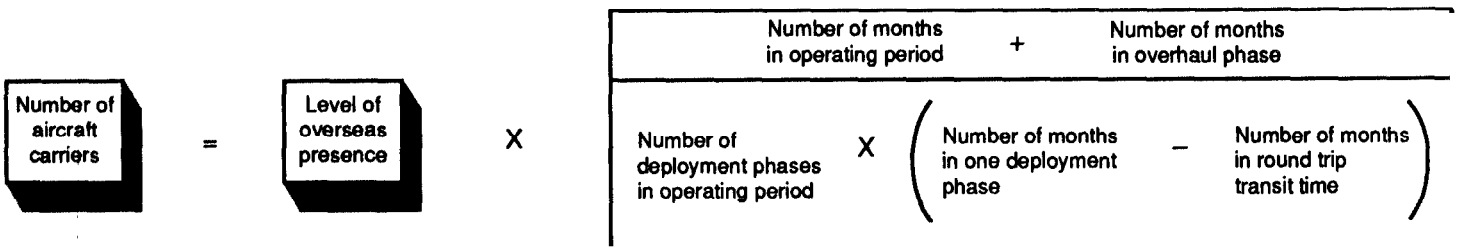
Aircraft Carrier Requirements Model

The Navy uses a model to determine its aircraft carrier requirements for specific geographic locations. The model considers the time spent by carriers, or presence, in a particular region; the length of the operating period, overhaul phase, and deployment phase; the round-trip transit time, including stops, between the carrier's U.S. home port and the area of operation; and the number of deployments in the ship's operating period.[9] When the numbers for each of these factors are incorporated into the model, the Navy can determine the number of carriers needed to maintain

[9]The model is applied to aircraft carriers deployed from U.S. home ports. Because the carrier based in Japan is located in its deployment area and has an employment cycle that permits a higher availability than those carriers based in the United States, the requirement to meet a continuous presence is one carrier.

one carrier in that region for a given level of presence.[10] Figure VI.6 shows the requirements model.

Figure VI.6: Aircraft Carrier Requirements Model



Source: Navy.

For example, assume that a 1.2 carrier presence during a given year[11] is required in the Mediterranean Sea region. When this number and the numbers for the other factors are incorporated into the model (84 months in an operating period, 24 months in an overhaul phase, four deployments during the operating period, 6 months in one deployment phase, and 0.7 months in round-trip transit time to the region), the Navy can determine that about six nuclear carriers are needed to maintain the presence level for that region:

$$6.1 \text{ carriers} = \begin{matrix}1.2 \text{ years of} \\ \text{presence}\end{matrix} \times \frac{84 \text{ months} + 24 \text{ months}}{4 \times (6 \text{ months} - 0.7 \text{ months})}$$

[10]The right portion of the model can also be expressed as the length of the employment cycle divided by the total deployment time spent by carriers in an operating area during the cycle. This portion yields the number of carriers required to maintain a continuous deployment of a battle group in a region.

[11]Presence level can also be described in days. To determine the number of days required, the presence level is multiplied by 365 days. For example, a 1.2 presence level is equal to 438 days during a given year. This means that if one carrier is in the Mediterranean Sea region continuously, the Navy could also have a second carrier in the region for at least 73 days (0.2 presence level) of that year. The days could also be allocated so that two carriers could be in the region for 219 days and none for the rest of the year.

The requirements for nuclear carriers will vary between regions due to two factors in the model: the level of presence and the round-trip transit time. The other factors in the model are constant, since they are determined by the employment cycle and PERSTEMPO goals.

Information on the Capabilities of Current Surface Combatant and Attack Submarine Classes

Current surface combatant and attack submarine classes have significant capabilities in the strike, antiair, antisurface, and antisubmarine warfare areas. Tables VII.1 and VII.2 provide some of the major capabilities of cruisers, destroyers, and frigates and nuclear attack submarines in the force or planned as of the end of fiscal year 1992, respectively. Specific capabilities of individual ships or groups of ships in a class may vary.

Table VII.1: Selected Capabilities Comparisons of Surface Combatant Classes

					Warfare area		
					Strike	Antiair	Antisurface
					Number of missiles		
Class	Initial operational capability date	Embarked aircraft	Major combat system	Number of vertical launching system cells	Tomahawk	Standard	Harpoon
Cruiser							
Leahy (CG-16)	1962	None	NTU	0	0	80	8
Belknap (CG-26)	1964	1 SH-2F	NTU	0	0	60	8
Ticonderoga (CG-47)	1983	2 SH-60B	AEGIS	122	← 0-122 mix →		8
Long Beach (CGN-9)	1961	None	Other	0	8	120	8
Bainbridge (CGN-25)	1962	None	Other	0	0	80	8
Truxton (CGN-35)	1967	1 SH-2F	Other	0	0	54	8
California (CGN-36)	1974	None	NTU	0	0	80	8
Virginia (CGN-38)	1976	None	NTU	0	8	60	8
Destroyer							
Spruance (DD-963)	1975	2 SH-60B	NSSMS	61	0-61	0	8
Charles F. Adams (DDG-2)	1960	None	Other	0	0	34	6
Farragut (DDG-37)	1960	None	Other	0	0	40	8
Arleigh Burke (DDG-51)	1991	Planned	AEGIS	90	← 0-90 mix →		8
Kidd (DDG-993)	1981	1 SH-2F	NTU	0	0	52	8
Frigate							
Knox (FF-1052)	1969	1 SH-2F	NSSMS	0	0	0	8
Oliver Hazard Perry (FFG-7)	1977	2 SH-60B	Other	0	0	36	4

Note: NTU, New Threat Upgrade; NSSMS, NATO Seasparrow Surface Missile System. Not all ships in the Belknap (CG-26) cruiser class are equipped with the New Threat Upgrade. Also, specific capabilities of ships in each class, including other weapons and combat systems, will vary because of modifications and upgrades.

Source: Our analysis of multiple source data.

Table VII.2: Selected Capabilities Comparisons of Nuclear Attack Submarine Classes

			Warfare area		
			Strike	Antisurface	Antisubmarine
			Number of missiles		
Class	Initial operational capability date	Number of vertical launching system cells	Tomahawk	Harpoon	Number of Torpedoes
Sturgeon (SSN-637)	1967	0	← 0-25 mix →		
Los Angeles (SSN-688I)	1988	12	12-37	← 0-25 mix →	
Seawolf (SSN-21)	1996	0	← 0-57 mix →		

Note: On the SSN-688I attack submarines, every Tomahawk missile carried as a torpedo stow will replace a Harpoon cruise missile or torpedo. Also, specific capabilities of submarines in each class, including other weapons and combat systems, will vary because of modifications and upgrades.

Source: Our analysis of multiple source data.

Comments From the Department of Defense

Note: GAO comments supplementing those in the report text appear at the end of this appendix.

OFFICE OF THE UNDER SECRETARY OF DEFENSE

WASHINGTON, DC 20301-3000

ACQUISITION

3 AUG 1992

Mr. Frank C. Conahan
Assistant Comptroller General,
National Security and
International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "NAVY CARRIER BATTLE GROUPS: The Structure and Affordability of the Future Force," dated June 25, 1992 (GAO Code 394368), OSD Case 9117. The Department concurs with some of the findings presented, but only partially concurs or non-concurs with others. In addition, the Department non-concurs with the suggestion to the Congress.

The Department's primary concerns about the draft report fall into four general themes. First, the use of annual amortized costs to represent potential savings from alternative battle group structures is potentially misleading. Such a methodology does not reflect the fact that many of these costs are "sunk" and cannot be "saved" in the near term, and that actual expenditures typically occur in "peaks and valleys" rather than averages.

Second, options for reduced carrier levels, with presence missions performed by alternative naval task forces, are presented without an adequate discussion of the risks associated with those options. In particular, surface action groups deployed overseas without aircraft carriers, while a useful complement to carrier battle group deployments, have potentially serious limitations. That is particularly significant in cases where organic air capability would be needed on the scene quickly, as presence missions transition rapidly to crisis response and potential combat. In addition, the GAO representation of the ability to "surge" carriers in a crisis and sustain their operations overseas is overly optimistic.

Third, the Department emphasizes that the Base Force of 12 deployable carrier battle groups, plus one training carrier, is sized to meet the minimum needs for peacetime presence, crisis response, and warfighting capability to support the new regionally oriented national defense strategy.

Fourth, delaying the FY 1993 advance procurement funds for the nuclear-powered aircraft carrier scheduled for authorization

in FY 1995 (CVN-76) would have a serious impact on producers of nuclear components, which is a key element of the industrial base.

Detailed DoD comments on the GAO findings are provided in the enclosure. The Department appreciates the opportunity to comment on the draft report.

