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A CBO STUDY

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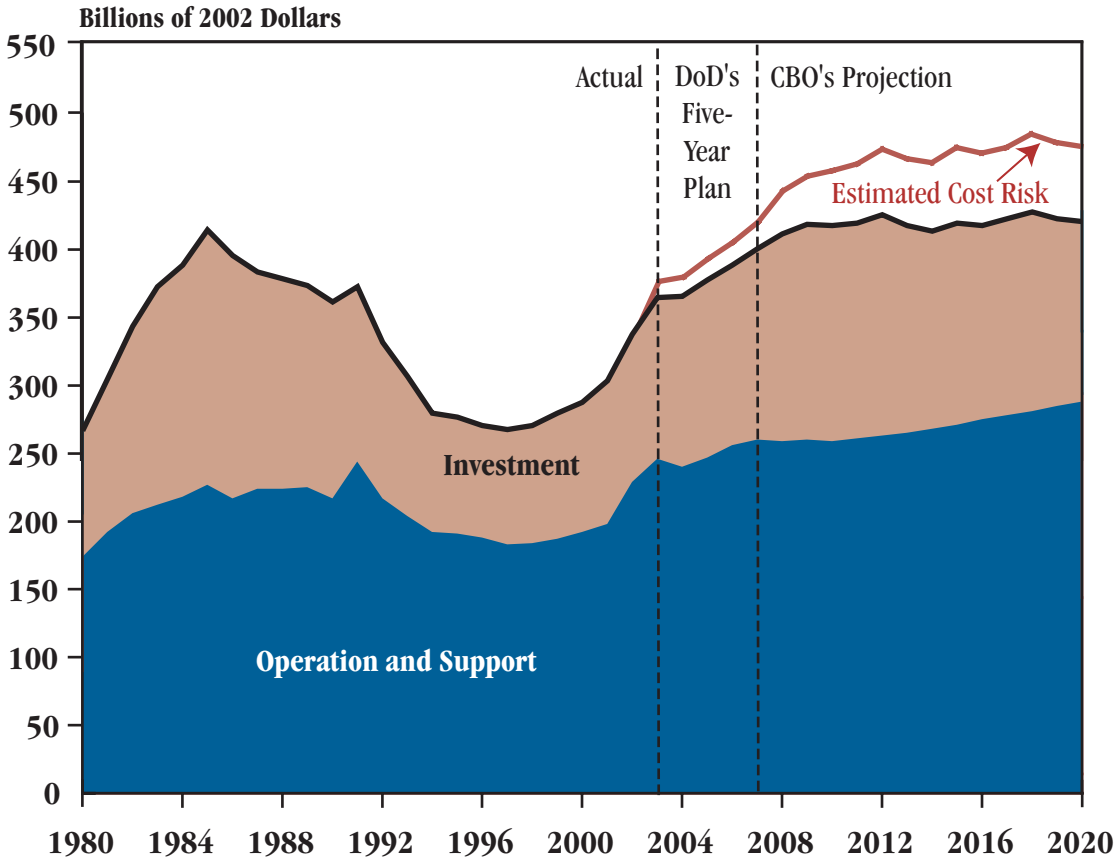
The Long-Term Implications of Current Defense Plans



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January 2003

The Congress of the United States ■ Congressional Budget Office

Notes

Unless otherwise indicated, all years referred to in this study are fiscal years, and all dollar amounts are expressed in 2002 dollars of total obligational authority.

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

Preface

What are the long-term implications of the Bush Administration's plans for defense? What level of resources might be needed to execute those plans? If they were carried out, what would the Administration's plans imply about the size, composition, and age of future U.S. military forces?

This Congressional Budget Office (CBO) study—prepared at the request of the Chairman and Ranking Minority Member of the Subcommittee on Defense of the Senate Appropriations Committee—addresses those questions. It projects the long-term implications of today's defense plans for both resources and forces. In keeping with CBO's mandate to provide objective, impartial analysis, the study makes no recommendations.

Lane Pierrot and Gregory T. Kiley of CBO's National Security Division wrote the study under the supervision of J. Michael Gilmore. Ian MacLeod and Eric J. Labs, along with Allison Percy, Paul Rehmus, Sally Sagraves, Russ Beland, Adebayo Adedeji, and David Arthur, all of the National Security Division, contributed to the analysis. Debbie Clay-Mendez supervised the analysis of operation and support costs, and R. William Thomas supervised portions of the investment analysis. Kent R. Christensen, Raymond J. Hall, Sarah T. Jennings, David B. Newman, Sam Papenfuss, Michelle Patterson, and Matthew Schmit of CBO's Defense, International Affairs, and Veterans' Affairs Cost Estimates Unit also contributed to the analysis, under the supervision of Jo Ann W. Vines. Barry Anderson and Arlene Holen of CBO provided thoughtful review comments. In addition, the authors are grateful to Robert R. Soule for his suggestions on how to improve the analysis. (The presence of external participants implies no responsibility for the final product, which rests solely with CBO.)

Christian Spoor edited the study, and Leah Mazade proofread it. Cindy Cleveland produced drafts of the manuscript, Karina Braszo and Kathryn Winstead prepared the study for publication, and Annette Kalicki prepared the electronic versions for CBO's Web site.

Barry B. Anderson
Acting Director

January 2003

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Summary

In their annual debate about the defense budget, Members of Congress focus primarily on whether the President's budget request will meet the military's immediate spending needs. But programs to develop weapon systems often run for a decade or more before those systems are fielded, and other policy decisions have long-term implications; thus, decisions made today can influence the size and composition of the nation's armed forces for many years to come. Recognizing the need for a longer view, the Senate Appropriations Committee's Defense Subcommittee requested that the Congressional Budget Office (CBO) analyze the long-term implications of the Administration's current plans for defense. This analysis examines those implications both for budgetary resources and for ages and inventories of weapon systems.

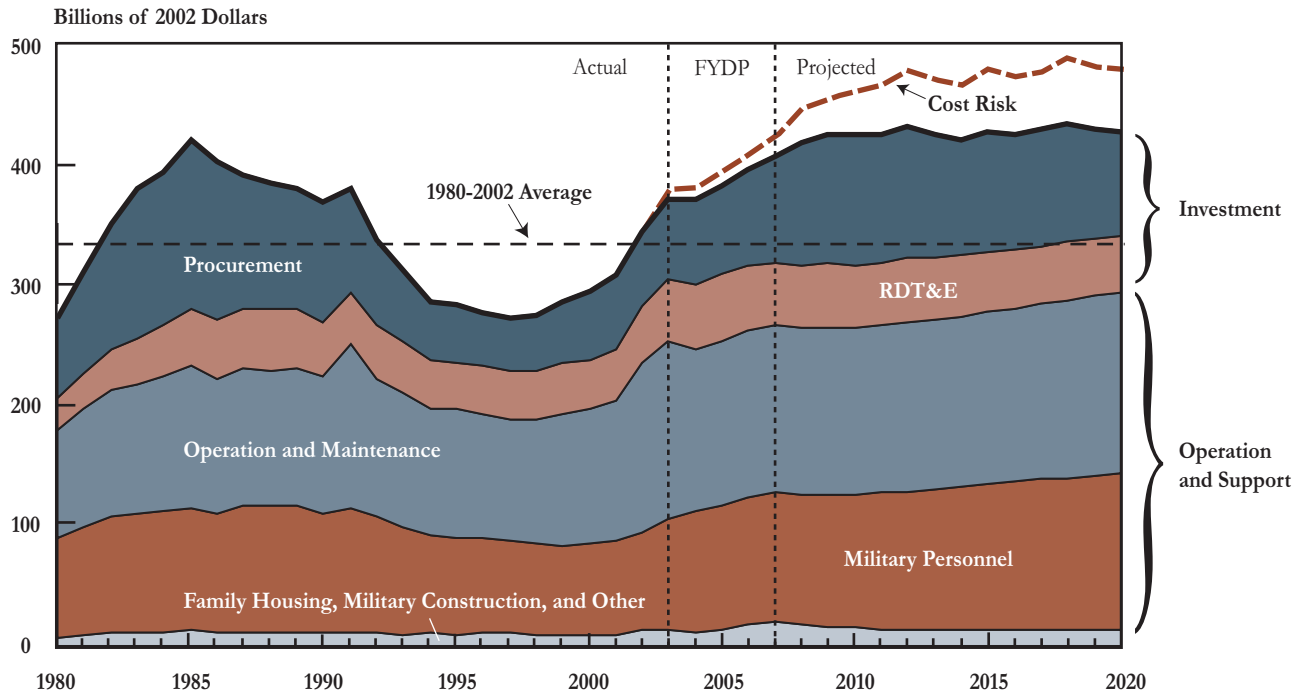
In the five years from 1997 to 2002, the annual U.S. defense budget grew from $274 billion to $345 billion. (All dollar amounts in this study represent total obligational authority expressed in 2002 dollars.) The defense program outlined by the Bush Administration for fiscal year 2003 and the following four years (the 2003 Future Years Defense Program, or FYDP) anticipates additional growth, with the defense budget averaging $387 billion over the 2003-2007 period and reaching $408 billion in 2007. If that program continued as currently envisioned, the demand for defense resources would continue to increase through 2012, CBO projects, and would average $428 billion a year between 2008 and 2020. Costs for day-to-day operations (running units, maintaining equipment, and providing pay and benefits to military personnel) would grow from $222 billion in 2002 to more than $280 billion by 2020. Demands for investment resources (primarily to develop and purchase new equipment) would rise from $110 billion in 2002 to $164 billion in 2012 and then decline to about $134 billion by 2020.

Those projections are based on the Department of Defense's (DoD's) current cost estimates for a host of defense programs and activities. CBO also projected long-term resource demands if costs for weapons programs and certain other activities grow as they have historically (a case it called cost risk). In that case, the annual cost of current defense plans would average $398 billion over the 2003-2007 period and could later reach $488 billion at its peak (*see Summary Figure 1*). In either case, future resource demands would be higher than defense spending has been at any time in the past 22 years—exceeding the peak of $421 billion in 1985—and would need to remain at such levels for a decade or more.

Viewed in relation to the size of the economy, however, future demands for defense resources could be less than past spending. The share of gross domestic product (GDP) dedicated to defense declined from an average of 6 percent in the 1980s to an average of 4 percent in the 1990s (*see Summary Figure 2*). If current defense plans were implemented, defense spending would drop to 3 percent of GDP by 2007 and to 2 percent by 2020, assuming that GDP grows at the rates projected by CBO. (Because of the size of the economy, those levels are the same for CBO's projections with or without cost risk.)

Summary Figure 1.

Past and Projected Resources for Defense



Source: Congressional Budget Office using data from the Department of Defense.

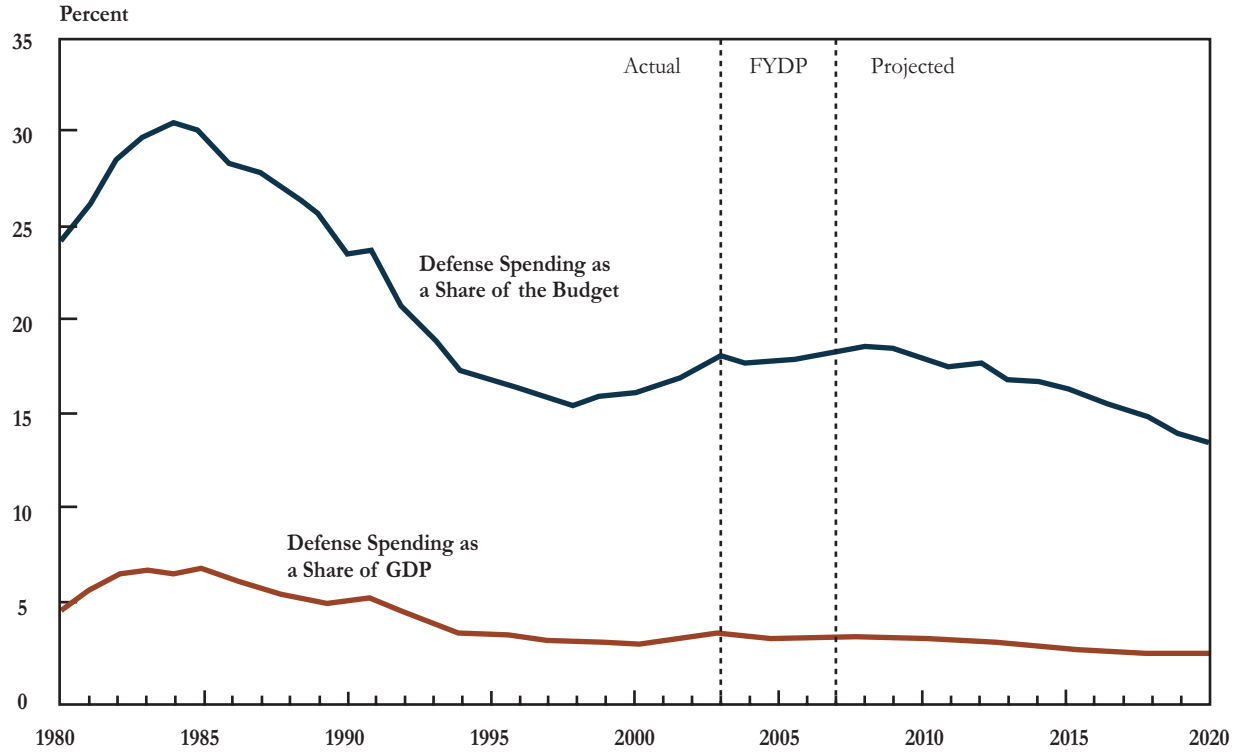
Notes: FYDP = Future Years Defense Program; RDT&E = research, development, test, and evaluation.

Portions of the budget titles for family housing and military construction pay for support activities, whereas other portions pay for investment. Thus, it is not possible to allocate all of the funding in each of those titles to either category.

As a share of the federal budget, defense spending declined from an average of 28 percent in the 1980s to 16 percent in 1998. Since then, its share of the budget has increased to about 18 percent. Nonetheless, assuming that the rest of the federal budget continues to grow in real (inflation-adjusted) terms through 2020 at the rate that CBO projects in its current 10-year baseline, defense funding would compose a steadily smaller portion of the budget over the long run under current plans. In CBO's long-term projection of those plans, defense spending would fall to about 13 percent of the total budget by 2020 (15 percent using CBO's projection with cost risk), as the growth of mandatory programs for the elderly, such as Social Security and Medicare, and other entitlement programs, such as Medicaid, outpaced projected increases for the military. Those three programs are projected by 2030 to consume a substantial portion of what the federal government now spends on the entire budget. Thus, even if defense spending rose substantially over the long term, it would compose a smaller share of a rapidly increasing total federal budget.

Summary Figure 2.

Defense Spending as a Share of the Federal Budget and GDP



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; GDP = gross domestic product.

In short, under CBO's projection of the Administration's current plans, defense resources could reach levels greater than those sustained during the Cold War. However, the fraction of the country's economic activity that they constitute, and their share of the total federal budget, could be significantly smaller than during the Cold War.

The Administration's Plans for Defense

CBO's estimates are current-policy projections, which assume that the policies and plans underlying the Bush Administration's 2003 defense program do not change in future years. That program is described in detail in DoD's 2003 FYDP, a report submitted with the President's 2003 budget request that presents DoD's estimated appropriation needs through 2007. Further detail comes from committee staff backup books, which DoD provides to the Congress to support its budget request for various accounts, and from Selected Acquisition Reports, which are submitted to the Congress for certain major defense programs. General descriptions of the Administration's current policies and plans are contained in the *Quadrennial Defense Review Report* from September 2001 and the *Annual Report to the President and the Congress* submitted by the Secretary of Defense in 2002.

As described in those sources, the Administration's current policies stress the importance of transforming the nation's military forces, but they make few substantial changes to those forces or to the defense programs that will sustain them in the long term. DoD describes transformation as shifting the composition of the armed forces from traditional approaches to new approaches. Those new approaches are intended to incorporate advanced technologies that will save money while retaining or improving combat capability to meet the threats foreseen for the 21st century. The Administration plans to initiate or increase funding for a number of programs that it associates with transformation, including space-based radar satellites, missile defenses, unmanned combat air vehicles, unmanned reconnaissance aircraft, small surface combat ships for the Navy, advanced-technology combat vehicles for the Army, and precision munitions.

However, the 2003 FYDP would also continue to fund nearly all of the major defense programs inherited from the previous Administration (except the Army's Crusader self-propelled howitzer, which was terminated in the spring of 2002). In addition, the Administration has not announced any major changes to military force structure—the number and composition of Army divisions, Air Force tactical fighter wings, Marine Corps expeditionary brigades, Navy carrier battle groups, and so forth—through 2007. Although transformation might enable DoD to make significant changes to its major investment programs or force structure in the longer term, programs started now are unlikely to provide operational capabilities for 10 to 15 years, if not longer.

Thus, in CBO's projection of current plans, demands for defense resources increase in the long term for three reasons: the transition from development to production or increasing production for a number of existing programs; continued growth (even without cost risk) in the costs to operate and sustain future forces, which are assumed to be essentially the same size as today's forces; and continued development and eventual production of those few new programs associated with transformation that are included in the Administration's current plans.

CBO projected the resource demands associated with current plans—but it did not evaluate the basis for those plans, the necessity of pursuing them, or possible alternative plans. For example, CBO has not considered alternatives to the national security strategy or to the defense strategy developed during the 2001 Quadrennial Defense Review. It has not assessed alternative plans that might achieve those strategies or examined their resource implications. In addition, CBO has not attempted to evaluate the efficiency of the way in which DoD does business or the need for a particular infrastructure to support combat forces. Those are all important issues that could have a major impact on future defense costs. But those issues would be associated with changes to current policies and plans and thus are excluded from CBO's current-policy analysis.

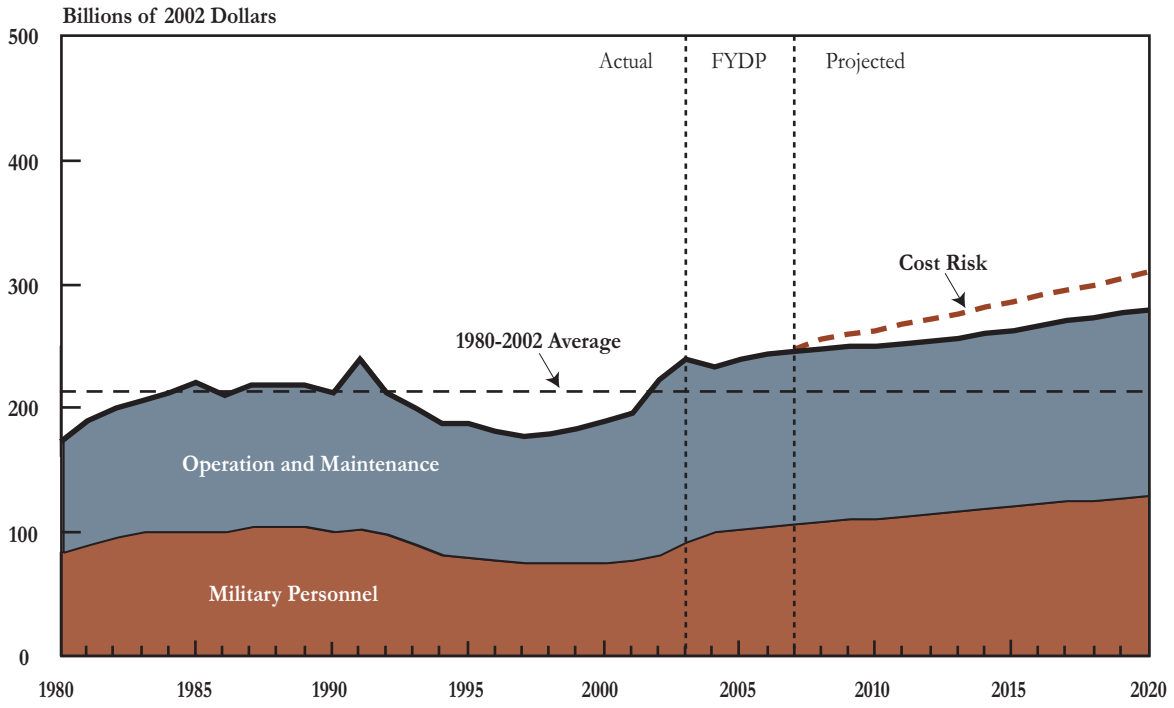
Resource Demands for Operation and Support: Paying for Day-to-Day Operations

Although investment in new weapon systems tends to get more attention, about two-thirds of the defense budget is devoted to operation and support (O&S) funding—a category that covers almost all of DoD's current operating costs. In 2002, O&S funding totaled $222 billion ($218 billion will be available for O&S in 2003).

Some 60 percent of O&S funding is appropriated to operation and maintenance accounts, which pay for the salaries of DoD's civilian employees, the services of contractors, and purchases of fuel, spare parts, and other goods routinely consumed by the military (*see Summary Figure 3*). Some of the activities funded by the operation and maintenance accounts, such as training for individuals and units, support combat capabilities directly, whereas other activities, such as central headquarters, support combat indirectly.

Summary Figure 3.

Past and Projected Resources for Operation and Support



Source: Congressional Budget Office using data from the Department of Defense.

The remaining 40 percent of O&S funding consists of appropriations to DoD's military personnel accounts. That funding covers the pay and allowances received by active-duty and reserve personnel as well as contributions to their retirement fund. Beginning in 2003, personnel spending also includes contributions to a fund to provide supplemental medical benefits for current service members when they have retired and become eligible for Medicare.

If the Administration's current defense plans were unchanged over the long term, annual O&S costs would grow by 14 percent between 2007 and 2020, CBO projects, rising from $245 billion in 2007 to $280 billion. The main sources of that projected growth are wage increases and rising medical costs.

As noted above, CBO's projection assumes that the size of the military remains constant from 2007 through 2020. It also assumes that military and civilian pay grows at the same rate as the employment cost index (a measure of wage increases in the private sector produced by the Bureau of Labor Statistics). Medical costs for active-duty personnel are assumed to grow at the annual long-term rate projected by the Department of Health and Human Services for growth in civilian health care costs (3.6 percent). Medical costs for retirees are assumed to grow at an annual rate estimated by DoD's independent board of actuaries and included in the 2003 FYDP (4.0 percent).

CBO's projection of the Administration's plans excludes certain risks of additional cost growth, such as

potential costs that are not fully funded in current plans or elements of those plans that experience suggests may not come to pass. Those sources of risk include the cost of maintaining existing equipment as it ages and the cost of maintaining new, more-complex equipment as it is acquired and fielded. Another source of risk is that the round of base realignments and closures that the Administration has proposed for 2005 will not proceed as planned and thus not produce the anticipated savings in O&S costs.

If those and other cost risks are taken into account, annual operation and support costs could rise by an additional $26 billion, CBO projects, reaching $306 billion by 2020. That increase would represent growth of 25 percent from the 2007 level rather than the 14 percent increase without cost risk. Of the additional $26 billion in the cost-risk projection, about $16 billion would come from increases in the cost of maintaining older equipment and new, more-complex equipment, and $5 billion would reflect forgone savings from the anticipated 2005 round of base closures.

In CBO's projection including those risks, the introduction of new equipment does not offset the growth in maintenance costs that would otherwise occur if old equipment were retained. Although increases in costs because of equipment aging and the introduction of more-complex equipment do not dominate total projected growth in O&S costs, they are the largest component of O&S cost risk considered by CBO. The reason is that those costs are some of the largest that are not fully funded in DoD's current plans.[1]

1. For a discussion of the effects of equipment age on operating costs, see Congressional Budget Office, *The Effects of Aging on the Costs of Operating and Maintaining Military Equipment* (August 2001). CBO concluded that although equipment aging is not the primary contributor to increases in total operation and maintenance costs (being only a small subset of those costs), evidence exists that equipment such as aircraft does become more expensive to operate and maintain as it ages.

Other risks of cost growth may exist that CBO has not considered. Such additional risks would most likely be associated with changes to current policy, such as the provision of additional medical benefits to military personnel or increases in force structure to meet increased commitments overseas. Those sorts of risks were not considered in CBO's projection, which is based on current policies and plans. (In addition, there are some projections of growth in U.S. health care costs that, at least in the near term, greatly exceed the rates that CBO used in this analysis. If those higher rates were realized over the long term, they would represent a cost risk associated with current plans that CBO has not considered.)

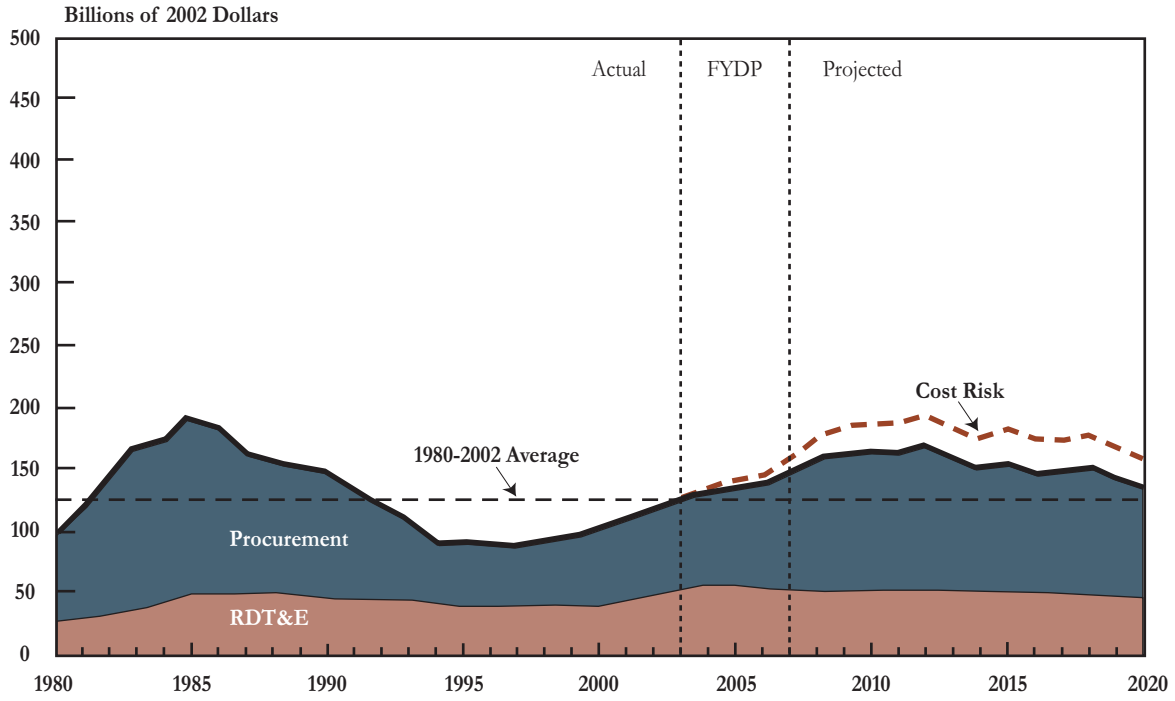
Resource Demands for Investment: Paying for a Modern Force

DoD currently devotes about one-third of its budget to researching, developing, testing, and buying weapon systems. In 2002, investment funding (which this analysis defines as the sum of accounts for research, development, test, and evaluation and for procurement) totaled $110 billion. (About $128 billion will be available for investment in 2003.)

Under the 2003 FYDP, the Administration plans to increase funding for investment by about 5 percent per year, reaching $142 billion by 2007. If the Administration's plans were carried out over the long term, resource demands for investment would continue to grow—peaking at about $164 billion in 2012, CBO projects. Unlike operation and support, which would increase continuously through 2020, investment would decline after 2012 as the purchases projected to begin just beyond 2007 are completed. Annual investment would fall to about $134 billion by 2020, or $8 billion less than the amount planned for 2007. Over the entire 2002-2020 period, resource demands for investment would average $144 billion a year—about $20 billion more than average annual funding during the past 22 years (*see Summary Figure 4*).

Summary Figure 4.

Past and Projected Resources for Investment



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; RDT&E = research, development, test, and evaluation.

Those projections are based on DoD's current estimates for the costs and numbers of weapon systems that it expects to buy. If costs for such systems exceeded current estimates to the extent that they have historically, the resources needed to carry out current investment plans could rise to $156 billion by 2007 and top $190 billion in 2012, CBO projects. In that case, investment demands through 2020 would average about $165 billion—or $41 billion more per year than the average investment funding provided since 1980.

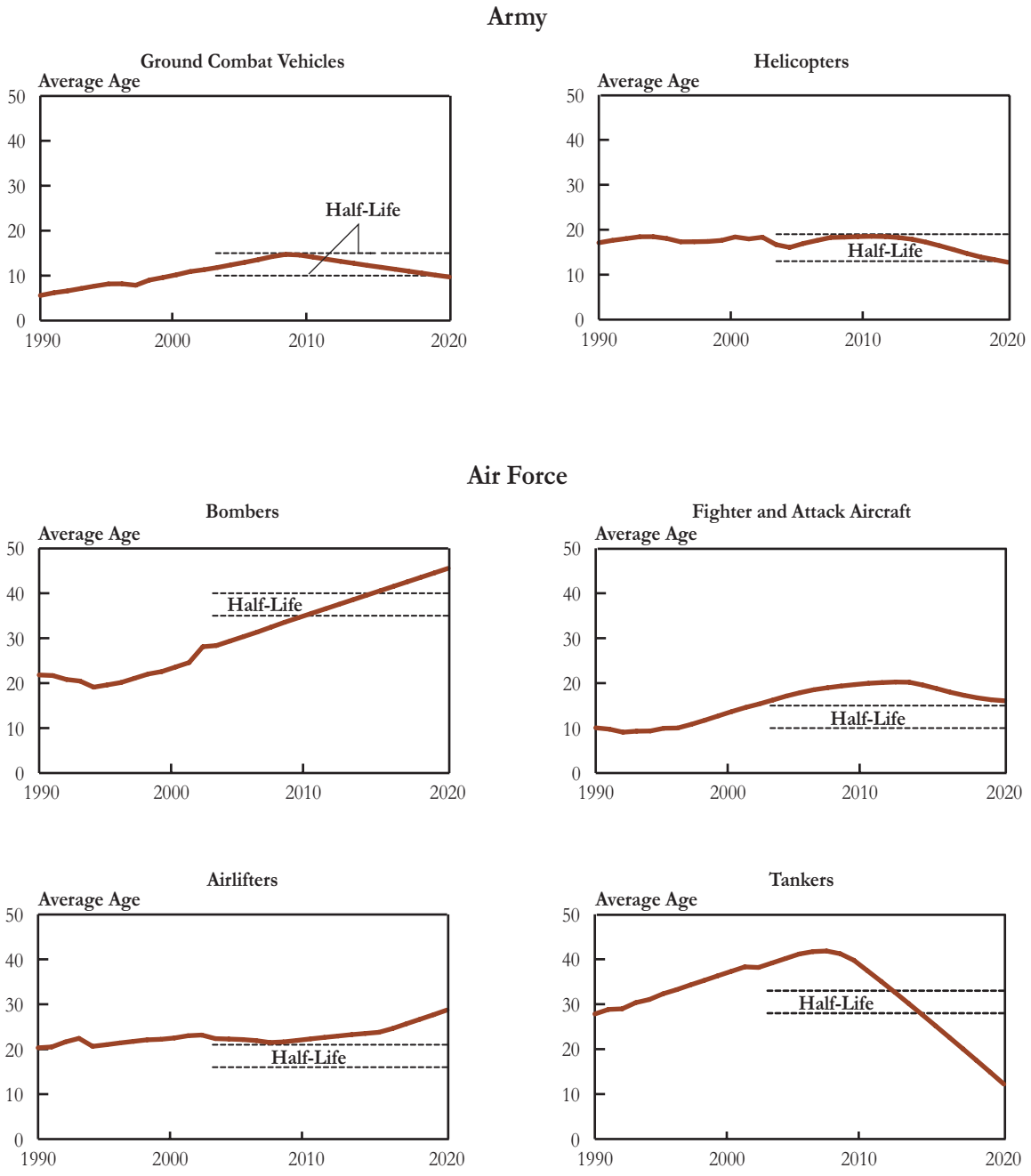
Aging Equipment

In addition to projecting the long-term cost of the current defense program, CBO examined whether planned purchases would support DoD's planned forces and halt the aging trends that are evident for many types of military equipment since the armed forces were reduced after the Cold War. CBO projected the size of DoD's equipment stocks through 2020 and their average age if currently planned purchases occur. A useful indicator of whether the age of equipment stocks is an issue is how close that age is to one-half of the equipment's expected service life (what this analysis calls the half-life). An average age well above the half-life generally implies an inventory with many pieces of equipment that might soon have to be replaced or refurbished over a short span of time.