Sincerely,

FOR John D. Christie
Director, Acquisition Policy
and Program Integration

Enclosure

GAO DRAFT REPORT - DATED JUNE 25, 1992
(GAO CODE 394368) OSD CASE 9117

"NAVY CARRIER BATTLE GROUPS: THE STRUCTURE AND AFFORDABILITY OF THE FUTURE FORCE"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

- **FINDING A: New Defense Strategy and Base Force.** The GAO reported the Bush Administration plan to restructure the Military calls for (1) reducing the number of active duty aircraft carriers from the FY 1990 level of 15--to 12 aircraft carriers by FY 1995 and (2) maintaining that level through the end of the decade. The GAO explained that the high cost of acquiring and operating carrier battle groups may require additional reductions of the carriers and their associated battle groups, and an examination of other force options to accomplish future security objectives.

  The GAO reported that significant political and military changes in the former Soviet Union have diminished greatly the threat to U.S. national survival, which had provided the rationale for U.S. force requirements, planning, and expenditures. The GAO concluded that, today, there is little likelihood of a massive, short-warning attack by the new Commonwealth of Independent States against the U.S. and its allies, or the prospect of a global war in the foreseeable future. The GAO observed that, in August 1990, President Bush announced a new defense strategy--which shifts the focus of defense planning away from the threat of global war to a variety of threats in major regions of consequence to U.S. interests--particularly Europe, Southwest Asia, and East Asia. The GAO reported that, according to the DoD, threats are likely (1) to involve more than one nation, (2) to be unconventional in character, and (3) possibly to develop suddenly and unpredictably (e.g., the Iraq invasion of Kuwait) into smaller-scale regional crises. The GAO noted that such threats are becoming more dangerous because of the proliferation of advanced weaponry among an increasing number of countries--including chemical, biological, and nuclear capabilities. The GAO explained that the President's strategy focuses on the following:

Enclosure

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- strategic nuclear deterrence and strategic defense;
- overseas presence;
- crisis response; and
- reconstitution to establish the basis for future force requirements and employments. (pp. 16-17/GAO Draft Report)

Now on pp. 14-15.

DoD Response: Concur. The GAO analysis of the new military strategy is essentially correct. However, it must be emphasized that the four pillars upon which the strategy is built--strategic nuclear deterrence and strategic defense; forward presence; crisis response; and force reconstitution--are all interrelated. The strategy is based upon the concept that the U.S. military supports overall U.S. national security policy on many different levels, and does not achieve its usefulness only when major hostilities threaten. In its discussion of the requirements for naval forces, the GAO implies that the imperatives of forward presence, crisis-response missions, and warfighting requirements are unrelated. In fact, U.S. forces have often transitioned from routine presence in forward areas to crisis response to combat and back again--often with very little warning or time to prepare. That is an important factor in evaluating the types of forces most appropriate to carry out forward presence missions.

- **FINDING B: Impact of Base Force on Future Force Structure.** The GAO reported that, in its FY 1992 budget, the Administration proposed a plan, called Base Force, to implement the President's new defense strategy. The GAO explained that the base force is considered the minimum force structure required to address future regional contingencies against various potential threats. The GAO observed that Naval battle forces assigned to the Atlantic and Pacific Forces, particularly carrier battle groups, figure prominently in implementing the Administration plan for peacetime presence and crisis response. The GAO noted that those forces would also become important elements of the Contingency force during escalating crises. The GAO concluded that, although the planned Naval battle forces are smaller in size, their roles and employment appear to have changed little from Cold War requirements.

  The GAO concluded that, as a result of growing Federal debts, rising interest payments on the national debt,

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Now on pp. 15-18.

and other domestic spending priorities, significant additional cuts in Defense spending--beyond those envisioned in the Base Force proposal--are likely to be required over the next several years. The GAO pointed out that, in the late 1980s, the Navy budgets exceeded $100 billion each year, but the Defense program shows the Navy budget will be $68 billion by FY 1997. (pp. 17-21/GAO Draft Report)

DoD Response: Partially concur. The GAO notes that the roles and employment of U.S. naval forces in the new U.S. defense strategy "appear to have changed little from Cold War requirements." That is a misperception. In particular, the roles of U.S. naval forces in the new defense strategy have changed substantially in the post-Cold War era and their employment is being adjusted as well.

Not only has the size of U.S. naval forces been reduced to reflect a changing international environment attendant with the fall of the Berlin Wall in November 1989 and the subsequent dissolution of the Soviet Union and Warsaw Pact, but the focus of the Naval Service has changed to reflect the new realities. The emphasis is no longer on the Cold War Maritime Strategy and all that it entailed. Instead, today's Naval Service emphasizes operations in littoral areas of the world, directly influencing events ashore, deterring and containing crises, and protecting U.S. property and citizens overseas.

> The operational context of the Naval Service has changed as well. Throughout much of the Cold War, naval forces operated on the seaward "flanks" of large, forward-deployed U.S. ground armies and air forces deterring the Soviet threat. It so happened that some areas to which the Navy deployed, such as the Mediterranean Sea, also were adjacent to other regions of instability threatening U.S. interests beyond the U.S.-Soviet context. Consequently, the Navy's forward-deployed battle groups performed two major roles: supporting the North Atlantic Treaty Organization and Japan in the face of a Soviet threat, and being able to respond to "lesser" contingencies in their forward operating areas.

Now, however, the challenges to U.S. foreign and security policies no longer emanate from a well-armed, aggressive Soviet Union. Instead, future threats are likely to spring from states, subnational groups, or combinations of the two that aspire to dominate areas or disrupt interests of importance to the United States. The absence of a Soviet threat does not mean that the United States will not have to concern itself with

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"unsophisticated" weapons and systems; those, too, warrant continued reliance on advanced systems and tactics. The challenges of open-ocean operations now shift to the challenges of littoral theaters, shallow water, mine warfare, and the land-water interface. The current and future threats that the United States will face also have access to technologically advanced, sophisticated, and lethal weaponry.

The Navy's employment and deployment patterns are no longer fashioned by commitments driven by a Soviet threat. Likewise, the areas of potential hostilities are no longer located in areas where the United States maintains deployments of large ground and air forces. In many cases, this means that U.S. naval forces will play a major role in securing access to an area for other forces, as opposed to operating on the "flanks" of a well-developed theater. Additionally, the ongoing reduction of overseas bases for U.S. ground and air forces increases the relevance of maritime forces. The employment of U.S. naval forces is changing in other ways to reflect the new defense strategy, as noted in the draft report (and summarized below in Finding E).

See comment 1.

With regard to the treatment of future budgets, it is unclear how the GAO arrived at an estimate of $68 billion (FY 1990 dollars) for the FY 1997 Navy budget. The Department of the Navy budget, which includes the Marine Corps, is currently projected at $71 billion (FY 1990 dollars), while the Navy budget alone will be approximately $64 billion.

- **FINDING C: Cost of an Aircraft Carrier Battle Group.** The GAO reported that an aircraft carrier battle group, including associated logistics support ships, costs almost $1.5 billion each year to acquire, operate, and support. The GAO noted that operating and support costs accounted for about 60 percent (about $900 million) of the battle group annual expenses, while annualized acquisition costs accounted for the other 40 percent (about $600 million). The GAO also observed that about 35 percent (over $300 million) of the battle group annual operating and support costs were for the Military personnel assigned to command, operate, maintain, and support the ships and aircraft in the group. The GAO projected that a notional carrier battle group in FY 2000 will cost about $1.6 billion--an increase of about 10 percent.

The GAO further reported that, in FY 1990, the Navy had a mix of different carrier air wings--but, by FY 1996, the Navy plans to have only one type, the Power

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Projection. The GAO found that the carrier air wing is the most expensive element of the cost of a carrier, accounting for about 40 percent ($587 million) of the total annualized FY 1990 cost. The GAO noted that the annualized cost of the Power Projection air wing is about $608 million each. The GAO reported that, when the carrier air wing force stabilizes in FY 1996, with eleven active Power Projection air wings, the force will have a total annualized costs of about $6.7 billion--$3.8 billion for annualized acquisition of aircraft and $2.9 billion for operations and support. The GAO observed that the cost of acquiring future carrier air wings is expected to be about $6 billion in annualized acquisition costs for aircraft. (pp. 22-25/GAO Draft Report)

Now on pp. 18-21.

DoD Response: Partially concur. The GAO cost analysis is based on the use of annual amortized acquisition costs. Although the method has some utility for showing rough, long-term costs of different types of forces, it is not appropriate for evaluating near-term budget decisions because it does not reflect sunk costs or the timing of replacement costs. The annualized method has been shown to overstate actual yearly expenses and potential savings by as much as 65 percent (also see Findings H and I). In the near term, eliminating carrier battle groups would save only annual operating and support costs, because once carriers join the fleet, their procurement costs represent "sunk" costs, which cannot be "saved." There would be no savings in replacement costs until some time in the future, when new replacement carriers and other battle group ships were actually needed and budgeted. That consideration is not appropriately taken into account in the draft report.

Given the cited disparities and the fact that the GAO estimate of $1.5 billion for the annual amortized acquisition and operation and support costs of a notional carrier battle group is the basis for all subsequent cost comparisons in the draft report, there is reason to doubt the ultimate usefulness of such comparisons.

The GAO annualized methodology also fails to take into account actual "cash-flow" for the collective investment streams in the Navy budget. "Peaks" and "valleys" above and below the historical average always exist and must be taken into account, especially when calculating then-year or present-value (i.e., FY 1990) dollars. Such fluctuations also provide the flexibility to move funds among different investment accounts and stay within overall budget ceilings and obligational authority. For example, the 1980s represented a period of relatively high investment in new ships and aircraft. During the

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draw down from 15 to 12 carrier battle groups now under way, investment in new systems can be lower than the "annualized average," as indicated by the relatively low levels of investment in the current Future Years Defense Program. Thus, during the current period, elements of the GAO annualized cost estimates are not available for "savings" even if the carrier force were to be reduced still further in size from the planned level of 12 carriers.

On a broader level, the Navy acquires ships, aircraft, submarines and infrastructure to maintain a broad range of naval capabilities. Those assets, some of which become--for a time--part of carrier battle groups, are also used in other naval task forces. They can range in size from a single ship engaged in drug surveillance, to multi-unit maritime action groups. So cost estimates for "notional" battle groups must be viewed in that context.

- FINDING D: Lower Carrier Levels Will Reduce Presence Provided By Battle Groups. The GAO reported that a force of 15 carriers can maintain a continuous presence of a carrier in each of the major regions--the Mediterranean Sea, western Pacific Ocean, and Indian Ocean/Arabian Sea. The GAO noted that the planned FY 1995 level of 12 aircraft carriers will still be able to provide a significant overseas presence by carrier battle groups, but at lower levels than in the past. The GAO explained, however, that at force levels below 15 carriers, it becomes increasingly difficult to maintain a continuous carrier presence in more than two regions. The GAO observed that, at the planned level of 12, the Navy can provide 76 to 90 percent overall regional presence--depending on the distribution of the carriers among the regions. The GAO further observed that, even at a level of six carriers, overall carrier presence in the regions noted remains above 50 percent. (pp. 26-30/ GAO Draft Report)

Now on pp. 23-26.

DoD Response: Partially concur. The Base Force of 12 carriers reflects a changed reality in both the domestic and international environments. It is balanced between the President's mandate to maintain naval forces in three important regions of the world--the Mediterranean, the Persian Gulf/Indian Ocean, and the western Pacific--and the fiscal constraints that the United States currently faces.

Twelve carriers cannot maintain a full-time presence in all of the areas. For that reason, in August 1991 the Joint Chiefs of Staff adopted a policy of "flexible forward presence." The new policy means that there will

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be occasional gaps in carrier coverage, which is an acceptable risk in light of the reduced threat in some areas. The gaps are sometimes filled by the alternative naval task forces, such as the maritime action groups and sea control battle groups described in GAO report. The current exception is that a carrier will be present full time in the Persian Gulf area.

The Navy carrier force has been, and continues to be, driven by the warfighting requirements of the regional Commanders in Chief. Naval forces have utility in meeting the National Military Strategy requirement for forward presence--which, in turn, allows them to respond rapidly in a crisis. It is the combination of presence, crisis response, and warfighting requirements that drives the overall size of the carrier force. With a force of less than 12 carriers, the Navy will be unable to meet current requirements for flexible forward presence.

Currently, the Navy keeps one of its carriers--presently the USS *Independence*--forward home ported in Yokosuka, Japan, a location that shaves thousands of miles off distances to operating areas in the Western Pacific and Indian Ocean. That carrier can be counted as forward deployed, except when it is in dry-dock, which might be less than three months out of every 20. Covering the Western Pacific thus requires a Pacific-coast carrier less than 15 percent of the time.

- **FINDING E: Navy Strategies to Increase Fleet Utilization.** The GAO reported that the Navy is beginning to explore and implement alternatives to a smaller carrier force, including (1) decreasing the number of combatant escorts assigned to a deployed battle group, (2) coordinating and combining the deployments of carrier battle groups and amphibious readiness groups, (3) incorporating attack submarines into the training and deployment of the battle group, and (4) increasing the flexibility and coverage of deployments by dispersing the battle group over larger areas and not rigidly maintaining the group in a particular region. The GAO found that, in addition, the Navy is adapting its deployment strategies to exploit the capabilities of available joint U.S. and allied forces to augment the dispersed naval presence.

  The GAO also found that, to meet overseas commitments with a decreasing force, the numbers of combatant and submarine escorts assigned routinely to a battle group are being reduced from seven or eight to four or five. The GAO observed that the Navy introduced greater flexibility into the number and types of ships assembled

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for each new battle group to better match the regional security situation.

The GAO further found that the deployments of amphibious readiness groups, consisting of several amphibious warfare ships, are being coordinated and combined with those of carrier battle groups to reduce deployment requirements. The GAO noted that the number of amphibious ships in the amphibious readiness group will be reduced from five to three--as newer, more capable ships enter the fleet. The GAO also reported that submarines are now fully integrated into carrier battle group deployments. The GAO observed that, under the changed policy, submarines will train and deploy with the battle group.

The GAO indicated that, during deployment, the carrier battle group also can be split into smaller configurations of ships to provide more extensive coverage of the region. The GAO explained that two force configurations currently being evaluated are (1) the maritime action group and (2) the sea control battle group. The GAO reported that the maritime action group is the smallest configuration, consisting of two surface combatants and one attack submarine--with the sea control battle group configured the same as the maritime action group, except that it includes one or more amphibious assault ships, such as a *Wasp* or *Tarawa* class ship. (pp. 31-33/GAO Draft Report)

Now on pp. 26-27.

DoD Response: Concur. In response to a shrinking budget and the reduction in the size of the fleet as a whole, the Navy is studying alternative ways to employ all of its assets. That review process is not only a response to a smaller carrier force, but also addresses overall force flexibility to meet the needs and challenges of the new international environment. The Navy developed innovative organizing principals for its units; Maritime Action Groups and Sea Control Battle Groups are geared to accomplish specific missions by capitalizing on their expeditionary capabilities. For instance, in 1991, the ability of carriers to support a small Marine Corps Air-Ground Task Force was tested during a noncombatant evacuation exercise. The carriers were able to support the 400 Marines and ten assault helicopters, simultaneously providing a defensive air umbrella and close air support.

- **FINDING F: Aircraft Carrier Surge Capabilities.** The GAO reported that, during crisis or war, the Navy can increase the number of carriers available for deployment by accelerating maintenance and training activities

during a ship inter-deployment phase. The GAO noted that the minimum amount of time required before a carrier can surge depends on the activity it is engaged in during the inter-deployment phase. The GAO pointed out that a result of the acceleration is that a carrier may deploy at a slightly less than optimum readiness level, with minor deficiencies that will not degrade the ship and crew ability to meet mission requirements. The GAO explained that another aspect of surge capability is how quickly a ship can reach its destination once it deploys, which depends largely on transit speed and distance.

See comment 2.

The GAO learned that, at force levels of eight or more carriers, a significant portion of the force can be either deployed or capable of surging to overseas areas in relatively short periods of time. The GAO noted, for example, that a 12-carrier force could have seven carriers deployed or capable of deploying within 30 days. The GAO observed that an eight-carrier force could have seven carriers deployed or capable of deploying within 60 days. The GAO concluded that, in the event of a crisis, a carrier force comparable to that deployed to the Persian Gulf region during OPERATIONS DESERT SHIELD AND DESERT STORM, could be deployed overseas relatively quickly. The GAO further concluded that an eight carrier force could have five carriers deployable immediately and a total of seven carriers deployed within 3 months. (pp. 33-39 and p. 73/GAO Draft Report)

Now on pp. 27-32 and pp. 64-65.

DoD Response: Nonconcur. The GAO presents an overly optimistic picture of carrier battle group surge capability. The number of carriers that could be surged at any given time would be a function of several factors, including maintenance and training cycles. The GAO appears to have calculated potential surge capability on the basis of unrealistic assumptions, including the near-term availability of carriers scheduled for inactivation.