If DoD received enough funding through 2020 to execute its current plans, as projected by CBO, aging trends would eventually be halted or reversed for many

Summary Figure 5.

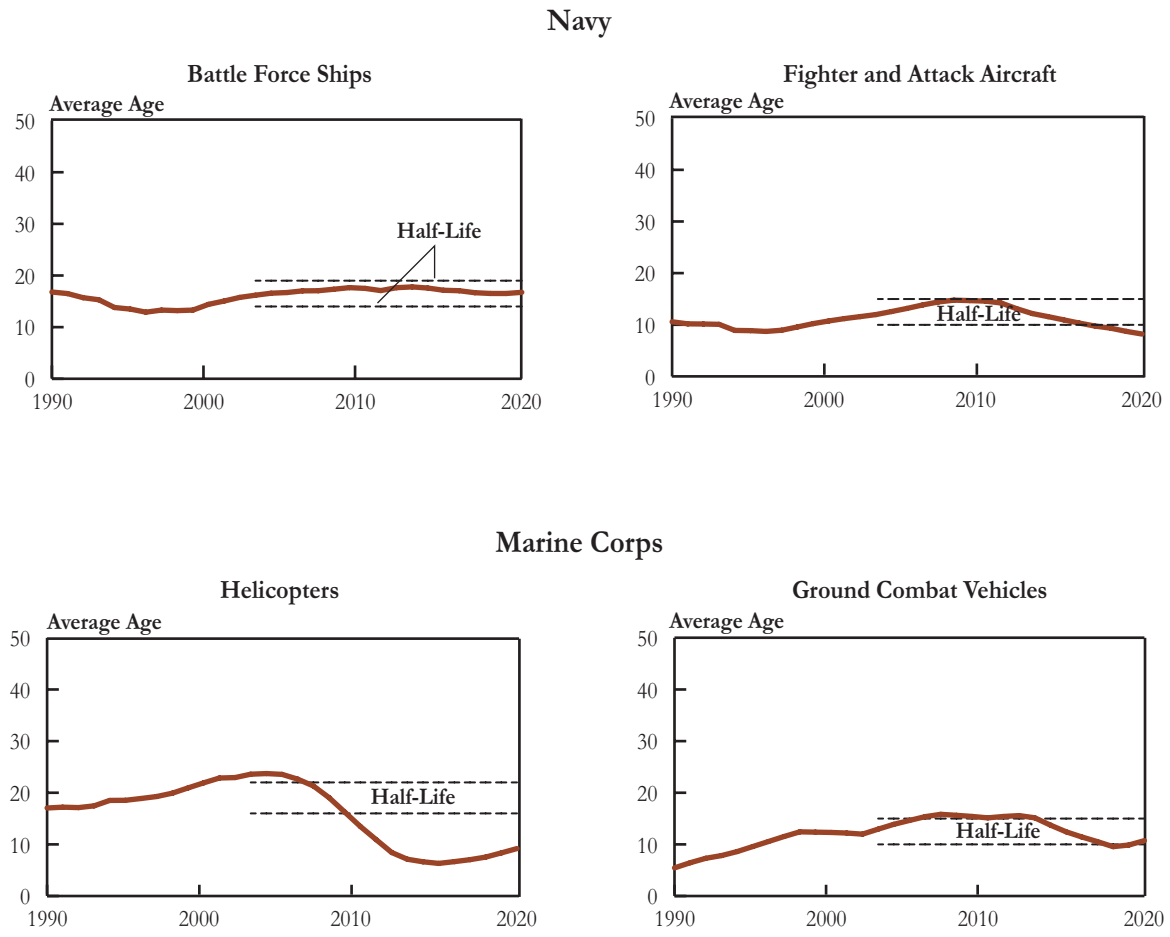
Average Age of Selected Army and Air Force Weapon Systems



Source: Congressional Budget Office using data from the Department of Defense.

Summary Figure 6.

Average Age of Selected Navy and Marine Corps Weapon Systems



Source: Congressional Budget Office using data from the Department of Defense.

types of weapons, including Army and Marine Corps combat vehicles and helicopters, as well as Air Force tankers (*see Summary Figures 5 and 6*). In addition, current plans would sustain the Navy's fleets of ships and aircraft at average ages that the service considers acceptable. Average ages would remain a concern for only three of the categories of weapons that CBO analyzed: Air Force bombers, airlifters (transport aircraft), and fighter and attack aircraft.

Of course, to achieve those results, purchases and procurement budgets would, in many cases, have to match or exceed the levels seen during the defense buildup of the 1980s. Future budget pressures—arising from growth in other federal programs, such as Social Security and Medicare, as well as from continued growth in the military's O&S costs—might make it difficult to sustain those levels of procurement spending.

Steady-State Procurement

Another way to measure the adequacy of planned purchases is to compare those purchases with steady-state levels (the procurement needed to sustain planned forces indefinitely).[2] CBO estimated the annual level of steady-state purchases by dividing a planned inventory of weapon systems by the expected service life of those systems. Multiplying those steady-state purchases by the estimated unit costs of various systems (either DoD's estimates or those estimates plus historical cost growth) yields an overall projection of annual steady-state procurement costs *(see Summary Table 1)*. In making that calculation, CBO used two alternative estimates of service lives. One assumes DoD's current projections for service lives, which are generally longer than those planned for during the Cold War. The other uses the shorter service lives incorporated in DoD's Cold War-era planning.

In the past, the combination of new military equipment funded during the Reagan Administration and the drawdown in U.S. military forces that occurred after the Cold War enabled DoD to sustain its forces with much smaller annual equipment purchases. But during the 1990s, those purchases fell below the steady-state level, and as a result, the average age of many types of weapons increased, as shown in Summary Figures 5 and 6.

DoD's planned procurement budgets for the 2003-2007 period, as outlined in the current FYDP, are below CBO's estimates of the steady-state procurement costs needed to sustain currently planned forces. That is why average ages generally rise through 2007 in Summary Figures 5 and 6. But if current procurement plans were carried out through the 2008-2020 period, procurement would be within the steady-state range (between the estimates for long and short service lives), CBO projects. That is why average ages for many weapon systems decline beginning around 2010 in Summary Figures 5 and 6.

As noted earlier, the Bush Administration has stated that it expects DoD's forces to ultimately be transformed. The programs associated with transformation that the Administration has just started will not provide substantial numbers of operational weapons for 10 to 15 years. Therefore, transformation is unlikely to be fully realized before the 2020 endpoint of CBO's projection.

Whenever it occurs, transformation could take many forms, depending on the success or failure of concepts that have only begun to be explored. Research on unmanned aircraft, advanced-technology combat vehicles, and smaller ships has started. In addition, the military services and the U.S. Joint Forces Command are experimenting with new ways of organizing and operating forces that might be possible if such systems can be developed. If those (or other) concepts succeed, military forces could eventually be very different from the ones assumed in DoD's current plans and in CBO's year-by-year projections. And if the cost goals now asserted for those systems can be achieved—which would be at variance with past experience—steady-state procurement costs might eventually be lower.

To assess the potential impact of transformation on future procurement needs, CBO estimated steady-state procurement costs for one example of how a transformed force might look. The example that CBO chose assumes that many of the transformation initiatives now being undertaken by the Bush Administration ultimately succeed and are fully embraced by the military services. Thus, CBO's hypothetical transformed force uses unmanned aircraft

2. This analysis developed detailed year-by-year projections of the long-term implications of current defense programs through 2020. It used steady-state procurement costs as one of several metrics to assess the sufficiency of the programs underlying those long-term projections. A previous CBO study, *Budgeting for Defense: Maintaining Today's Forces* (September 2000), included steady-state procurement estimates for the military forces and defense acquisition programs planned by the Clinton Administration. However, that study did not provide detailed long-term projections of annual demands for defense resources comparable to the ones presented here.

Summary Table 1.

Steady-State Procurement Costs Under a Variety of Assumptions

(In billions of 2002 dollars of total obligational authority)

	Using DoD's Cost Estimates	Assuming Historical Cost Growth
Steady-State Procurement Costs for Currently Planned Forces		
Assuming long service lives	85	99
Assuming short service lives	111	130
Average Annual Procurement Costs to Carry Out Current Plans		
2003-2007 (As requested in the FYDP)	77	81
2008-2020 (As projected by CBO)	101	121

Source: Congressional Budget Office.

Notes: FYDP = Future Years Defense Program.

In the long-service-lives assumption, the Department of Defense keeps weapons as long as it currently projects, which is generally longer than it has in the past. In the short-service-lives assumption, the Department of Defense operates systems only as long as it has previously.

to replace today's manned systems for both ground-attack and reconnaissance missions. It also assumes that many ships can be operated with two alternating crews or from forward bases, which would allow a smaller fleet of surface combatants to perform the current level of peacetime missions, and it asssumes that the Navy converts additional nuclear-missile-carrying submarines to perform conventional missions. Such a military force would be a radical departure from today's force—and is unlikely to be realized within the period of CBO's projections.

CBO's estimate of steady-state procurement costs for a transformed force suggests that DoD might eventually be able to reduce its annual procurement needs below the level associated with current plans if it can ultimately change those plans significantly. For the particular example of transformation examined by CBO, procurement savings could equal 10 percent to 15 percent compared with the annual steady-state costs of current plans shown in Summary Table 1.

Of course, those estimates hinge on the particular assumptions that CBO made about the composition of a transformed force. Larger or smaller savings—or higher costs—might result depending on how transformation actually occurred. Although CBO's transformed force is radically different in composition from today's force, it contains about the same total numbers of aircraft and other major weapon systems. If transformation enabled DoD to substantially reduce its number of weapon systems, greater procurement savings than CBO projects might be possible. (Likewise, if transformation allowed forces to be cut or signifi-

cantly changed peacetime operating concepts, savings could accrue in O&S costs as well as in procurement. CBO did not analyze the potential O&S savings that might result from transformation, which could be substantial.)

Conversely, savings could be much less if—as happened in the past—the currently hoped-for cost goals of new systems cannot be met. Such goals are generally very optimistic relative to historical experience with cost growth in DoD systems. For example, the Global Hawk unmanned reconnaissance aircraft now in operation was originally intended to cost $20 million apiece. Actual costs have exceeded $60 million per aircraft.

CHAPTER

1

Introduction

Roughly one out of every six dollars spent by the federal government goes to the Department of Defense (DoD).[1] Those resources make up half of the discretionary funds in the federal budget (funds whose levels the Congress can control directly each year through appropriations). Congressional debates on defense budgets most often focus on DoD's immediate spending needs. Nevertheless, some defense programs—such as major weapon systems—are years in the making, and DoD produces plans for them in advance. In addition, DoD publishes detailed five- or six-year plans incorporating resource projections for all of its programs.

What would current defense plans mean for military forces and budgets over the longer term? To cast light on that question, the Congressional Budget Office (CBO) has produced annual projections through 2020 of the resources that might be needed to carry out the Bush Administration's current plans for DoD (*see Figure 1-1*). It has also examined the implications of those plans for quantities and ages of major weapon systems. CBO projected DoD's two main types of resource demands—current operating expenses and spending on investment—separately and also produced separate estimates for the Department of the Army, the Department of the Navy (which includes the Marine Corps), and the Department of the Air Force. In addition, CBO estimated the steady-state procurement costs needed to sustain currently planned forces indefinitely.

The Bush Administration has called for transforming U.S. military forces to better meet the challenges of warfare in the 21st century. If such transformation occurred, it could have significant implications for DoD's costs to buy new systems. To illustrate those implications, CBO projected steady-state procurement costs not only for a force of today's size and composition but also for a hypothetical example of a transformed force, in which new and different types of systems replace current systems in many mission areas.[2]

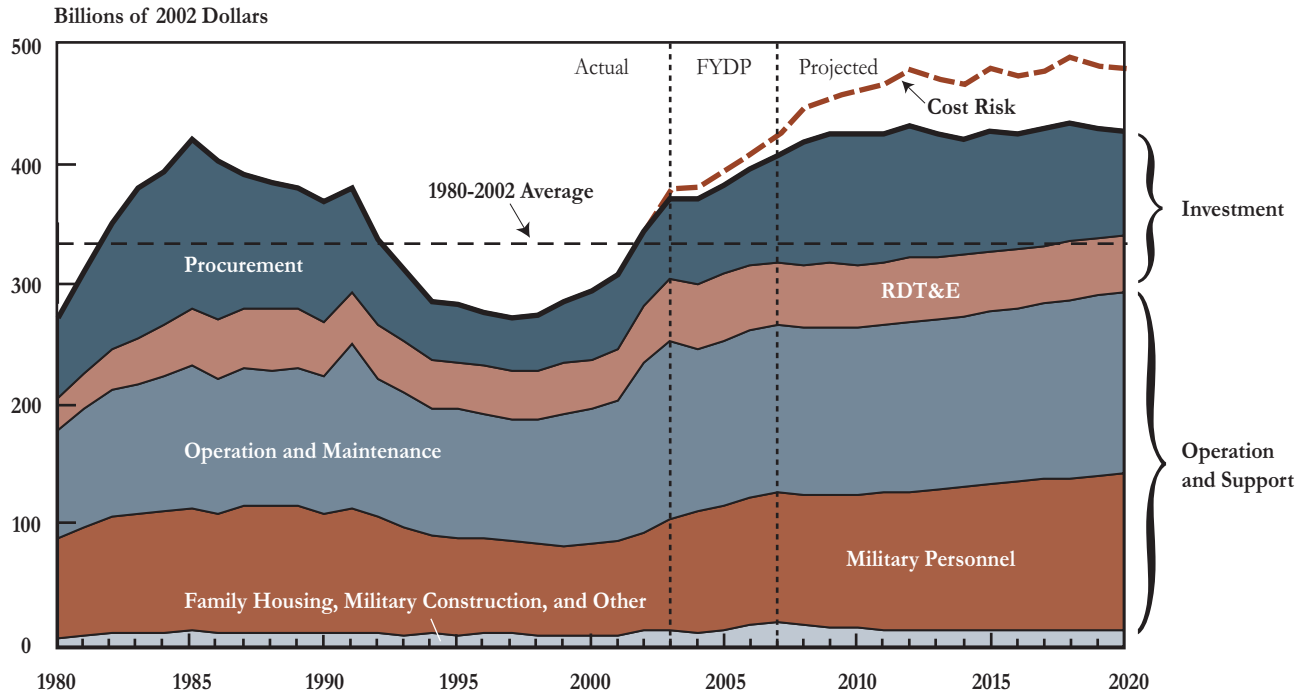
All long-term projections are uncertain. To reflect some of the elements contributing to that uncertainty, CBO produced two sets of projections of the long-

1. The Office of Management and Budget assigns funds for DoD to the national defense function of the budget (function 050). That function also includes funding for nuclear weapons programs run by the Department of Energy and for activities related to national security conducted by the Department of State, the Department of Justice, and other agencies. This study deals with resources for the Department of Defense (subfunction 051 of the budget).