Moreover, surge capability is not the only measure of carrier combat capability. Just as important is the ability of a carrier force to sustain combat operations in distant regions vital to U.S. security interests. In the long run, a 12-carrier force permits battle groups to rotate periodically between forward operating areas and home ports in the United States (and Japan, in the case of the one carrier home ported overseas). The ability to sustain overseas operations--even for short periods--is important during a prolonged crisis, as the fighting edge of crews and the material condition of ships and aircraft deteriorate over time. And, as was shown during the mid-to-late-1970s, when operating and personnel tempo guidelines are ignored and forward deployments

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consistently exceed six months, personnel retention is severely degraded.

In many circumstances, the ability to maintain carriers on station before, during, and after hostilities can be as important as being able to surge a large number of carriers for a short period of time (one example is the sustained, multi-carrier presence the United States maintained in Far Eastern waters during the Korean War and its aftermath). Not every international problem will be closed out in seven months, as the 1990-1991 Gulf crisis was.

Moreover, carriers that are theoretically available to surge will not have completed their training--which, in turn, degrades their combat capability. To a certain extent, that was the case with USS *John F. Kennedy* during Operation Desert Shield. Only after she was deployed, and had the opportunity to train in-theater, was she actually fully prepared to go to war. Future crises may not afford U.S. forces the luxury of a lull in which to train. In general, carriers that surge should have completed much of their pre-deployment training.

- **FINDING G: Alternating Other Naval Forces With Carrier Battle Group Deployments in Providing Necessary Overseas Presence.** The GAO concluded that the Navy can provide overseas naval presence and crisis response by using other naval force configurations. The GAO explained that those configurations could be alternated with carrier battle group deployments in providing overseas presence or be relied on solely for providing overseas presence and initial crisis response, and have carriers augment these forces when necessary. The GAO observed that both alternatives shift the reliance from groups centered around a carrier to those centered around major surface combatant or amphibious ships for meeting regional security requirements. The GAO noted that, essentially, the alternatives suggest deploying the battle group without the carrier. The GAO concluded that the options imply that the carrier capability may not always be necessary to provide a credible peacetime presence and an effective crisis response in overseas regions. The GAO further concluded that increased reliance on other naval forces could require fewer overseas carrier deployments and eventually a smaller carrier force.

The GAO Reported that the surface combatants, submarines, and amphibious ships now entering the fleet are significantly more capable both offensively and defensively than those that made up the majority of the

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force during the Cold War. The GAO further reported that newer and upgraded surface combatants increasingly are capable of operating independently, with self-defense and offensive capabilities in almost every mission area, including (1) anti-air, (2) anti-surface, (3) strike, and (4) antisubmarine warfare. The GAO observed that the most significant changes in surface combatant capability have been the additions of the TOMAHAWK cruise missile, the AEGIS anti-air weapon system, and the vertical launch system. The GAO reported that, currently, the Navy has 49 surface combatants and 69 submarines equipped with TOMAHAWK cruise missiles. The GAO noted that, by the year 2000, 86 ships and 64 submarines will have Tomahawk capability. The GAO observed that, during OPERATION DESERT STORM, a total of 288 TOMAHAWKS were fired against Iraq. The GAO concluded, however, that the analysis of the success rate of the launches against the intended targets is hampered by the lack of complete battle damage assessment data. The GAO reported that, according to the Navy, the TOMAHAWK range permits launching against targets on over three-fourths of the world land areas. The GAO also found that the TOMAHAWK has some operational limitations that are being worked on and some of the resulting upgrades will begin appearing in the fleet later this year. (pp. 39-47/GAO Draft Report)

Now on pp. 32-40.

DoD Response: Partially concur. The GAO contends that naval task forces centered around major surface combatants or amphibious ships can be "alternated with carrier battle group deployments in providing overseas presence" or can "be relied upon solely for providing overseas presence and initial crisis response." Meanwhile, carriers would "augment these forces when necessary."

There is no doubt that, as the GAO states, "[t]he surface combatants, submarines, and amphibious ships now entering the fleet are significantly more capable both offensively and defensively than those that made up the majority of the force during the Cold War." Task-organized units have been employed, under specific and delimiting circumstances, to provide overseas presence. But the GAO did not place those capabilities in any type of operational context, including consideration of the potential threats to naval surface forces. Nor did the GAO adequately address the varying degree of *risk* associated with reduced numbers of carriers or alternative battle group employment concepts and patterns. The risk would stem from the lack of organic air capabilities possessed by Surface Action Groups and the longer periods of time for carriers to reach trouble spots if numbers were reduced or overseas deployments reduced still further.

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Although surface combatants, attack submarines, and amphibious ships are highly capable, they may not be able accomplish all the tasks that U.S. forces will have to carry out early in a serious crisis. And carriers or other supporting air forces deploying to "augment" such forces may not arrive soon enough to make a difference in many situations. The presence mission cannot be evaluated in isolation from crisis response and warfighting missions, because the transition from a presence role to a crisis response or combat role can occur virtually instaneously. Forces assigned to the presence mission must be evaluated with that important consideration in mind.

Operation Desert Shield provided insight into specific military tasks the United States may have to undertake in future crises. Had Iraq invaded Saudi Arabia, U.S. forces would have faced some immediate imperatives, including securing the sea and air lines of communication into the theater, defending or capturing ports and airfields through which U.S. forces and logistics could pass, slowing down and disrupting enemy forces until the U.S. could build up its own combat power, and blockading an enemy's exterior lines of communication.

On August 2, 1990, eight surface combatants (in effect, a large surface action group roughly similar to the maritime action group described by the GAO) of the Joint Task Force Middle East were in the Persian Gulf. They provided a useful presence, but it is clear that they could not have successfully carried out all of the tasks mentioned above without air support from carriers or in-theater land-based air forces. For that reason, two forward deployed aircraft carriers, *Independence* in the Indian Ocean and *Eisenhower* in the Mediterranean Sea, were ordered to close the area within 5 days of Iraq's invasion of Kuwait. Aircraft from the carriers, operating with Saudi and two squadrons of U.S. Air Force fighters, provided critical air defense to Saudi Arabia. Air Force aircraft flew cover over Riyadh and the interior of the country, while Navy aircraft protected the lines of communication and key ports in the Gulf through which the massive coalition build-up would pass.

Moreover, the carrier air wings included offensive aircraft that could have struck strategic targets in Iraq such as airfields, air defenses, command-and-control facilities, and storage depots for Iraqi weapons of mass destruction, to name a few. Just as critically, those aircraft also could have provided invaluable support to the light U.S. forces on the ground that were attempting to blunt and delay the Iraqi army, while reinforcements were rushed to the theater.

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Had carriers been concentrated in their U.S. home waters waiting to augment other task forces, rather than forward deployed, the capabilities available to U.S. forces in the early days of the crisis would have been more limited. Surface ships armed with Tomahawk land-attack cruise missiles would have been able to carry out only some of the many critical tasks mentioned above. They would have been well-suited to patrolling the southern Persian Gulf and launching Tomahawk strikes against some strategic targets. They would not have been as well suited to supporting beleaguered U.S. troops on the ground, striking mobile targets and formations, or providing reconnaissance on Iraqi movements both in the Gulf and ashore.

Additionally, even such highly capable ships would have faced a variety of threats. Their situation would have become even more precarious if the Iraqis had overrun Saudi airfields to which Air Force aircraft were deploying. At that point, the United States would have lost the ability to maintain unbroken combat air patrols over the Gulf -- at least until carriers made the 15-day journey from the U.S. east coast and the 21-day transit from the west coast.

Beyond its impact on crisis response capabilities, reducing or eliminating routine carrier deployments would curtail many of the advantages the United States currently derives from exercises with the armed forces of allies and other regional powers--an important consideration in this era of coalition warfare. Good familiarity with local operating conditions and with each other's equipment permits U.S. and allied forces to integrate smoothly in the event that combined combat operations ever become necessary, as was the case in the Persian Gulf in 1991. Such familiarity is even more important if a crisis escalates quickly, plunging U.S. and allied forces into early combat.

Now on p. 26.
See comment 3.

The GAO report states (page 31) that "[t]hroughout the 1980s, the Navy consistently deployed an amphibious ready group to each of the three major regions..." The Navy, in fact, did not routinely deploy an amphibious ready group to the Indian Ocean.

(See also the DoD responses to Findings B, D, E, and F.

- **FINDING H: Possible Surface Action Groups and Amphibious Readiness Group Configurations.** The GAO observed that a surface action group is centered around a cruiser or destroyer, consists of two or more surface combatants--

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and may include attack submarines. The GAO noted that, like carrier battle groups, the actual number and type of ships assembled for each deployment will depend on the likely threats and available assets. The GAO reported that an amphibious readiness group, centered around a *Tarawa*- or *Wasp*-class amphibious assault ship, includes three or more amphibious and one or more surface combatants equipped with the AEGIS weapon system and TOMAHAWK capability. The GAO further observed that an attack submarine could also be assigned to the group.

The GAO reported that, as the number of carriers is reduced, the assets formally assigned to the battle group will be used to form the surface action groups. The GAO noted that the number of surface combatants and submarines in the force structure should, therefore, remain the same or decrease slightly. The GAO concluded that, if a lower presence in the three regions were possible, the number of carrier battle groups or surface action groups could be reduced. (The GAO noted that its analysis did not include Naval force requirements for other world areas, such as the Caribbean Sea.)

The GAO also reported that the cost of the surface action group is significantly less than the carrier battle groups. The GAO observed, for example, that the annualized cost of an eight carrier force level with six surface action groups, including aircraft, would be about $4.4 billion less than a 12-carrier force level with two surface action groups ($17.298 billion versus $12.862 billion). (pp. 47-51/GAO Draft Report)

Now on pp. 40-43.

DoD Response: Nonconcur. The GAO comparisons of alternative naval forces address only *cost* differences, without taking *effectiveness* into consideration. That is especially important in cases where forces performing presence missions must transition virtually instantaneously to a crisis response or combat role.

The maritime action groups and sea control battle groups described by the GAO as potential *replacements* for carrier battle groups are, indeed, important *components* of a balanced naval task force. They can be organized for specific tasks and missions under certain circumstances. But they incorporate neither the power projection capacity nor the deterrent value of a carrier battle group. The carrier provides presence that includes immediate and sustainable crisis response.

Another significant shortcoming is either a complete or relative lack of defensive air cover compared with carrier task forces. That is critically important in regions where other U.S. forces are not available to

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ensure air superiority. For a maritime action group (with no sea-based tactical air support at all), lack of air capability can be a problem even during peacetime operations, as many aircraft acquired on radar must also be visually identified. Moreover, in the event of hostilities, even a sea control battle group with its small complement of Harriers, will require air support.

In the Falklands War of 1982, the British, operating a force of two small carriers--with air wings actually larger (12-20 Sea Harriers) than that aboard an LHA or LHD in a sea control battle group (10-14 AV-8B Harriers)--found that they suffered from some major shortcomings. The small size of their air wings meant that they could not maintain around-the-clock airborne fighter coverage. Probably even more crucial was their lack of any airborne early warning. U.S. task forces based around an LHA/LHD would also face those problems. Land-based aircraft may sometimes be available for support, but if their cost and the cost of their support systems are included, much of the savings that the GAO ascribes to the alternative naval concepts would evaporate.

It should also be noted that the GAO is incorrect in stating that during peacetime amphibious ready groups routinely include "one or more surface combatants equipped with the AEGIS weapon system and Tomahawk capability." This is not to say that the Navy would not include such assets in an amphibious ready group, if so required; it is simply that the Navy today does not "routinely" do so.

The GAO cost analysis, using the annualized approach (as discussed in Finding C), overstates the difference between the cost of eight carrier battle groups and six surface action groups ($12.862 billion) and the annualized cost of 12 carrier battle groups and two surface action groups ($17.298 billion). The comparison exaggerates potential savings from reducing four carrier battle groups in two ways. First, including two Surface Action Groups with the 12-carrier force uses a different, more expensive total force structure as a basis of comparison than is used throughout the rest of the study. Second (as discussed in the DoD response to Finding C), the use of annualized costs overstates possible savings by the amount of the sunk acquisition costs. Based on the example below, reducing a 12-carrier force to eight carrier battle groups plus six Surface Action Groups would save only $2.13 billion--the annual operating and support costs for four carriers, five air wings, and two submarines.

	Escort Ships	Submarines
12 CVBGs + 2 SAGs	80	26
8 CVBGs + 6 SAGs	72	22

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As indicated by the above example, the DoD does not agree with the GAO cost comparisons and considers the conclusions derived from them to be invalid.

The GAO concludes incorrectly that only seven future active air wings can be afforded because future air wings for a 12 carrier force will cost about "60 percent more than those for the same force level" in 1992 (also see Finding J). The GAO cost analysis--using annualized average costing to amortize aircraft (and ship) acquisition costs over a 30-year period--overstates actual yearly expenses and potential savings by as much as 65 percent, as shown above.

- **FINDING I: Relying Solely on Other Naval Groups.** The GAO indicated that the Navy could rely solely on the employment of naval groups, such as surface action groups and similar non-carrier configurations, to provide the necessary regional naval presence and crisis response capabilities. The GAO observed that, under such an option, aircraft carriers would remain near their U.S. home ports in varying states of readiness to enable rapid deployment at high speeds to a crisis area to join on-station naval forces.

  The GAO observed that, in order to maintain the proficiency and readiness of the carrier and air wing crew, the carriers would be scheduled to train and exercise with surface action groups before each group deploys. The GAO noted that the carriers would, however, remain behind to continue training and exercising with other forces. The GAO further observed that, if required by the security situation, carriers could make selective deployments with a battle group to overseas regions. The GAO concluded that, with fewer overseas presence requirements placed on carriers, lower carrier force levels than currently planned would be possible. The GAO reported that the number of surface action groups necessary would be about 14, including those assets formally assigned to carrier battle groups. The GAO further concluded that such an approach would support a nearly continuous naval coverage in each of the three major regions. The GAO also found that, if the Navy were to maintain 14 surface action groups along with either six or eight carriers, the annualized costs of the forces would range from about $9.6 billion to $11.3 billion, respectively. (pp. 52-53/GAO Draft Report)

Now on pp. 43-44.

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Now on pp. 41 and 43.

DoD Response: Nonconcur. The GAO formula for the total number of groups needed to meet overseas presence requirements (i.e., number of carriers + number of surface action groups = 14; Tables 2.5 and 2.6, pages 50-51) misleadingly hides an overall loss of capability, creates a false comparison of unequal battle groups, and overstates potential savings. This is because a carrier added to the alternative Surface Action Group that the GAO describes still does not have an escort group or warfighting capability equal to the original carrier battle group. In fact, eight carriers plus 14 Surface Action Groups provides a less capable total force than even the eight-carrier battle group plus six Surface Action Group force discussed in Finding H.

	Escort Ships	Submarines
12 CVBGs	72	24
8 CVBGs + 6 SAGs	72	22
8 CVs + 14 SAGs	56	14

Deploying a carrier to join a four-escort, one-submarine Surface Action Group would not provide the same warfighting capability as a full carrier battle group that includes six escorts, two submarines, and one combat support ship. Using the GAO annualized costs in Table 1.2, the additional ships necessary to get equal capability to the carrier battle group would increase the cost of the carrier plus Surface Action Group by $230 million, as shown below:

Combat Support Ship	$56M
1 Submarine	$70M
1 Cruiser	$65M
1 Destroyer	$39M
Total of 4 Ships	$230M

Assuming the GAO cost analysis were correct--and the DoD does not agree with the specific approach employed--an additional $230 million per surface action group would be needed to account for the missing battle group elements (1 SSN, 2 escorts, and 1 AOE/R).

In addition to those cost considerations, the DoD does not agree that the concept of operations associated with the eight carrier plus 14 Surface Action Group approach would be practical for the reasons already discussed in the DoD responses to Findings D, F, G, and H.

- **FINDING J: Important Budget Decisions Depend on Future Carrier Force Levels--Funding the Next Nuclear Carrier.** The GAO concluded that a number of costly decisions regarding force structure have to be made over the

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next several years. The GAO noted that the Navy, in its FY 1993 budget, requested $832.2 million (then-year dollars) in advance procurement funding for the next nuclear carrier, the ninth *NIMITZ*-class--which is scheduled to begin construction during FY 1995. The GAO reported that, if built, the carrier will cost about $4.2 billion (then-year dollars).

The GAO also reported that a number of new naval aircraft will be acquired to replace and upgrade the aging fleet. The GAO estimated that, with acquisition costs expected to be much higher than current aircraft, future active air wings for a 12-carrier force will cost about 60 percent more than those for the same force level today. The GAO calculated that seven future active air wings for eight carriers will cost the same as eleven active air wings for twelve carriers today. The GAO reported that the Navy intends to invest over $11 billion in FY 1993 for carrier battle group elements--including ships, aircraft, and weapons. The GAO also concluded that reducing the frequency and duration of operations and training of carrier battle groups will not provide significant reductions in operating and support costs. In summary, the GAO concluded that the Navy only will achieve substantial budget savings by reducing the number of carriers, carrier-based aircraft, and escort ships.

The GAO asserted that the future size of the carrier force impacts decisions on (1) the procurement of a ninth *Nimitz*-class carrier, (2) the retirement of conventional carriers, and (3) the procurement of new carrier-based aircraft. The GAO concluded that, given the cumulative costs of those decisions, the Navy may not be able to sustain a 12-carrier force. The GAO further concluded that the size and affordability of the carrier force necessary to meet the national defense strategy needs to be defined more clearly before making pending production decisions. (pp. 54-55/GAO Draft Report)

Now on p. 49.