2. For discussions of military transformation, see Steven Kosiak, Andrew Krepinevich, and Michael Vickers, *A Strategy for a Long Peace* (Washington, D.C.: Center for Strategic and Budgetary Assessments, January 2001); Michael O'Hanlon, *Technological Change and the Future of Warfare* (Washington, D.C.: Brookings Institution Press, 1999); Secretary of Defense Donald Rumsfeld, *Quadrennial Defense Review Report* (September 2001); and Secretary of Defense Donald Rumsfeld, *Annual Report to the President and the Congress* (2002).

Figure 1-1.

Past and Projected Resources for Defense



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program; RDT&E = research, development, test, and evaluation.

Portions of the budget titles for family housing and military construction pay for support activities, whereas other portions pay for investment. Thus, it is not possible to allocate all of the funding in each of those titles to either category.

term funding needed to implement the Administration's current plans. One set is based on DoD's assumptions about future program costs (where available), and the other is based on a certain degree of cost risk. For current operating expenses, cost risk includes the potential growth in costs as existing weapon systems age and as new systems that are more complex and expensive are added to the inventory. It also includes the risk that the Administration's current plans to reduce costs by realigning or closing military bases cannot be carried out. Cost risk for investment reflects DoD's past experience with cost growth in its major weapons programs. (Other sources of possible cost risk, which are generally associated with changes to DoD's current policies and plans, are not considered in this analysis.)

CBO's analysis focuses only on projecting the possible resource demands and other effects associated with current defense plans—not on evaluating the basis for those plans. For example, CBO did not analyze alternative approaches to structuring U.S. military forces consistent with the President's newly announced national security strategy. Nor did CBO assess the range of threats that the United States might face in coming decades and how those threats could alter current plans. Further, CBO did not attempt to evaluate the efficiency of DoD's business practices or its

need for a particular infrastructure to support combat forces. Those issues could have a major impact on future defense costs, but they are beyond the scope of this analysis, which looks at the long-term implications of the Bush Administration's current decisions about defense policies and programs.

The Current Defense Budget

Defense is the second biggest item in the federal budget (only Social Security is larger). It is also the single biggest category of discretionary spending. That category has two main components: operation and support (O&S) funding, which covers DoD's day-to-day operations; and investment funding, which covers the development and procurement of new and modified equipment. O&S funding is by far the larger of the two parts, making up 65 percent of DoD's budget in 2002. It pays for the salaries and benefits of military and civilian personnel, the services of contractors, and purchases of consumable goods (such as fuel and spare parts for equipment). The rest of DoD's budget—about 35 percent in 2002—represents investment in future capability.

Of the $222 billion in O&S funding provided for 2002, slightly less than 40 percent ($82 billion) was allocated to the military personnel accounts.[3] (Unless otherwise indicated, all dollar amounts are in 2002 dollars to account for the effects of past or projected inflation. Those amounts represent total obligational authority.)[4] Together, the four military services have about 1.4 million members on active duty and another 0.9 million members in the National Guard and Reserve. Appropriations for military personnel cover pay and benefits (including the allowances for food and housing given to some service members) as well as selected benefits for future military retirees.

The other 60 percent of O&S funding ($140 billion in 2002) was appropriated to the operation and maintenance accounts.[5] Those accounts fund all of DoD's current operating expenses except the costs of military personnel, family housing ($4 billion annually), and some small direct appropriations to trust funds and revolving funds (about $3 billion a year). Operation and maintenance pays for combat and training activities and for such support activities as medical care for active-duty military personnel and their families, child care and schools for the children of service members, and the costs of operating bases (including utilities, groundskeeping, and fire departments).

Funds for the other major part of DoD's budget—investment—totaled about $110 billion in 2002, rising to $128 billion for 2003. Investment comprises activities paid for in DoD's research, development, test, and evaluation (RDT&E) accounts and procurement accounts.[6] RDT&E funding pays for conducting basic and applied research, building devices to demonstrate new technology, and developing and testing equipment prototypes and full-scale preproduction systems. That funding also pays for operational testing

3. In the Department of Defense Appropriations Act, 2003, the Congress has provided $92 billion for military personnel for 2003. In general, this analysis uses 2002 numbers as a base because they represent the most recent full year of defense funding, including supplemental appropriations. Unless otherwise noted, historical values used in the study reflect sums reported in *National Defense Budget Estimates for FY2003* released by the Office of the Under Secretary of Defense (Comptroller) in March 2002.

4. Total obligational authority (TOA) is the funding available to be obligated by a federal agency or department. The great majority of that funding is budget authority, which is appropriated by the Congress, but TOA also includes funding that is derived from receipts as well as other nonappropriated amounts. In most years, the difference between total obligational authority and budget authority in budget subfunction 051 is no more than about $2 billion.

5. The Congress has provided $127 billion for operation and maintenance for 2003. That figure is smaller than the 2002 amount because the latter includes supplemental funding for operations in Afghanistan and the war on terrorism.

6. Some breakdowns of the budget include spending for military construction and for some aspects of military family housing in the investment category. CBO's analysis treats those costs separately, for reasons described later in this chapter.

when systems are first fielded and for design and testing when they are modified later during the course of their use. Procurement appropriations pay for the purchase of a wide variety of new weapons and other equipment—ranging from items unique to the military (such as combat aircraft and ships, fighting vehicles, and missiles) to desktop computers and office furniture.

The Administration's Plans for Defense

The Administration's current defense plans are described in general terms in the Secretary of Defense's *Quadrennial Defense Review Report* from September 2001 and his *Annual Report to the President and the Congress* from 2002. More-detailed descriptions of DoD's plans are provided in the Future Years Defense Program (FYDP) for 2003 (a document submitted to the Congress as part of the President's budget request), in committee staff backup books for various budget accounts (reports that DoD provides to the Congress about its program plans), and in Selected Acquisition Reports (SARs) submitted to the Congress for major defense programs that meet certain guidelines.

The annual FYDP summarizes the force levels and funding associated with specific programs that the Administration would like the Congress to approve. The 2003 FYDP, published early in 2002, presents DoD's estimated funding needs for the year for which funds were being requested (fiscal year 2003) and the following four years (2004 to 2007). For 2003, the Congress provided $359 billion in total obligational authority for defense rather than the $373 billion that the Administration had requested (*see Table 1-1*).

The FYDP is a database that also includes actual spending on defense since 1962 (for more details about that database, *see Box 1-1*). For this analysis, CBO used data contained in the FYDP going back to 1980. As described in the sources listed above, the Administration's current plans would make few substantial changes to U.S. military forces or to the major acquisition programs that are expected to sustain them over the long term. The plans do, however, stress the importance of transformation—shifting forces from traditional approaches to new approaches that incorporate advanced technologies. As a consequence, the Administration plans to initiate or increase funding for programs such as space-based radar satellites, unmanned combat air vehicles, unmanned reconnaissance aircraft, small surface combatants for the Navy, advanced-technology combat vehicles for the Army, and precision munitions. Nevertheless, the Administration's 2003 plans would continue to fund nearly all of the major acquisition programs inherited from the Clinton Administration (except the Army's Crusader self-propelled howitzer program, which was terminated). And the 2003 FYDP incorporates no significant changes over the next five years to the military's force structure—the number and composition of Army divisions, Air Force tactical fighter wings, Marine Corps expeditionary brigades, Navy carrier battle groups, and so forth. Transformation might enable DoD to make significant changes at some point, but programs begun now are unlikely to provide operational capabilities for 10 to 15 years, if not longer. Thus, transformation is unlikely to be realized before the 2020 endpoint of CBO's long-term projections.

Even though most types of forces are not expected to change significantly over the next five years, the 2003 FYDP projects that annual O&S funding will need to grow by 10 percent between 2002 and 2007, reaching $245 billion. That growth rate is smaller than the rate at which the Administration expects the total DoD budget to increase (18 percent). As a result, the share of the budget allocated to O&S costs would decline by 4 percentage points during the 2002-2007 period—from 64 percent to 60 percent—under the Administration's plans.

The Administration projects that spending for investment will grow three times faster than O&S spending over the next five years. Under the 2003 FYDP, investment spending would reach $142 billion by 2007—a real (inflation-adjusted) increase of 30 percent from the 2002 level. Investment's share of the total DoD budget would increase by 3 percentage points during the 2002-2007 period—to 35 percent in 2007.

Table 1-1.

Actual, Requested, and Projected Funding for the Department of Defense, 2003-2020

(In billions of 2002 dollars of total obligational authority)

	2003	Average, 2003-2007	Average, 2008-2014	Average, 2015-2020
Funding Envisioned in the Administration's 2003 Future Years Defense Program[a]	373	387	n.a.	n.a.
Funding Provided by the Congress	359	n.a.	n.a.	n.a.
Funding in CBO's Long-Term Projection of the Administration's Current Plans				
Without cost risk	373	387	426	430
With cost risk[b]	380	398	464	480

Source: Congressional Budget Office.

Note: n.a. = not applicable.

a. The annual funding needs laid out in the FYDP amount to $372 billion for 2004, $384 billion for 2005, $396 billion for 2006, and $408 billion for 2007 (in 2002 dollars of total obligational authority).

b. CBO's projection of cost risk for the period of the Future Years Defense Program (2003 to 2007) reflects cost growth only for investment, not for operation and support. Projected cost growth for investment is based on historical patterns of cost increases for major weapons programs. The methods used to project cost growth for operation and support use 2008 as a starting point, in part based on funding trends over the 2003-2007 period.

Methods of CBO's Analysis

CBO developed its long-term projections assuming that the policies and plans underlying the Bush Administration's 2003 FYDP are not changed in future years; thus, they are current-policy projections and are not meant to predict future budgets. Specifically, CBO estimated the resource demands associated with executing the Administration's current defense policies in each year from 2008 (the first year not covered by the current FYDP) through 2020.[7] Those resource demands were broken down by budget titles,

7. CBO's long-term defense projections differ from the baseline estimates that it provides twice a year to the Congress. CBO's baseline covers a 10-year period and projects the current budget into the future assuming no policy or program changes other than those already enacted into law. The baseline gives the Congress a benchmark against which to measure the effects of proposed changes in tax and spending policies. CBO's long-term defense projections, by contrast, are based on the 2003 FYDP and capture changes in defense programs that are now anticipated to occur during the 2008-2020 period.

Box 1-1.

The Future Years Defense Program

The annual Future Years Defense Program (FYDP) produced by the Department of Defense is a database that contains a historical record of defense forces and spending as well as DoD's plans for future programs and priorities. The Congressional Budget Office's projections rely heavily on both parts of that database.

The historical section of the database contains a record of costs, forces, and personnel levels since 1962. The FYDP data analyzed for this study have been adjusted to take into account changes in definitions of funding categories between 1980 and 2002. (Both the Institute for Defense Analyses and DoD's Office of the Director of Program Analysis and Evaluation make those adjustments to allow for better comparisons of defense spending over time.) For example, from the late 1980s to the early 1990s, spare parts were purchased with procurement dollars rather than operation and support dollars, as they are today, so one adjustment moved those past purchases to the operation and support side of the budget.

The plan portion of the FYDP presents DoD's program budgets—estimates of future funding needs based on the planned content of specific programs. DoD projects costs for each element of those programs through a period of either five or six years, on the basis of proposals made by each of the services and the policy choices made by the current Administration. The 2003 FYDP extends from 2003 to 2007. DoD's projections of FYDP funding change each year to reflect anticipated changes in the content of programs. For instance, the FYDP projection for a weapons program would increase or decrease over time if DoD intended to raise or lower the quantity of that weapon it expected to buy. Funding would also change if an Administration expected to alter the number of military personnel, the force size, personnel benefits, or various other factors in future years.

by service, and by operating and investment costs. Major acquisition programs and selected operation and support accounts were projected in detail using the sources of information described in the previous section. Other elements of acquisition programs were projected using a regression analysis of the historical trends in their funding. In addition, CBO estimated the effects of current plans on the size and age of major types of equipment inventories through 2020.

Those long-term projections required many assumptions. For example, CBO assumed that the total number of military and civilian personnel would remain constant through 2020 and that increases in their pay would keep pace with changes in the employment cost index—a measure of growth in wages in the private sector. CBO also assumed that the current force structure would not be changed and that the major acquisition programs now under way would be used to replace the equipment in today's forces. In addition, on the basis of currently stated Administration plans, CBO assumed that another round of base realignments and closures (BRAC) would begin in 2005 and would produce savings consistent with those from the four previous rounds (*see Box 1-2* for more details). CBO used deflators derived from its economic projections to adjust past or future costs to 2002 dollars.

In producing the long-term projections for investment, CBO used DoD's current estimates of development costs as well as its long-range plans for purchase rates and quantities (if they were available). CBO also

used DoD's pricing assumptions for major weapons, a choice that was intended to characterize the Administration's goals.

In the past, however, DoD has regularly failed to achieve its goals for preventing costs from rising. Over many Administrations, its plans have underestimated future operating costs, have projected cuts in infrastructure that did not occur, and have incorporated projections of weapons costs that were lower than the costs actually realized. Therefore, CBO also developed projections that reflect the risk of cost growth. For investment, CBO's cost-risk projections reflect DoD's experience with cost growth during the past 30 years of weapons purchases.[8] For O&S spending, cost risk includes the added costs of operating aging equipment and fielding and operating modern, more-complex equipment, as well as the additional costs that might accrue if key elements of the Administration's program, such as the 2005 BRAC round, do not proceed as now planned.

Projecting Resource Demands for Operation and Support

For its analysis, CBO divided O&S spending into seven categories based on function:

- *Forces and Logistics.* Almost half of O&S spending in 2002 fell in this category, which covers the costs—including pay—of operating and maintaining DoD's combat forces as well as activities in support of those forces, such as airlift, reconnaissance, and unit-level intelligence and communications.

- *Medical.* Military medical care—which includes health care for service members and their families plus accrual charges for the health benefits of future military retirees—accounted for over 10 percent of O&S spending in 2002.

- *Training, Permanent Change of Station, and Transient and Holding Accounts.* This category constituted 10 percent of O&S spending in 2002. It funds training for new military personnel, periodic training for experienced personnel to upgrade their skills or prepare for new assignments, moving expenses, students' salaries, and the personnel costs of service members who are between assignments.

- *Installations Support.* About 10 percent of O&S spending in 2002 went to the upkeep and repair of military buildings and facilities, operating expenses for military bases, and environmental programs.

- *Headquarters; Central Command, Control, and Communications; and Defensewide Administration.* Just under 10 percent of O&S spending in 2002 paid for operating higher-level headquarters staffs, such as the staffs of the Office of the Secretary of Defense, service headquarters, and other operational headquarters; for centralized intelligence and mapping activities; and for DoD-wide administration.

- *Personnel Support.* This category, which made up 2 percent of O&S spending in 2002, funds recreation programs and facilities for service members,

8. The Bush Administration has adopted a new policy of using the cost estimates for major systems prepared by the Office of the Secretary of Defense Cost Analysis Improvement Group (CAIG) in developing its budget and FYDP. The CAIG was established by Deputy Secretary of Defense David Packard. CAIG estimates have a record of being closer to actual costs than do the military services' estimates, which were often used to develop past budgets. Nonetheless, significant cost growth relative to the Administration's current estimates is still possible for several reasons. First, the new policy is not fully implemented yet, and many of the new or recently begun systems that are included in CBO's projections (such as the Future Combat System) lack CAIG estimates. Second, when the policy is fully implemented, it will not cover the many major systems that have been delegated to the services to over see (such as the space programs delegated to the Air Force). And third, the historical record indicates that costs have grown even relative to CAIG estimates. For 2012, CBO estimates that about 20 percent of its projection of total investment without cost risk, and about one-third of its projection of major investment, is based on CAIG-generated costs.

Box 1-2.

Base Realignment and Closure

Beginning in the late 1980s, the Department of Defense sought to reduce its operating costs by closing unneeded military bases. Significant reductions in force structure at the end of the Cold War made many bases unnecessary. But because political and procedural difficulties had long made closing bases nearly impossible, the Congress set up four successive independent commissions on base realignment and closure (BRAC), whose recommendations would be presented to the Congress for a single up-or-down vote. Those commissions recommended shutting or realigning (moving departments and facilities at) hundreds of military installations in the United States, Puerto Rico, and Guam. As a result of those changes, DoD estimates that it saves about $6 billion annually in operation and support costs.

The Secretary of Defense has asked the Congress numerous times over the past five years to authorize additional base closures. In *The Report of the Department of Defense on Base Realignment and Closure* of April 1998, DoD stated that opportunities exist for further cutbacks and consolidations at several types of bases—such as defense laboratories, test and evaluation installations, training facilities, naval bases, aircraft installations, and supply facilities. That report evaluated 259 major military installations, estimating that DoD has about 23 percent excess base capacity. In the *Quadrennial Defense Review Report* of September 2001, DoD again stated that it has 20 percent to 25 percent more facility structure than necessary to support its forces.

The Administration's current plan would implement a fifth round of base closures and realignments in 2005 that the Congress authorized in 2001. Such actions could produce substantial operation and support savings in the long run, but they would require some up-front investment in repair and restoration to ensure that closed bases were in good condition for transfer to localities. As a result, costs would increase in the short run. Those investment dollars are gererally placed in the military construction accounts until spent (and once spent are spread between the budgets for military construction and for operation and maintenance, primarily for environmental restoration).

Under the 2003 Future Years Defense Program and the Congressional Budget Office's long-term projections, up-front funding for the fifth BRAC round would increase DoD's military construction costs by a total of $8 billion between 2006 and 2008. By 2014, however, DoD could realize recurring savings of around $5 billion per year in operation and support costs, CBO projects, if the four earlier rounds of base closings are any guide.

In its cost-risk case, CBO assumes that the 2005 BRAC round would not proceed as planned. Some analysts argue that BRAC cuts have gone far enough in matching the planned reductions in forces. They maintain that the military's base structure should retain enough excess capacity to accommodate a new risk to national security that required a sudden increase in the number of military forces. Accordingly, in its risk case, CBO does not include any savings from a BRAC round. Moreover, without such a round, DoD might need to fund maintenance and repair that it had delayed in hopes that the bases and facilities in question would be demolished, closed, or sold. Thus, CBO's risk case also includes additional funding for repairs that are now being delayed.

child care and schools for their children, commissaries, and other activities intended to improve the quality of military life.

- *Recruiting.* About 2 percent of O&S spending in 2002 covered the costs of recruiting new military personnel.

For most of those functional categories, CBO made two projections of resource demands for O&S: one reflecting the Administration's expectations and another reflecting additional cost risk. (For detailed information about each category and about the assumptions, methods, and results of CBO's projections, see Chapter 2.)

In the projection of the Administration's plans, wage increases for military and civilian personnel and rising medical costs help push total O&S spending from $245 billion in 2007 to $280 billion by 2020—a 14 percent increase. That total includes projected savings of $4 billion to $5 billion a year starting in 2014 from closing bases to be identified in the 2005 BRAC round.

As noted above, cost risk for O&S spending mainly springs from the possibility that aging equipment and new, more-complex equipment will raise operation and maintenance costs and from the possibility that the 2005 BRAC round will not occur as planned. That additional cost risk could total $26 billion through 2020, CBO estimates, pushing annual O&S spending to $306 billion by 2020—a 25 percent increase from the 2007 level rather than a 14 percent increase.

Projecting Resource Demands for Military Construction and Family Housing

Most of DoD's spending for construction and a share of its spending for service members' housing are considered part of investment spending in some tallies of the defense budget. CBO separates out those costs (discussing them in Chapter 2 rather than Chapter 3) because its methods for projecting military construction and family housing have more in common with the methods it uses for projecting operation and support costs. Specifically, for those categories, CBO used an aggregate approach that projected funding for DoD as a whole rather than for individual construction or housing projects in each military service.

In 2002, DoD devoted $7 billion, or 2 percent of its budget, to the military construction account, which funds the planning, design, construction, and major restoration of military facilities. That account also pays for the operating expenses of the BRAC commission. In the 2003 FYDP, funding for military construction is expected to rise to $12 billion by 2007, mainly because of the need to pay the up-front costs of what DoD expects will be the largest-ever BRAC round. In CBO's long-term projections of current plans, resource demands for military construction remain close to $6 billion a year from 2010 through 2020, consistent with recent levels.

The family housing account—which received $4 billion in 2002, or 1 percent of DoD's budget—funds the operation, leasing, and construction of housing for military families. Since 1980, that funding has varied between $4 billion and $5 billion a year, the level also projected in the 2003 FYDP. CBO's long-term projection assumes that planned efforts to privatize the building and operation of family housing will not lessen resource demands, which continue at a level of about $4 billion per year through 2020.

Projecting Resource Demands for Investment

CBO's investment projections have two parts: estimates for major systems (such as aircraft, ships, and tanks), for which DoD provides detailed plans; and estimates for all other equipment and activities, for which DoD does not provide long-term plans. (For details of CBO's projections of resource demands for investment, by military service, and the assumptions underlying them, see Chapter 3.)

Major Investment. CBO projected future resource demands for major systems individually, using the Administration's long-range plans for costs, purchase rates, and quantities, as well as DoD's current estimates of the costs to develop those systems. In most cases, CBO's projections were based on information provided by DoD or the services, although in a few cases, CBO developed independent estimates of costs and schedules for programs for which DoD has expressed a desire but not yet formally submitted plans. Using those sources, CBO was able to project about 60 percent of the investment budget in detail. (Besides large weapon systems, major investment includes activities associated with the National Foreign Intelligence Program. CBO projected that those activities would be funded through 2020 at their 2007 levels.)[9]

Minor Investment. DoD provides no widely available, detailed estimates for the items that make up the other 40 percent of the investment budget, which CBO termed the minor-investment category. That category funds RDT&E and procurement for a wide array of items and activities, such as ammunition, radios, computers, lower-cost modifications to systems already in use, and basic and applied research. (It also includes selected highly classified, or black, programs.) CBO projected resource demands for minor RDT&E and procurement on the basis of their relation to past investment funding and to spending on major programs.

Spending for investment, which would rise to about $142 billion by 2007 in the FYDP, would continue to grow under current plans, CBO projects. It would peak at about $164 billion in 2012 and average about $143 billion a year over the 2002-2020 period. If, by contrast, historical trends in the growth of weapons costs continue, the investment resources necessary to carry out current plans would rise to about $156 billion by 2007. They would top $190 billion in 2012 and average $164 billion annually over the 2002-2020 period.

9. Projected funding for activities of the National Foreign Intelligence Program is not identified explicitly in this report because it is classified.

Possible Effects of Transforming the Military

CBO's projections through 2020 assume that the Bush Administration will make only those changes in forces and major programs that it has explicitly announced or that are contained in the 2003 FYDP. Because those changes are relatively minor, CBO assumes that the composition of future forces will be similar to that of today's forces. For example, manned aircraft such as the Air Force's F-16 fighter or the Marine Corps's AV-8 jump jet are assumed to be replaced by the manned Joint Strike Fighter that DoD has on the drawing board.

As noted above, however, the Administration has also stated that it expects to transform DoD by incorporating new technologies to save money while retaining or improving combat capability. Transformation could take many forms, depending on whether concepts that DoD has just begun to explore succeed or fail. DoD has started research on advanced-technology combat vehicles, unmanned aircraft, and smaller combat ships; in addition, the military services and the U.S. Joint Forces Command are experimenting with new ways to organize and operate forces that might be possible if such systems can be fielded. If those transformation concepts succeed and are adopted—which is unlikely before 2020, the endpoint of CBO's projections—future military forces could be very different from the ones assumed in the Administration's current plans. Moreover, if the cost goals now envisioned for those systems can be met, transformation could reduce future defense costs.

To illustrate the possible scope of that impact, CBO calculated the steady-state procurement funding needed over the long term to sustain both current military forces and a hypothetical example of transformed forces. (For more information about how CBO made that calculation, *see Box 1-3.*)

In its current-forces case, CBO assumed that today's forces would be maintained indefinitely and equipped with systems that are similar to the ones they have

Box 1-3.

Calculating Steady-State Procurement Costs

To provide a measure with which to compare the long-term implications of the Administration's current procurement plans—as well as the potential savings from transforming the military—the Congressional Budget Office estimated how much the Department of Defense would need to spend on major procurement each year to sustain forces and keep the average age of various types of weapon systems constant. CBO concluded that DoD would need a total of $85 billion to $112 billion annually for major procurement to sustain currently planned forces indefinitely if costs do not grow beyond DoD's expectations. If historical cost growth was repeated, steady-state procurement costs would range from $99 billion to $130 billion a year.

Those estimates are based on the number of weapons that DoD has in its current inventory, the projected life spans of those weapons, and the costs of their replacements. For example, the Air Force's desired inventory of fighter and attack aircraft totals about 2,400 planes (including reserves to replace lost or damaged planes). In the past, the Air Force expected to keep its fighter and attack aircraft flying for about 20 years before replacing them. Beginning in the 1990s, however, the service planned to retain its fighters for 30 years or more. Thus, CBO assumes service lives for Air Force fighters that span 20 to 30 years.

Annual steady-state purchases equal the desired inventory level divided by the expected service life—or, in this case, purchases of 80 to 120 Air Force fighters per year. The cost of the Joint Strike Fighter (JSF) and the F-22 aircraft, which will eventually replace current fighters, ranges from about $50 million for the Air Force version of the JSF to about $110 million for the F-22. (The Air Force plans to replace some 80 percent of its fleet with the lower-cost JSF.) CBO multiplied annual steady-state purchases for each type of aircraft by the estimated cost for each replacement to estimate total steady-state procurement costs for the Air Force's fleet of tactical aircraft. That estimate ranges from $5 billion to about $7 billion a year.

Steady-state procurement funding relates only to the size and type of systems purchased; it is independent of the current level of the procurement budget. Implementation of actual plans could bring annual budgets that are higher or lower than steady-state levels. If DoD bought all systems in the annual quantities reflected in a steady-state estimate, inventories of equipment would eventually be evenly distributed throughout the age range from new deliveries to systems at retirement age. For inventories with such an age distribution, annual retirements would be steady rather than varying from year to year, as would happen if systems were purchased unevenly. The average age of each type of equipment would come to equal half the equipment's service life and would neither increase nor decrease thereafter.

now, unless the Administration has explicitly announced otherwise. Steady-state procurement costs for those forces would range from $85 billion to $130 billion a year, depending on CBO's assumptions about the costs and lifetimes of major defense systems.

In the transformed-forces case, CBO assumed that many of the transformation initiatives now being undertaken by the Bush Administration ultimately succeed and are embraced by the military services. In that case, the services would use significantly different systems in the future to replace some of their current

equipment. For example, unmanned combat air vehicles—instead of manned combat aircraft—would be used for ground-attack missions. CBO also assumed that DoD would transform some of its operating methods to reduce the number of platforms needed to perform peacetime missions. CBO projects that steady-state procurement costs for that particular example of transformed forces would range from $76 billion to $114 billion per year. Thus, under CBO's assumptions about transformation, DoD might eventually save between $9 billion and $16 billion (or about 12 percent) annually on procurement if it succeeded in significantly altering the way it equips and uses its forces.

Of course, those estimates hinge on the particular assumptions that CBO made about the composition of transformed forces. Larger or smaller savings, or higher costs, might result depending on how transformation actually occurred. Although CBO's transformed forces are radically different in composition from today's forces, they contain about the same total numbers of aircraft and other weapon systems. If transformation enabled DoD to substantially reduce its number of weapon systems, greater procurement savings than CBO projects might be possible. Conversely, savings could be much less if—consistent with past experience—the currently hoped-for cost goals of new systems cannot be met.

Projected Long-Term Costs Versus Actual Funding

For 2003, the Bush Administration requested $373 billion for DoD, an amount that it hopes to increase to $408 billion by 2007. In October 2002, the Congress passed—and the President signed into law—a budget of $359 billion for defense for 2003 *(see Table 1-1 on page 5)*.[10]

10. See the Department of Defense Appropriations Act, 2003 (Public Law 107-248) and the Military Construction Act, 2003 (P.L. 107-249). Note that the amounts reported in this study are in 2002 dollars of total obligational authority, whereas the amounts enacted are in 2003 dollars of budget authority.

In CBO's long-term projections of current plans, demand for defense resources would continue to grow, reaching about $430 billion by 2020. That projected growth springs from three sources: increasing production of a number of existing programs; continued growth in the costs to operate and sustain future forces, which are assumed to be essentially the same size as today's forces; and continued development and eventual production of new programs.