DoD Response: Nonconcur. While the DoD agrees with the GAO that "important budget decisions depend on future carrier force levels," the estimated Navy budgets for FY 1994 and future years take those critical issues into account.

See comment 4.

The GAO estimate of the cost of CVN-76 is identical to that presented in the CVN-68 December 31, 1991, Selected Acquisition Report. However, the figure of $11 billion that the GAO states will be spent on battle group elements in FY 1993 is highly uncertain, since the definition of "battle group elements" could vary considerably.

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The GAO estimate that future air wings could cost 60 percent more than current air wings is driven by the cost of the AX. That aircraft has not yet reached Milestone I of the acquisition process and is still being defined. And affordability--as well as capability--is an important consideration in the tradeoff analyses currently under way for the program. Consequently, any estimates of its ultimate cost must be considered preliminary and highly uncertain at this time.

The President and his civilian and military advisors have determined that the Base Force requires 12 active carriers for today's regionally oriented strategy. That determination is based upon the inputs of the regional Commanders-in-Chief concerning the naval forces they need to carry out their assigned missions.

As noted in the DoD response to Finding C, the GAO annual methodology also fails to take into account actual "cash-flow" for the collective investment streams in the Navy budget.

Another key factor the GAO did not consider in sufficient detail was the life extension programs being undertaken by the Navy for existing tactical aircraft, such as the F-14, F/A-18, A-6, E-2, and EA-6B. Those programs provide a relatively low-cost way to maintain force levels to fill out the 11 carrier air wings.

(Also see the DoD responses to Findings C, G, and I.)

- **FINDING K: Authorization Request for Construction of the Next Nuclear Carrier.** The GAO reported that, according to the Navy, building another *Nimitz*-class nuclear carrier, as planned, will allow it to maintain a highly capable carrier force--even as the number of carriers is reduced to twelve. The GAO found that, more importantly, the Navy argues that construction of the CVN-76 is critical to maintaining the nuclear shipbuilding base. The GAO concluded that the Navy argues that canceling or delaying the carrier would (1) adversely affect a large number of jobs and companies throughout the country and (2) impact particularly the nuclear construction capability at Newport News Shipbuilding and Drydock Company--the only shipyard capable of building *Nimitz*-class nuclear carriers. The GAO also concluded that delaying construction will result in increased costs for the next new carrier.

The GAO found, however, that at the same time the Navy is requesting another carrier, it is removing a conventional carrier before the end of its useful service life. The

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GAO observed that, under current force structure plans to maintain a 12-carrier level, one other nuclear carrier will need to be authorized and funded later in the decade and two more through FY 2005.

Moreover, GAO identified four factors that will have an impact upon the future size of the carrier force: (1) procurement of a ninth *Nimitz*-class carrier; (2) the retirement of conventional carriers; (3) the refueling of the *Nimitz*-class carriers; and (4) the procurement of new carrier-based aircraft. The GAO noted that the Navy is refueling its first nuclear carrier, *Enterprise*. This ship is expected to reenter the fleet in 1994 and have about 20 additional years of operating life. The GAO stated that in FY 1998, the Navy will begin an overhaul and refueling of *Nimitz*, a process expected to last two and a half years and cost about $2.3 billion (then-year dollars). The GAO observed that the Navy is requesting $6.8 million (then-year dollars) in its fiscal 1993 budget for the advance procurement of long-lead items for the refueling. It noted that other *Nimitz*-class carriers will follow, so that at least one nuclear carrier will be undergoing refueling in a shipyard for the next 24 years. (pp. 55-57/GAO Draft Report)

Now on pp. 50-51.

DoD Response: Partially concur. There is a significant industrial base argument to be made for approving advanced procurement for the ninth *Nimitz*-class carrier (see the Matter for Congressional Consideration, below).

After its refueling/complex overhaul, a nuclear carrier's longevity has been increased by at least 20 years. It is also a more modern, safer, capable ship, receiving upgrades of its electronics, command-and-control, damage control and other systems.

Now on p. 51.
See comment 5.

A footnote on the bottom of pages 58 and 59 of the draft report states: "The Navy has recently discovered cracks in the containment plates of the *Enterprise*'s nuclear reactor. This could delay completion of the overhaul by several months and increase its cost. Before this problem occurred the overhaul and refueling was expected to cost about $1.9 billion." The footnote is inaccurate. It is apparently derived from an unsubstantiated article that appeared in the April 20, 1992, Navy Times. No cracks have been found in reactor vessels or reactor containment structure in the *Enterprise*.

See comment 6.

It should also be noted that the GAO carrier force level projection shown in Table II.1 is incorrect, inasmuch as it indicates future force levels greater than 12 carriers after the turn of the century. The Navy has a well-structured carrier replacement program that will maintain the FY 1995 Base Force of 12 active carriers and one

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training carrier. The program will see the replacement on a one-for-one basis of older, and less capable conventional aircraft carriers with the most modern nuclear-propelled ships; as the new ships join the fleet, the older ships will be retired, thus maintaining the Base Force of 12 carriers.

Also note that the current plan for replacement carrier procurement anticipates two additional carriers after CVN-76 through FY 2005, rather than the three carriers implied by the GAO draft report.

- **FINDING L: Cost of New Naval Aircraft Could Impact the Affordability of Carriers.** The GAO reported that, as Defense and Navy budgets decline during the next decade, naval aviation will be under intense scrutiny as large development and procurement budgets are proposed, particularly since billions of dollars in past expenditures have not resulted in substantive force structure changes or modernization. The GAO asserted that the cancellation of several costly Navy aircraft development programs during the 1980s--such as (1) the A-12 Advanced Tactical Aircraft, (2) the Navy Attack Tactical Fighter, (3) the F-14D fighter aircraft upgrade, (4) the Advanced Tactical Support Aircraft, (5) the A-6F/G medium-attack aircraft upgrade, (6) the P-7A long-range antisubmarine patrol aircraft, and (7) several P-3 submarine patrol aircraft upgrades--have strained funding resources and delayed introduction of newer, more capable aircraft into the fleet.

  The GAO found that the cost of replacing large quantities of older carrier-based aircraft with similar or modernized versions, such as the F/A-18E/F fighter/attack aircraft and the AX Advanced Strike Aircraft, could impact the affordability of carriers or affect adversely carriers from deploying with full complements of aircraft. The GAO reported that each F/A-18E/F is currently estimated to cost about $49 million (FY 1990 dollars), and the Navy plans to purchase about 1,000 aircraft. The GAO observed that the total development and acquisition costs for these aircraft would be about $54 billion, not including anticipated, but not yet defined, upgrades and modifications. The GAO also noted that the Navy estimated the AX to cost about $14 billion to develop through FY 2004. The GAO reported that, based on Congressional Budget Office estimates, procurement unit costs for each aircraft will be at least $105 million--or $65 billion to support future carrier air wings. The GAO noted that, in addition, the Navy also is planning a number of life extension programs for existing combat and support aircraft.

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The GAO estimated that the acquisition costs of eleven future active carrier air wings comprised of F/A-18E/F and AX aircraft will cost about 60 percent more than a similar force today. The GAO concluded that, if the Navy were to sustain air wings at current funding levels, it would only be able to afford enough air wings for an eight-carrier force in the future. (The GAO noted that the acquisition costs of two reserve air wings are not included, but similarly will be more costly than those of today.) The GAO further concluded that, unless the Navy decreases the number of carriers, increases funding for carrier aviation, or develops more affordable replacement aircraft, it will experience increasing difficulty in the future deploying its carriers with full complements of aircraft.

The GAO noted that the House Armed Services Committee leadership recently proposed a restructuring of Defense tactical aircraft acquisition priorities, because the Pentagon plans were flawed in that "they won't give us the planes we need when we need them and even if they did, we wouldn't have the money to pay for them." The GAO noted that the leadership also indicated that the plans "...may have worked when we had lots of money and a relentless Soviet threat to match...," but "...we have neither now." (pp. 58-62/GAO Draft Report)

Now on pp. 52-54.

See comment 7.

DoD Response: Partially concur. The GAO correctly reported the F/A-18E/F acquisition cost and procurement objective, but overstated the current development and acquisition cost estimate for the AX. In FY 1990 dollars, the current development cost estimate for the AX is approximately $11 billion, compared to the $14 billion cited by the GAO. Concerning the estimated F/A-18E/F cost, the GAO observed that acquisition cost would be "about $54 billion, not including planned, but not yet defined, upgrades and modifications." These costs are not included because there is no specific, defined upgrade program for the Hornet E/F at this time. In addition, all DoD affordability studies have taken into account the requirements to outfit the two reserve wings as well as the 11 active wings.