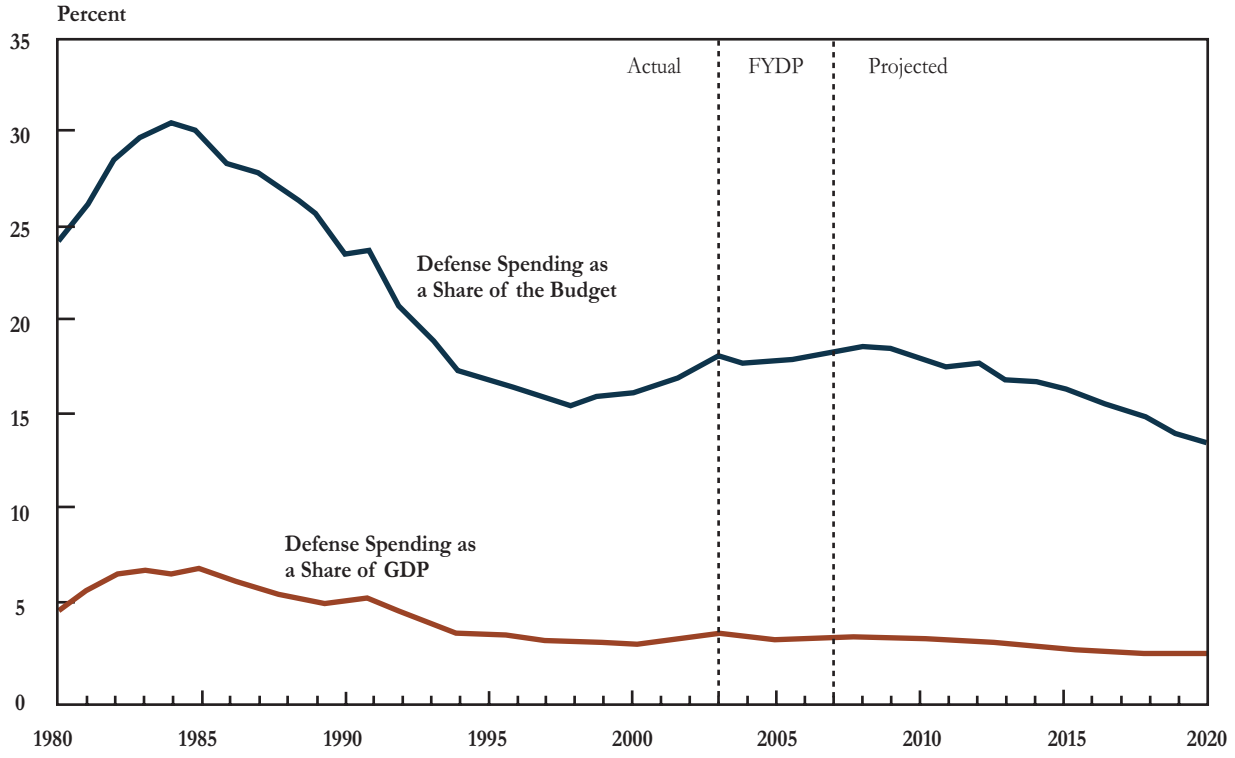
How do those projected levels of resource needs compare with past and present defense budgets? Over the past 20 years, DoD's budget has ranged from about $275 billion to $420 billion per year. The levels of defense spending envisioned in the FYDP period are not unprecedented, but the higher levels in CBO's long-term projections are slightly greater than past spending. Moreover, levels approaching those amounts have been sustained in the past for only a few years in succession *(see Figure 1-1 on page 2)*. Projected annual resource demands for defense through 2020 exceed the funding requested for 2003 by an average of $45 billion, or 12 percent.

Some defense experts argue that the nation's ability to pay for such defense spending should be measured relative to benchmarks other than past budgets—such as the size of the U.S. economy or of the federal budget. As a share of the nation's gross domestic product (GDP), defense spending declined from an average of 6 percent in the 1980s to an average of 4 percent in the 1990s. Under the 2003 FYDP, defense spending would remain at about 3 percent of GDP through 2007 *(see Figure 1-2)*. Assuming that the economy grew at a long-term rate of 3 percent a year, the resource demands associated with current defense plans would drop to 2 percent of GDP by 2020, CBO projects.

Defense spending has also declined as a share of the overall federal budget—from an average of 28 percent in the 1980s to an average of 18 percent in the 1990s. The Administration's plans under the 2003 FYDP would keep defense spending at 18 percent of the

Figure 1-2.

Defense Spending as a Share of the Federal Budget and GDP



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; GDP = gross domestic product.

budget through 2007. After that, if the federal budget grew through 2020 at the rates that CBO now projects through 2012, the resources needed for current defense plans would represent 13 percent of the budget by 2020.[11]

That projected decline results because increases for nondefense spending outpace projected increases in defense. In particular, the aging of the large baby-boom generation will begin to push up costs for federal health care and retirement programs significantly in the next three decades.[12] The resource demands of those entitlement programs could limit the funding available for all discretionary programs, including those of the Department of Defense.

11. CBO's most recent published projections for GDP and federal budgets through 2012 are contained in *The Budget and Economic Outlook: An Update* (August 2002).

12. U.S. demographic pressures are such that without major changes to Social Security, Medicare, and Medicaid, those three programs are projected by 2030 to consume a substantial por tion of what the federal government now spends on the entire budget. See Congressional Budget Office, *The Budget and Economic Outlook: An Update*, Chapter 1.

CHAPTER

2

Long-Term Implications for Operation and Support

Nearly two-thirds of the defense budget goes to operation and support, a category that covers the day-to-day costs of the Department of Defense as well as its civilian and military payrolls. If the plans in the Administration's 2003 Future Years Defense Program were carried out, annual O&S costs would grow by 14 percent from 2007 to 2020, the Congressional Budget Office projects—rising from $245 billion in 2007 to $280 billion.[1] The main contributors to that projected growth are wage increases that exceed inflation and rising medical costs.[2]

CBO's projections of the long-term implications of the Administration's defense plans assume that only the changes included in the 2003 FYDP or already announced by the Administration are made. They also assume that the size of the military remains constant from 2007 (the end of the current budget plan) through 2020 and that military and civilian pay grows at the same rate as the employment cost index.[3]

Even under those assumptions, uncertainty remains about future O&S costs. The biggest question is whether the cost of maintaining equipment will rise as existing inventories age and as DoD acquires new, more-complex equipment. Another important question is whether the proposed 2005 round of base realignments and closures will proceed as planned and produce the anticipated savings in O&S costs.

If those and other cost risks are taken into account, annual operation and support costs could rise by an additional $26 billion, reaching $306 billion by 2020, CBO estimates. (That increase would represent growth of 25 percent from the 2007 level rather than 14 percent.) Of the additional $26 billion in that projection, about $16 billion comes from increases in the cost of maintaining equipment, and $5 billion reflects forgone savings from the 2005 BRAC round.

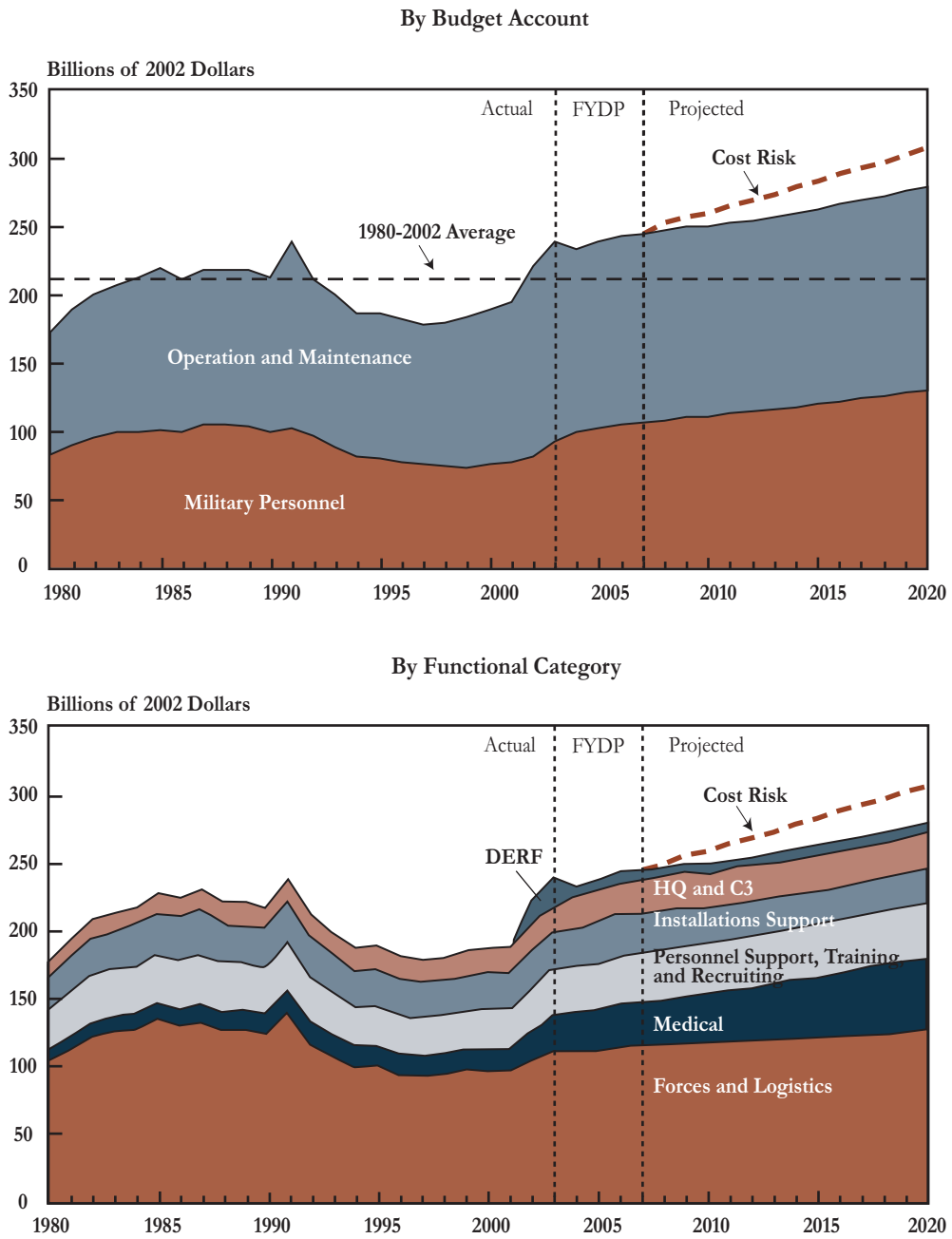
1. Historical O&S spending and CBO's projections of O&S costs are expressed in terms of total obligational authority. All dollar amounts are in 2002 dollars.

2. The National Defense Authorization Act for Fiscal Year 2003, enacted in December 2002, institutes funding for special compensation for veterans with combat-related disabilities. That provision was not included in the 2003 FYDP and thus is excluded from CBO's long-term projections. CBO estimates that the provision will cost DoD about $5 billion (in current dollars) over 10 years.

3. The employment cost index measures the weighted-average cost of an hour of labor in the U.S. civilian labor force. It comprises the cost to the employer of wage and salary payments, employee benefits, and contributions for social insurance programs (such as Social Security and Medicare). The employment cost index is calculated by the Department of Labor's Bureau of Labor Statistics.

Figure 2-1.

Spending for Operation and Support



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; DERF = Defense Emergency Response Fund; HQ = headquarters; C3 = command, control, and communications.

Overview of Operation and Support

Operation and support includes the funds appropriated for two main budget accounts: operation and maintenance, and military personnel *(see Figure 2-1)*. Those accounts, along with appropriations for family housing and some small direct appropriations for trust funds and revolving funds, cover all of DoD's current operating costs.

The bulk of O&S spending (about 60 percent in both 2002 and 2003) goes to operation and maintenance costs, which include the salaries of DoD's civilian employees, the services of contractors, and purchases of fuel, spare parts, and other goods routinely consumed by the military. Operation and maintenance funding pays for activities that directly enhance combat capabilities, such as individual and unit training, and for activities that are less directly linked to combat capabilities, such as central headquarters management.

Appropriations for military personnel make up much of the remaining 40 percent of O&S spending. They cover the pay and allowances received by active-duty and reserve personnel as well as the accrual costs of military retirement. Beginning in 2003, personnel spending also includes accrual charges for the expanded supplemental medical benefits that DoD provides to military retirees who are eligible for Medicare.[4]

In addition to budget accounts, another way to break down O&S spending is by functional category. For its analysis, CBO divided O&S spending into seven categories, as described in Chapter 1—forces and logistics; medical; training; installations support; headquarters, central command, control, and communications, and defensewide administration; personnel support; and recruiting. CBO examined past trends in funding and the Administration's current plans, as reflected in the 2003 FYDP, for each category. CBO then developed budget projections of the Administration's plans and of selected cost risks for those categories through 2020 (described in greater detail later in this chapter).

The amount that DoD spends on O&S activities has nearly doubled over the past 22 years relative to the size of the active-duty force: from $84,000 per service member in 1980 to $160,000 per member in 2002 *(see Figure 2-2)*. Some of that increase reflects growth in the cost of supporting military personnel, including rising health care costs and pay increases. But it also reflects a decline in the size of the active-duty force—in part because of efforts to substitute less costly reservists, contractors, or civilians for active-duty personnel. (Over the same period, spending on investment has risen from $46,000 to $80,000 per active-duty service member, although it has fluctuated with DoD's investment cycles. That rise suggests that DoD has substituted capital for active-duty personnel.)

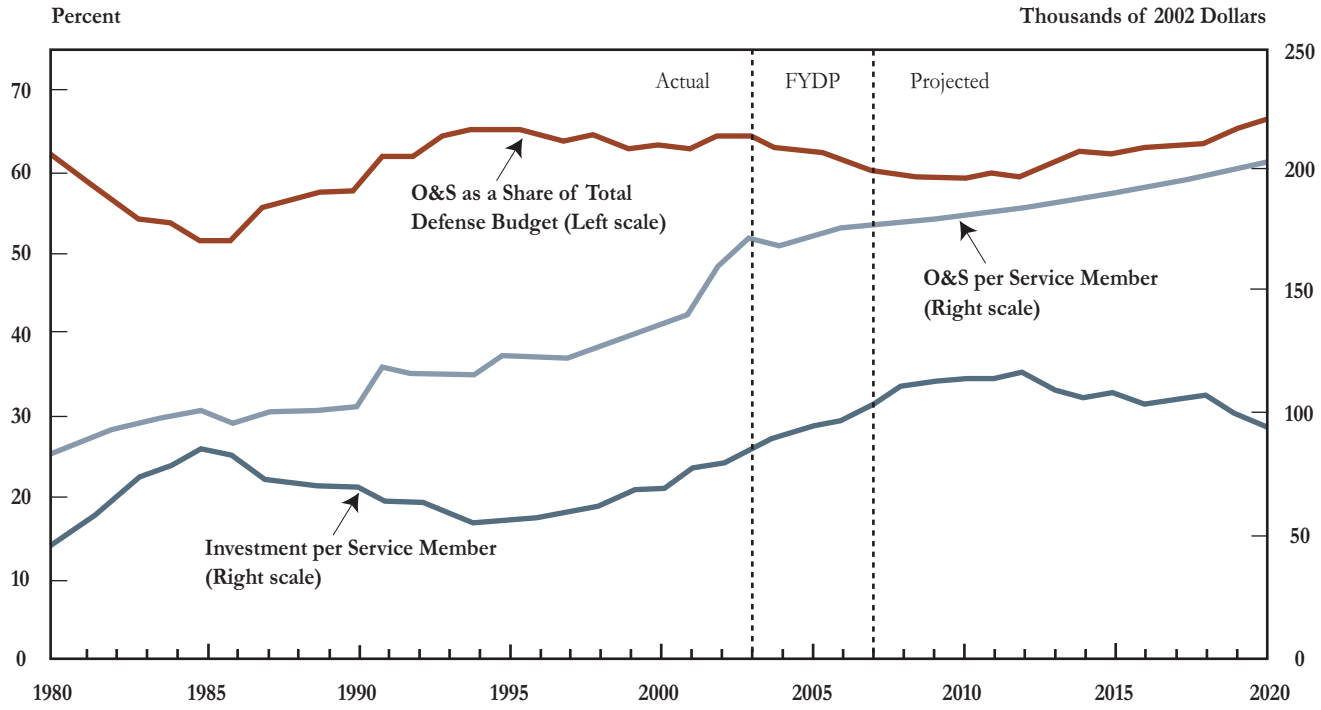
O&S spending currently accounts for almost two-thirds of DoD's budget *(see Table 2-1)*. During the defense buildup of the mid-1980s, investment spending rose dramatically, but the number of DoD's military and civilian personnel increased very little. As a result, O&S's share of the defense budget declined from the high levels that had existed during the Vietnam War to a low of 52 percent in 1985 *(see Figure 2-2)*. That share rose again to 65 percent during the 1990s because of the post-Cold War drawdown of U.S. forces and the sharp reduction in procurement of new equipment that accompanied it.