It should also be noted that, although the GAO made mention that the House Armed Services Committee proposed a restructuring of tactical aircraft acquisition priorities, the House Appropriations Committee did not agree and supported the Administration FY 1993 requests and acquisition strategies.

Although future investment resources for naval aviation modernization will be constrained, the DoD will be able

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to manage the force and maintain sufficient numbers of aircraft to support the 12-carrier force. Among the approaches the Department is pursuing to address that issue are measures to extend the service life of existing tactical aircraft.

- **FINDING M: Reducing Operating Tempo Has Less Potential for Cost Savings Than Reducing Forces.** The GAO concluded that the greatest potential for realizing cost savings is by reducing forces rather than reducing operating tempo because (1) the most significant operating and support costs are fixed expenses and (2) reductions in force mitigate long-term replacement costs and reduce requirements for expensive undergraduate pilot training. The GAO pointed out that an aircraft carrier (not including the air wing) costs between $180 million and $210 million to operate and support annually--but a 20 percent reduction in operating tempo for a force of 12 carriers reduces costs by less than $40 million annually. The GAO further concluded that, reducing the overall force level, lessens requirements for immediately acquiring new carriers, such as the $4.2 billion (then-year dollars) to construct the FY 1995 nuclear carrier, CVN-76.

  The GAO asserted that personnel, major maintenance and modernization, and nuclear fuel are the most significant operating and support costs for a ship--and they are relatively fixed costs that do not vary with changes in operating tempo. The GAO observed that ship variable costs include fossil fuels and other consumables, such as training devices, which only account for about 5 to 20 percent of ship operating and support costs. The GAO reported that a 20 percent reduction in operating tempo for a *Nimitz*-class nuclear carrier, conventional carrier, and a surface combatant results in only marginal (i.e. 1 to 3 percent) overall reductions in operating and support costs because most of these costs are fixed. The GAO observed that for the ships in a carrier battle group, including the carrier, costs would be reduced by about $17 million annually, or just over $200 million for a 12-carrier battle group force. The GAO noted, in contrast, a reduction of one carrier battle group would reduce ship operating and support costs by about $525 million (not including the costs of ship-based aircraft).

  The GAO reported that operating tempo reductions in the 20 percent range have the potential for significantly affecting the ability of the force to deploy, because such a reduction results in an average of 29 underway days each for both non-deployed and deployed forces. The

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Now on pp. 54-59.

GAO concluded that the result is a significantly reduced amount of time for conducting fleet exercises and other ship operations. The GAO further concluded that, for conventional carriers, the ability to support flight operations would be impaired greatly and training exercises would be curtailed sharply. (pp. 62-68/GAO Draft Report)

DoD Response: Partially concur. In general, the DoD concurs with the characterization of ship operating and support costs with respect to fixed and variable costs. However, the DoD notes that there are limits to the use of amortized acquisition costs used by the GAO to derive those estimates, as explained in the DoD responses to Findings C, G, J, and L.

While the GAO has correctly concluded that the greatest potential for realizing cost savings is by reducing forces rather than reducing operating tempo, the impact to drive both deployed and non-deployed operating tempo to 29 days per quarter has not been accurately reflected in the GAO draft report. Non-deployed operating tempo is already budgeted at 29 days per quarter. Reducing deployed operating tempo to 29 days per quarter would represent more than a 40 percent reduction in operating tempo vice the 20 percent reduction asserted by the GAO. In either case, however, the impact on readiness and safety would be significant, as discussed in the DoD response to Finding O.

- **FINDING N: Aircraft Operating and Support Costs.** The GAO reported that, in contrast with ships, total aircraft operating and support costs are more sensitive to changes in operating tempo. The GAO found that personnel costs account for almost 40 percent of the total operating and support costs, and at current operating tempos, about 50 percent of aircraft operating and support costs are fixed. The GAO explained that one reason a larger portion of an aircraft costs are more sensitive to changes in operating tempo is because aircraft maintenance philosophies changed in the 1980s in a way that relates maintenance more directly to intensity of operations--rather than to a calendar schedule.

The GAO found that a 20 percent reduction in operating tempo for aircraft operations results in a 10 percent overall reduction in operating and support costs. The GAO noted, for example, that a 20 percent reduction in operating tempo for a 12-carrier force level reduces annual costs a total of about $275 million. The GAO noted, in contrast, a reduction of one carrier air

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wing would reduce operating and support costs by about $260 million. The GAO concluded, however, that operating tempo reductions of such a magnitude could affect pilot proficiency--particularly for perishable skills, such as ability to perform night-time carrier operations--although it is not clear to what extent overall readiness would be diminished once an aviator becomes an experienced pilot. (p. 68/GAO Draft Report)

Now on p. 59.

DoD Response: Nonconcur. Personnel costs account for approximately 26 percent of total air wing operating and support costs vice the 40 percent estimated by the GAO. In addition, the GAO estimates for total savings are overstated. A 20 percent reduction in operating tempo applied across 11 active air wings would yield annual savings of approximately $150 million compared to the $275 million estimated by the GAO. The $150 million estimate is based on a 20 percent reduction in Navy CVW aircraft annual Primary Mission Readiness from the FY 1992 budget level of 85 percent, using FY 1992 President's Budget costs. That $150 million includes only aircraft fuel, aviation depot-level repairables, and organizational and intermediate maintenance Operations and Maintenance, Navy costs directly related to budgeted flight hours. Engine and Airframe depot repair requirements do not decline in direct proportion to Primary Mission Readiness and should not be included in Primary Mission Readiness reduction savings.

- **FINDING O: Reductions in Operating Tempo Versus Reductions in Forces.** The GAO reported that evaluating the potential for cost reductions resulting from changes in operating tempo alone does not consider a significant cost of fielding a force: the need to develop and acquire replacement forces. The GAO observed that the inactivation of one carrier battle group has the potential of saving about $900 million annually in operating and support costs. The GAO pointed out, however, that to accomplish savings of such magnitude would require reductions in operating tempo of over 30 percent across a force of 12 battle groups--or over 50 percent when annualized acquisition costs are considered. The GAO concluded that operating tempo reductions at either level would create a hollow force with a low level of readiness and place crew safety at jeopardy. The GAO further concluded that, as future acquisition costs for carrier battle groups continue to increase, even greater reductions in operating tempo would be required. (pp. 69-70/ GAO Draft Report)

Now on pp. 60-61.

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DoD Response: Partially concur. The GAO is correct in asserting that an operating tempo reduction in the range of 30 to 50 percent would lead to unacceptable levels of readiness and safety. However, it would require a reduction in operating tempo of the magnitude of 50 to 60 percent to realize operating and support cost savings of $900 million annually vice a 30 percent reduction, as asserted by the GAO.

* * * * *

MATTER FOR CONGRESSIONAL CONSIDERATION

- DISCUSSIONS AND SUGGESTION: The GAO concluded that, given a declining Defense budget, the changing security environment, the increasing capability of surface combatant and amphibious ships, the high cost of upgrading and replacing carrier aircraft, and the long-term cost of maintaining the planned carrier force level, it is essential that the Congress and the Department of Defense reach early agreement on the size and affordability of the carrier force needed to meet future national defense requirements. The GAO noted that the size of the force directly affects the Navy plans to acquire carriers, surface combatants, escort ships and, at least as importantly, the affordability of developing and procuring a full complement of costly new fighter and attack aircraft.

The GAO observed that, in FY 1993, the DoD is requesting $832.2 million (then-year dollars) in advance procurement funds for the CVN-76. The GAO concluded that approval of that funding request represents a significant commitment by the Congress and the DoD to fund the remaining $3.4 billion (then-year dollars) for the carrier, requires retirement of a conventional carrier before the end of its useful life, and maintaining a 12-carrier force.

See comment 8.

The GAO suggested that the Congress condition the release of the funds on reaching such an agreement (on the size and affordability of the force needed to meet national defense requirements), unless the Navy can demonstrate convincingly that a critical industrial base capability would be lost. (p. 74/GAO Draft Report)

Now on pp. 65-66.

DoD Response: Nonconcur. The Department of Defense presented the Base Force, which includes a requirement for 12 carrier battle groups, to the Congress more than two years ago. The Secretary of Defense and the Chairman of the Joint Chiefs of Staff have testified repeatedly

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and extensively on the rationale for the Base Force and its relevance to the new U.S. defense strategy--which reflects the end of the Cold War and is oriented toward potential regional conflicts. To date, as indicated by passage of the FY 1992 Defense Appropriation Bill, the Congress and the DoD are already in consonance with the Base Force level of aircraft carriers. The normal Congressional review of the proposed FY 1993 DoD budget provides another opportunity to evaluate the need for the Base Force and the specific investment programs that support it.