In CBO's projection of the Administration's plans, the share of the budget devoted to O&S would decline in the next 10 years to a low of 56 percent with cost risk or to 59 percent without cost risk. In either case, however, O&S spending would return to just above its current share of the defense budget by 2020.

4. Accrual costs are charges to DoD's budget for deferred compensation (such as pensions and future retirees' health care). Under an accrual system, DoD pays the charges for the years in which employees are working and earning benefits, rather than for the years in which the benefits are actually paid. An independent board of actuaries sets the charges for each year so that, when invested in Treasury securities, DoD's payments will fully fund expected future benefits.

Figure 2-2.

Three Measures of Defense Spending



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; O&S = operation and support.

Because CBO's projection assumes no change in the number of active-duty service members, O&S costs per member would grow to the same degree as total O&S costs from 2007 through 2020: by 14 percent without cost risk and 25 percent with cost risk. The resulting pattern is consistent with historical trends in O&S spending per service member. (Investment costs per active-duty service member continue to show a long-term upward trend, though in a cyclical pattern, in CBO's projection. Between 2002 and 2020, they grow by 22 percent without cost risk and 41 percent with cost risk.)

The remainder of this chapter discusses in detail CBO's projections for each of the seven functional areas of operation and support costs. It also discusses projections for military construction and family housing. Those spending categories are grouped with O&S costs in this chapter because CBO used similar projection methods for all of them.

Table 2-1.

Requested and Projected Funding for Department of Defense Operation and Support

(In billions of 2002 dollars of total obligational authority)

	Average, 2003-2007	Average, 2008-2014	Average, 2015-2020
O&S Funding Envisioned in the Administration's 2003 Future Years Defense Program	240	n.a.	n.a.
O&S Funding in CBO's Long-Term Projection of the Administration's Current Plans			
Without cost risk	240	253	272
With cost risk	240	264	294
O&S Funding as a Percentage of the Total Defense Budget			
Without cost risk	62	60	63
With cost risk[a]	60	57	61

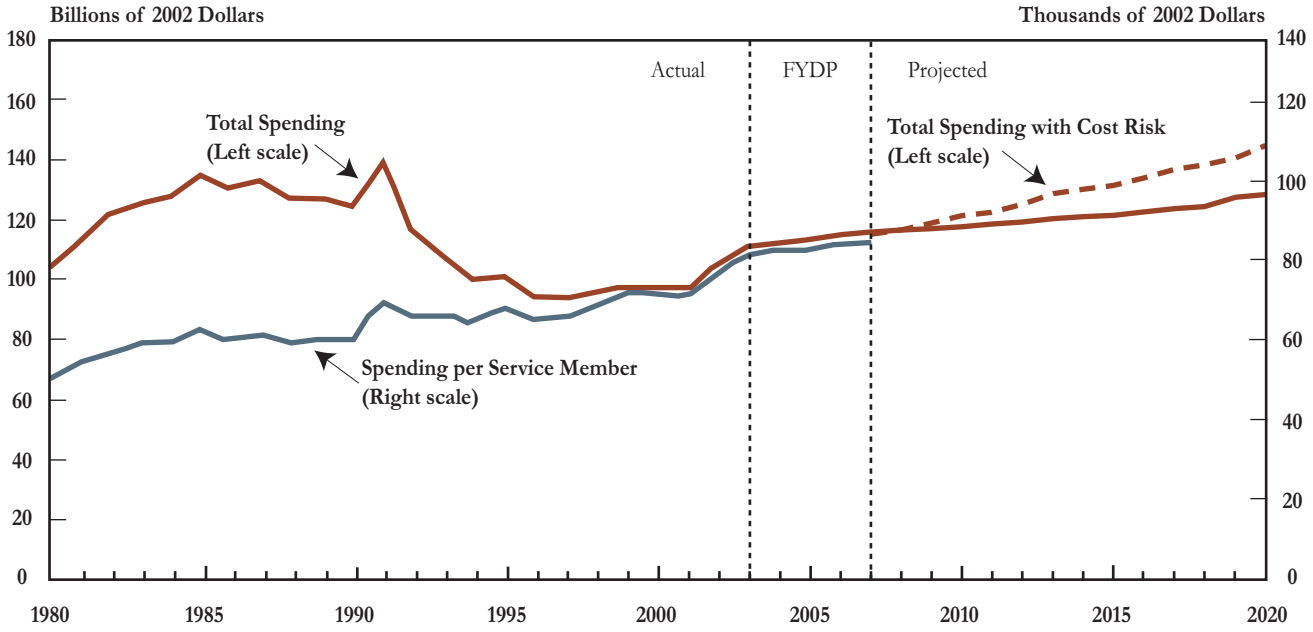
Source: Congressional Budget Office.

Note: n.a. = not applicable; O&S = operation and support.

a. Includes cost risk for both O&S and investment. O&S funding makes up a smaller percentage of the defense budget with cost risk than without cost risk because of a relatively larger amount of investment cost risk.

Figure 2-3.

Spending for Forces and Logistics



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Forces and Logistics

The category of forces and logistics, which now accounts for nearly half of O&S spending, includes the costs of personnel, supply, equipment maintenance, and day-to-day operations for Air Force squadrons, Navy fleets, and Marine Corps and Army divisions. In CBO's projection of the Administration's plans, the annual O&S costs of forces and logistics grow by 9 percent between 2007 and 2020—from $116 billion to $127 billion (in 2002 dollars). If cost risks are taken into account, those annual costs would rise by 23 percent over that period, to $143 billion.

What the Category Covers

O&S funding for forces and logistics pays for the flying hours of aircraft, the steaming days of ships, and the miles driven by tanks and other vehicles, as well as for the salaries of the personnel who operate and maintain that equipment.[5] Spending on fuel, parts, and equipment maintenance—including overhauls at depots—accounts for 20 percent of O&S spending on forces and logistics. The salaries of personnel associated with combat units make up another 40 percent of the total. The remaining spending covers deployable units or activities that directly support combat forces, such as airlift, reconnaissance, and unit-level intelligence and communications.

5. Cost per flying hour, steaming hour, or tank mile is defined as the hourly cost of operating equipment. It includes fuel and other consumable items, such as bearings and washers, as well as the repair of major subsystems such as radars, navigation instruments, or engines (so-called depot-level reparables).

Trends

Over the past 22 years, spending for forces and logistics has mirrored total DoD spending—rising when defense budgets increased and falling when they declined. Spending for forces and logistics reached its highest sustained levels during the defense buildup of the 1980s. Through the mid-1990s, as U.S. forces shrank by 30 percent, that spending also fell by 30 percent (despite a brief spike in 1991 for the Gulf War). From 1995 through 2001, as reductions in forces ended and concerns about readiness grew, spending for forces and logistics stabilized. Recently, total defense spending has risen, and the Administration plans to increase funding levels for forces and logistics from $105 billion in 2002 to $116 billion by 2007 *(see Figure 2-3).*

Projection

CBO's projection of the Administration's plans includes the costs of military and civilian pay raises. However, it follows the Administration's implicit assumption that management initiatives in logistics support, as well as the advent of more-modern equipment, will offset the rising operation and maintenance costs of existing systems as they get older. Historically, DoD's projections have assumed little or no growth in annual costs to operate and maintain existing military equipment. That remains true with the funding levels in the 2003 FYDP, despite anecdotal evidence, Congressional testimony, and recent analysis suggesting that aging systems do cost more to maintain.[6] Likewise, DoD's estimates of O&S costs for new systems have historically been optimistic, projecting lower operating costs for increasingly complex and expensive equipment. Although DoD provides for some real increases in operating costs for equipment through 2003, it appears to assume that lower costs for newer systems will offset rising costs for older systems in the longer term.

CBO's projection of cost risk for forces and logistics—which is based on recent analytic work about aging systems and about the increasing costs of more-modern equipment—includes additional cost growth of $16 billion between 2007 and 2020. For Air Force and Navy aircraft, CBO assumed that operating costs would grow by 1 percent for each additional year of average age per system, boosting annual costs by a total of $4 billion by 2020.[7] Additionally, the operating costs of aircraft from generation to generation are assumed to rise in relation to the purchase price (increasing by 4 percent for each 10 percent rise in the purchase price of new aircraft over the price of the previous generation).[8] That assumption would translate into another $4 billion in extra costs by 2020. For ships, CBO based its projection on current costs to operate and maintain the Navy's various types of vessels and on planned changes in the inventory and mix

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6. For a discussion of the effects of equipment age on operating costs, see Congressional Budget Office, *The Effects of Aging on the Costs of Operating and Maintaining Military Equipment* (August 2001). CBO concluded that although equipment aging is not the primary contributor to increases in total operation and maintenance costs (being only a small subset of those costs), Air Force and Navy aircraft do become more expensive to operate and maintain as they age.

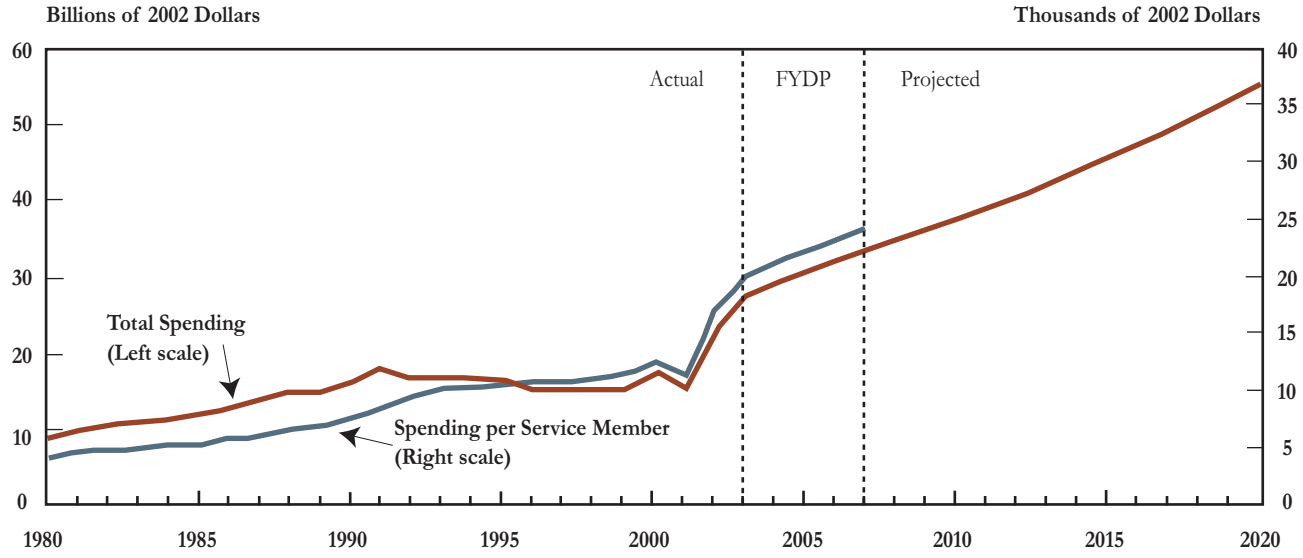
7. Average ages and inventories of different types of aircraft are based on CBO's projections of investment spending and commensurate purchases and retirements of systems (see Chapter 3). The 1 percent estimate is based on various analyses, including Congressional Budget Office, *The Effects of Aging on the Costs of Operating and Maintaining Military Equipment*; Center for Naval Analyses, "Effect of Aircraft Age on Maintenance Costs" (briefing given to the Congressional Budget Office, March 2000); and Department of the Navy, Naval Aviation Maintenance Office, *Aircraft Age Impact on Individual Operating and Support Cost Elements* (July 1993).

8. See Congressional Budget Office, *The Effects of Aging on the Costs of Operating and Maintaining Military Equipment*; and RAND, *An Estimation of USAF Aircraft Operating and Support Relations* (Santa Monica, Calif.: RAND, May 1990). Other works supporting the assertion that newer systems are more expensive to operate and maintain than older systems include Donald Vandegraff, ed., *Spirit, Blood, and Treasure: The American Cost of Battle in the 21st Century* (Navato, Calif.: California Presidio Press, 2001); and Center for Strategic and Budgetary Assessments, *Buying Tomorrow's Military: Options for Modernizing the U.S. Defense Capital Stock* (Washington, D.C.: CSBA, May 2001).

of ships. CBO's projection indicates that total operating costs for ships over the 2008-2020 period would not vary much from the current level of $9 billion a year. Little information or analysis exists on the operating costs of future Army vehicles. Consistent with historical trends, CBO assumed that the Army's costs for forces and logistics would grow by 1 percent a year, adding $8 billion to annual costs by 2020.

Figure 2-4.

Medical Spending



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Medical Costs

Spending for military medical care, which already makes up more than 10 percent of DoD's operation and support costs, is the fastest-growing category of O&S spending. In CBO's projection of the Administration's plans, annual medical spending rises by 67 percent over the 2007-2020 period, from $33 billion to $55 billion.

What the Category Covers

DoD's medical spending covers the health care costs of service members, their dependents, and military retirees. Those costs include expenses for patient care and prescription drugs provided at military treatment facilities as well as the cost of health care purchased in the private sector and paid for through Tricare (DoD's third-party health insurance program for active-duty and retired service personnel and their eligible family members and survivors). Medical spending also pays the salaries of doctors, nurses, and technicians at military treatment facilities and the salaries of personnel who administer DoD's health care system. In addition, it funds items that are unique to military medicine, such as deployable field hospitals, excess capacity to deal with wartime casualties, and programs to respond to attacks by chemical and biological weapons.

Trends

In general, medical costs per service member have increased steadily for the past 22 years *(see Figure 2-4)*. Many of the same forces that cause national health expenditures to rise—an increase in the volume of health care services available and expanded use of new, high-cost drugs and procedures—translate into higher military medical costs. In addition, retirees and their dependents now make up a larger share of beneficiaries, increasing the average age and costs of the people who receive health coverage through DoD.

In the current FYDP, medical costs are expected to rise dramatically over the next five years, for two reasons: new benefits for military retirees over age 65 (called Tricare for Life) and a switch to an accrual accounting system. In 2001, the Congress passed legislation providing medical benefits to retirees over 65, who had previously lost eligibility for Tricare coverage when they became eligible for Medicare. In addition, under that legislation, the new coverage for future retirees will be funded on an accrual basis, with DoD's budget being charged each year for the expected costs of future benefits.[9] The rate at which those accrual charges increase each year will be set by an independent board of actuaries, taking into account growth in civilian health care costs and demographic changes among military retirees.

Projection

CBO projects that the plans in the 2003 FYDP would boost annual medical costs by $22 billion between 2007 and 2020. That projection has two components: health care costs for active-duty personnel and their families, and accrual charges for retirees and their dependents. CBO estimated the growth of costs for active-duty personnel (about $11 billion a year by 2020) using the Department of Health and Human Services' projection of 3.6 percent real annual per capita growth in civilian health care costs in the long term.[10] The estimated growth of accrual charges (nearly another $11 billion a year by 2020) is derived from applying the 4.0 percent real annual growth rate set by the independent board of actuaries and included in the FYDP, projected out to 2020.