Moreover, the Department of Defense conducts regular reviews of its force plans and the roles and missions of the Military Services. The Chairman, Joint Chiefs of Staff, Roles and Missions Report is due to the Secretary of Defense in November of this year. That report, which is prepared not less than once every three years, considers such matters as the changing threat, unnecessary duplications among the Services, and changes in technology.

Beyond the operational imperatives dealt with elsewhere in this response, there is a need for CVN-76 advanced procurement in FY 1993 to support a key element of the defense industrial base.

Delaying FY 1993 advance procurement funds for CVN-76, as recommended by the GAO, would have a devastating impact. The FY 1993 advance procurement represents the first shipset of nuclear components bought in three years (four years in the case of the Navy's only supplier of carrier heavy equipment). The procurement represents a final opportunity for many suppliers, since other nuclear work is rapidly declining. The majority of components for the last nuclear carriers acquired--CVN-74 and CVN-75--will be completed by the end of FY 1994. In the submarine program, the termination of the *Seawolf* submarine program cancels all shipsets of any kind ordered since 1989--even with the recent restoration of the SSN-22. The components for SSN-22 itself are more than 75 percent complete and, therefore, cannot adequately support nuclear component manufacturers in the outyears.

Forging and other materials ordered in FY 1993 for CVN-76 will not result in shop floor work for about one year. Slipping to FY 1994 would add another year onto that, creating a gap of more than one year in shop-floor work.

Without CVN-76 advanced procurement in FY 1993, nuclear suppliers will have virtually no backlog of uncompleted orders and no new nuclear component business to sustain them in the near term. Many suppliers would likely search for non-nuclear commercial markets to remain in

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business. Once lost, restoring them as nuclear vendors will be difficult and expensive. Yet they are the very suppliers upon which the Navy must rely to design and build a new design submarine. These issues were discussed in the Secretary of the Navy's letter to Senator Kennedy, dated June 3, 1992 (a copy of which is attached).

Consequently, to ensure there is an adequate nuclear industrial base for future carrier and submarine construction, FY 1993 advanced procurement for and FY 1995 full funding of CVN-76 is critically important.

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DEPARTMENT OF THE NAVY
OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20350-1000

3 June 1992

The Honorable Edward M. Kennedy
Chairman, Subcommittee on Projection
Forces and Regional Defense
Committee on Armed Services
United States Senate
Washington, DC 20510

Dear Mr. Chairman:

I am writing this letter to expand upon my testimony at your Subcommittee's hearing on May 22, 1992. I would like to provide additional details concerning the analysis the Navy used to support the decisions that were made concerning CVN 76.

I firmly believe that the aircraft carrier will remain the cornerstone of future naval forces who are engaged worldwide in the coastal or littoral areas of the world, ready to deter the rise of a hostile regional power or to confront any unexpected crisis. Carriers give our President the tools he needs to provide effective credible presence in a complex multipolar world -- to protect U.S. citizens, combat international terrorism, contain or prevent regional crises through rapid response by sustainable sea-based forces, and, as a last resort, establish air superiority and project striking power ashore to enable the entry of Marines and other joint expeditionary forces.

We are beginning the process of procurement of CVN 76 now to give us an orderly replacement of older, conventional carriers. Delivery of a new carrier requires a nine year acquisition period. Adequate planning and preparation now will ensure we are ready to replace a carrier that will retire in 2003. Without authorization and appropriation of long lead funding for this ship this year, we will lose the opportunity to purchase this ship at the most cost-effective price and we will also jeopardize the unique industrial base that allows us to maintain a viable carrier force. In short, we will risk losing a national treasure.

The Navy routinely reviews the workload of each shipbuilder based on current and projected programs. This review includes consideration of how the major trades are phased within a shipyard in support of the construction process. Phasing of trades is critical to efficient construction. In preparing the FY 1992/1993 Budget, our review of Newport News Shipbuilding (NNS) indicated that the optimal phasing of CVN 76 would be a start in FY 1994. That would provide for the most efficient production with respect to the completion of CVN 75. Workload analysis concluded that NNS would experience a sharp dip in workload, potentially exceeding the equivalent of 5000 men per day in less than a one year period. Delay of CVN 76 by one year

would increase that dip by approximately 1500 additional men per day. NNS will feel the oncoming pause in submarine construction most strongly because they hold no contracts for SSN 21s. The longer CVN 76 is delayed, the more pronounced the drop in workload and the less efficient production phasing becomes.

While virtually all shipyards are experiencing a decline in workload, NNS is the only shipyard capable of building nuclear carriers. This capability must be preserved. Nevertheless, procurement of CVN 76 must be balanced with other requirements within the Navy. FY 1995 is the best compromise between fiscal limitations and industrial needs.

The FY 1993 advanced procurement funds for CVN 76 play a key role in sustaining the very fragile nuclear component industrial base. As Admiral DeMars explained at length during his testimony to the full committee on April 1, 1992, CVN 76 is the only nuclear component work currently planned between now and CENTURION -- all nuclear component shipsets for submarines ordered since FY 1989 have been stopped (the recent rescission compromise restores the SSN-22 shipset ordered in FY 1989). The attachment summarizes this situation.

The nuclear aircraft carrier industrial base and the nuclear submarine industrial base are both important. The dramatic changes in the world order have resulted in the need for a smaller Navy. The impact of a smaller Navy on the industrial base has been the subject of close scrutiny. We have concluded that CVN 76 is vital to both maintaining our carrier force levels and also sustaining our nuclear component base. Our plan provides for the most economical and efficient construction, preserves critical skills, and provides for orderly replacement of older, conventional carriers that will retire after the turn of the century.

I hope this additional information is of benefit. I would ask that this letter be made a part of the record of the hearing. If I can be of any further assistance, please do not hesitate to contact me.

Sincerely,

H. Lawrence Garrett, III
Secretary of the Navy

Enclosure

Copy to:
The Honorable William S. Cohen
Ranking Minority Member

SHIPSETS OF SSN NUCLEAR COMPONENTS

NUCLEAR COMPONENTS (S/S)	FY 89	90	91	92	93	94	95	96
FY89 PRESIDENTIAL BUDGET SUBMISSION	3	3	3	3	4	4	3	3
FY92 PRESIDENTIAL BUDGET SUBMISSION	2	2	0	1	1	2	1	1
APPROPRIATED	2*	2**	0	1				
AFTER RESCISSION	0	0	0	0	0	0	0	
SUSTAIN NUCLEAR COMPONENT SUPPLIERS:								
WITH CVN COMPONENTS	2*	2**			1(CVN)			1***
WITHOUT CVN	2*	2**		1	1	1	1	1***

* SEAWOLF COMPONENTS 75%-100% COMPLETE
** SEAWOLF COMPONENTS 40%-70% COMPLETE
*** CENTURION

Note: The rescission bill approved by Congress on May 21, 1992, would restore one shipset of SEAWOLF components and provide $540 million "to help preserve the the industrial base for submarine construction." If signed by the President, this should be enough to tide the nuclear component industrial base over until the FY93 CVN component procurement.

The following are GAO's comments on the Department of Defense's letter dated August 3, 1992.

GAO Comments

1. We arrived at the estimate of the Navy's fiscal year 1997 budget by using DOD's methodology, including DOD's deflators to express the estimate in fiscal year 1990 equivalent dollars. However, we deflated each appropriation account by a corresponding appropriation title deflator. DOD used an aggregate deflator for the Navy's budget estimate.

2. We adjusted our illustration to reflect surge intervals only up to 6 months rather than to 12 months because the majority of the force would have been surged at that point and longer periods postulate the unlikelihood of global warfare.

3. In subsequent discussions, the Navy indicated that during the 1980s amphibious readiness groups were regularly deployed to the Mediterranean Sea and western Pacific Ocean regions but were only infrequently deployed to the Indian Ocean/Arabian Sea region. The report has been changed to reflect this information.

4. We have changed our report to reflect a range in the cost of carrier battle group elements in fiscal year 1993 budget request. Our estimate now ranges from a low of $11.5 billion (then-year dollars) for items that directly support the battle group to a high of $15.1 billion (then-year dollars) for items that directly and generally support the group.

5. The statement regarding an alleged problem with the USS Enterprise's nuclear refueling has been deleted. According to Navy documents, the overhaul and refueling of the carrier is over $2 billion (then-year dollars).

6. In a subsequent meeting, the Navy provided additional information on its projected force structure plans after the turn of the century, and we have modified the table in appendix II accordingly.

7. The cost estimate for the AX cited in our draft report was a typographical error; the report has been changed to reflect the current development cost estimate of about $11 billion (fiscal year 1990 dollars).

8. Subsequent to DOD's review of a draft of this report, the advance procurement funds requested for CVN-76 were authorized and

appropriated by the Congress and obligated by the Navy. We revised the report to reflect this action.

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