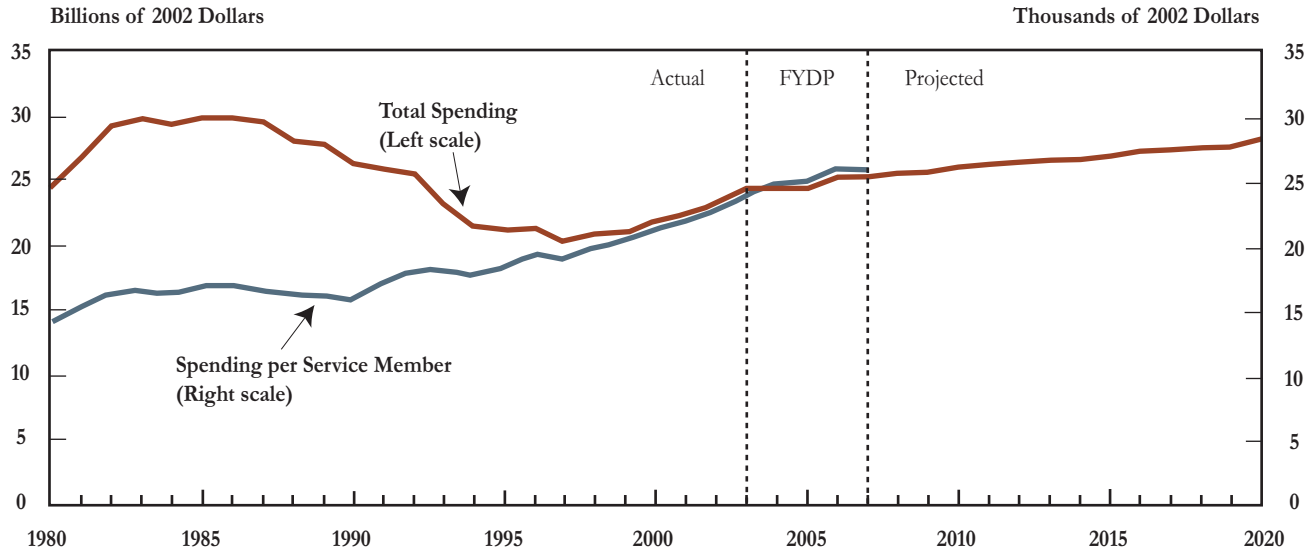
CBO did not produce a cost-risk projection for medical spending. The most likely risks, which would be the addition or expansion of health care benefits, are difficult to project now with any confidence. (However, some projections exist of growth in civilian health care costs that, at least in the near term, are higher than CBO's assumptions. If those higher growth rates were realized in the long term for military medical care, they would reflect a risk of increased costs not associated with additional benefits.)

9. Health care benefits for future Medicare-eligible retirees and their dependents are funded on an accrual basis as of 2003, whereas benefits for all other military retirees and dependents are funded out of DoD's annual operation and support budget. The 2003 FYDP proposed that health care costs for those other retirees and dependents be funded on an accrual basis beginning in 2004, but that measure has not yet been enacted. CBO's projection of future health care costs assumes that the proposal will be enacted and thus does not differentiate among retirees.

10. That growth rate is derived from data available at the Department of Health and Human Services, Centers for Medicare and Medicaid Services Web site (http://cms.hhs.gov/statistics/nhe/projections-2000/t1.asp).

Figure 2-5.

Spending for Training



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

These numbers include the defense budget's permanent change of station (PCS) and transient and holding accounts, which pay moving expenses, students' salaries, and the personnel costs of people between assignments.

Training

In CBO's breakdown of O&S costs, the training category currently accounts for 10 percent of O&S spending. It includes the costs of training military personnel, preparing them for new assignments, moving them from posting to posting (often called permanent change of station, or PCS, costs), and paying them between assignments (referred to as transient and holding costs). Annual training costs rise by 16 percent between 2007 and 2020 in CBO's projection (from $25 billion to $28 billion) because of assumed pay increases.

What the Category Covers

Funding for training pays for civilian and military instructors, supplies and equipment, and training support for both active-duty and reserve personnel. The PCS account covers the expenses of moving personnel from assignment to assignment. The transient and holding account pays for personnel not currently assigned to specific units and students in training billets. The training category focuses on so-called schoolhouse training; it does not cover exercises or training conducted by operational units. (Those costs are included in the forces and logistics category.)

The largest segment of training ($7 billion a year) is categorized as professional and skills training, including general skills training and advanced professional military education courses. DoD spends three times as much on professional and skills training as on training for new recruits. The second largest training account ($5 billion a year) is command-managed training—training above the unit level, such as for combat exer-

cises and follow-on flight schools. Initial aviation and flight training ($3 billion a year) as well as officer training and the service academies ($1 billion a year) are also included in the training category. The PCS account is funded at about $3 billion a year and the transient and holding account at $2 billion.

Trends

Training costs per service member have risen steadily since 1990, from $16,000 per member to $24,000 per member in 2003 *(see Figure 2-5)*. Training costs depend on the size of the military force, but they also include some overhead expenses for training facilities. Because training facilities did not shrink as quickly as the military force did during the drawdown of the 1990s, neither did training costs. By 1998, however, spending for both professional and skills training and command-managed training had declined by 30 percent from the highs of the previous decade (although not by the 35 percent that the overall defense budget had fallen).

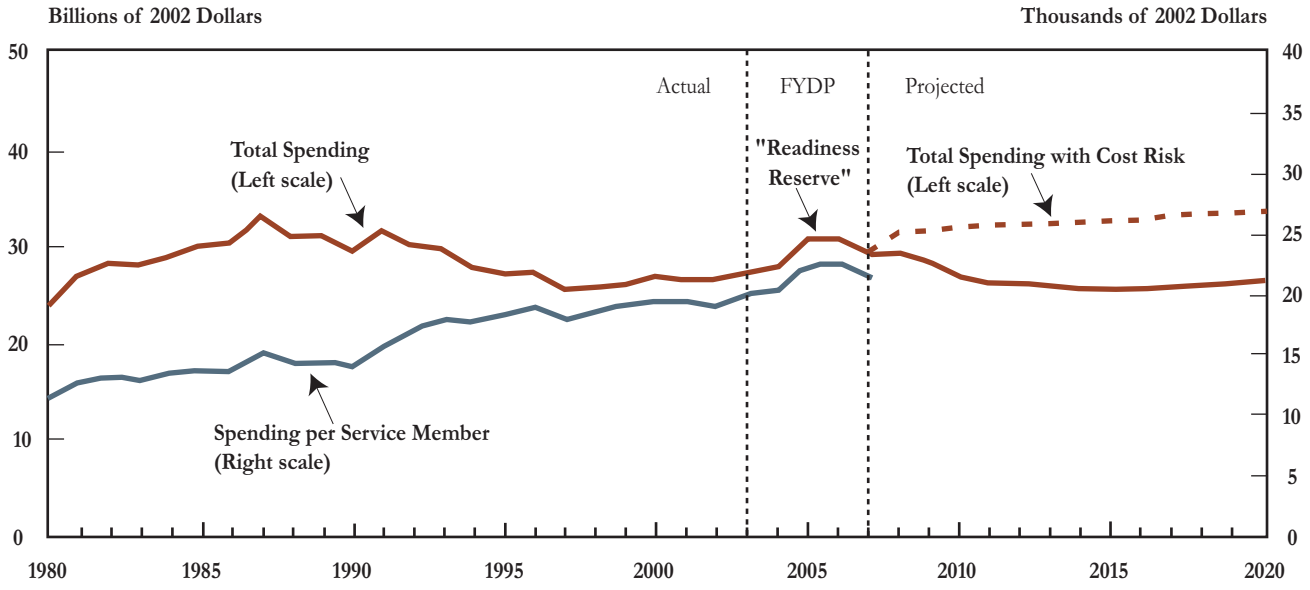
In the 2003 FYDP, overall spending for training would stay around $25 billion a year through 2007. Funding for command-managed training would remain steady at about $5 billion a year, but professional and skills training would grow by 16 percent—to nearly $9 billion a year by 2007.

Projection

In CBO's projection of the Administration's plans, the annual cost of military and civilian pay that is included in the training category would grow by $3 billion between 2007 and 2020, pushing total costs for training to $28 billion a year. CBO did not estimate cost risk for this category. Further study is necessary to determine the potential effect that new technologies or policies—such as advancements in computer-based training or increased reliance on simulation over actual training—could have on training, PCS, and transient and holding costs. Depending on their details, new technologies or policies might have either upward or downward effects on training costs.

Figure 2-6.

Spending for Installations Support



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Installations Support

Installations support covers the upkeep and repair of military buildings and facilities, operating expenses for bases (such as utilities and fire departments), and various environmental programs. Together, those costs currently account for a little over 10 percent of O&S spending. In CBO's projection of the Administration's plans, annual costs for installations support would drop by 10 percent over the 2007-2020 period (from $29 billion to $26 billion a year), in part because of savings from the round of base realignments and closures set to begin in 2005 *(see Box 1-2 in Chapter 1)*. If that BRAC round does not occur as scheduled and additional costs for facilities maintenance are incurred, annual costs for installations support could instead rise by 17 percent (from $29 billion to $34 billion) over that period *(see Figure 2-6)*.

What the Category Covers

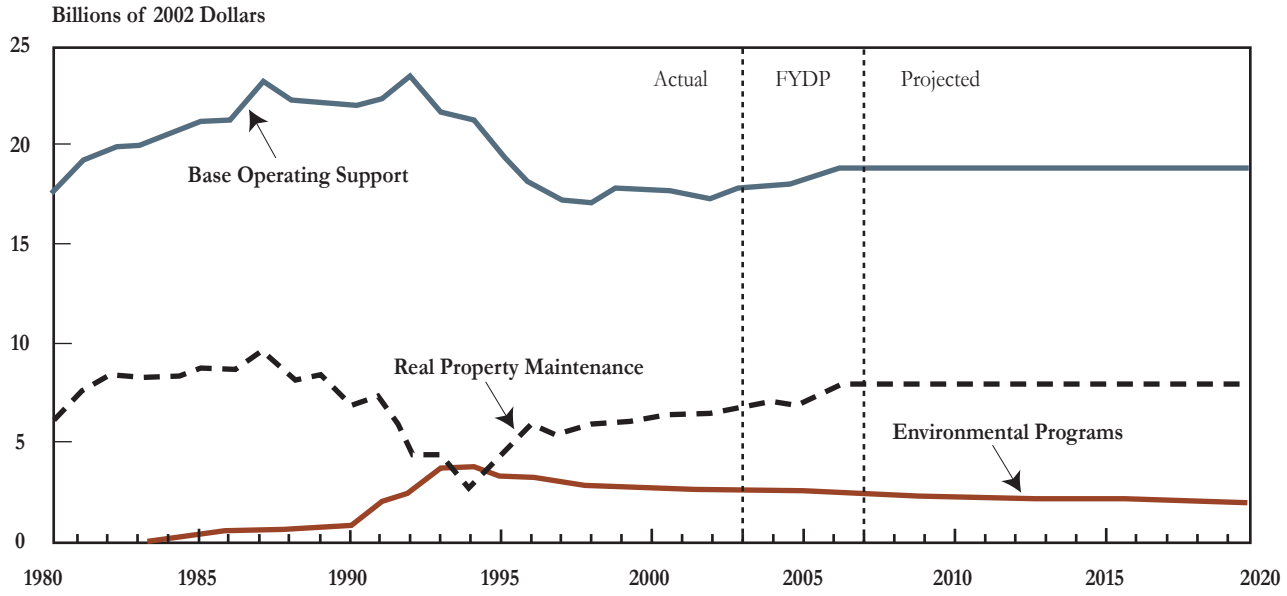
Installations support covers three main areas: maintenance of facilities, previously called real property maintenance; a wide variety of base operating support functions, such as utilities, fire fighting, and snow removal; and environmental programs designed to prevent pollution and clean up current and former facilities.

Trends

The three components of spending on installations support have followed different paths over the past 22 years *(see Figure 2-7)*. From its height during the 1980s defense buildup, spending for real property maintenance fell markedly, from $10 billion in 1987 to $3 billion by 1994. Part of that decline reflects reductions in defense infrastructure, such as base closures, that occurred during the post-Cold War drawdown.

Figure 2-7.

Spending for Installations Support by Subcategory



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

However, the decline also reflects DoD's decision to defer a substantial amount of maintenance and repair of noncritical facilities during the shrinking budgets of the 1990s. That decision created a backlog of maintenance and repair that stood at an estimated $27 billion in 2001. In the current FYDP, the Administration has called for further delay of some repairs and maintenance until it can announce the installations to be closed as part of the 2005 BRAC round.

In contrast, funding for base operating support did not immediately fall during the post-Cold War drawdown. Spending remained fairly stable between 1980 and 1994, averaging $21 billion a year. Between 1995 and 2002, it fell to an average of $18 billion a year as base closures and cuts in military personnel reduced some support requirements.

Spending on DoD-related environmental projects began in earnest only in the mid-1980s. It reached a peak of $4 billion in 1993 before slowly declining to the current level of $3 billion a year. That decline was largely caused by a drop in the number of restoration projects that needed funding.[11]

The 2003 FYDP contains an increase of $3 billion for installations support in 2005 and $2 billion in 2006 *(see Figure 2-6)*. According to documents provided by the Office of the Secretary of Defense (OSD), that

11. The installations support category does not include the costs of some substantial environmental programs that, despite being defense-related, are funded by the Department of Energy. Those programs include the cleanup of the former nuclear weapons plant at Rocky Flats, Colorado.

additional funding was initially designated to cover up-front costs of the 2005 BRAC round and was included in the operation and maintenance account during budget formulation. Later versions of the FYDP assigned BRAC funding to the military construction account (where it has been in the past) for 2006 and 2007 but never subtracted the original BRAC amounts from the operation and maintenance budget. Instead, the OSD Comptroller has redesignated that total of $5 billion in 2005 and 2006 as a readiness reserve.

Projection

CBO's projection of the Administration's plans includes the cost of pay raises for the military and civilian personnel who support installations as well as two areas of potential savings: the 2005 BRAC round and environmental restoration projects.

CBO projects that pay raises would increase costs for installations support by about $3 billion a year by 2020. To drive costs in the opposite direction, the Administration plans on holding a BRAC round in 2005 that would be three times as large (in terms of initial costs) as previous rounds. The base realignments and closures resulting from that round could save $5 billion a year in reduced installations support by 2014, CBO estimates.

CBO's projection also assumes that DoD's spending on planned environmental restoration projects would decline by $50 million each year until 2030, when all projects would be finished. DoD has identified $20 billion in projects that require cleanup to meet environmental codes; it included funding for them in the 2003 FYDP at a little over $1 billion a year. If CBO assumed (as it did with other types of costs) that the level of funding at the end of the FYDP continued through 2020, all of those projects would be completed by 2015, and total spending would exceed currently estimated requirements by $5 billion by 2020.

The main sources of risk in CBO's projection for installations support are that the 2005 BRAC round does not take place and that DoD does not eliminate its backlog of maintenance and repair of aging facilities by 2020. In that case, installations support costs would grow to $34 billion a year by 2020. DoD and military officials report that delayed maintenance is causing substantial problems at military bases in terms of costs, safety concerns, and readiness.[12] Without a BRAC round, DoD might need to fund maintenance and repair that had been delayed (in hopes that the bases and facilities in question might be demolished, closed, or sold). CBO estimates that eliminating the backlog would cost $2.5 billion each year through 2020.

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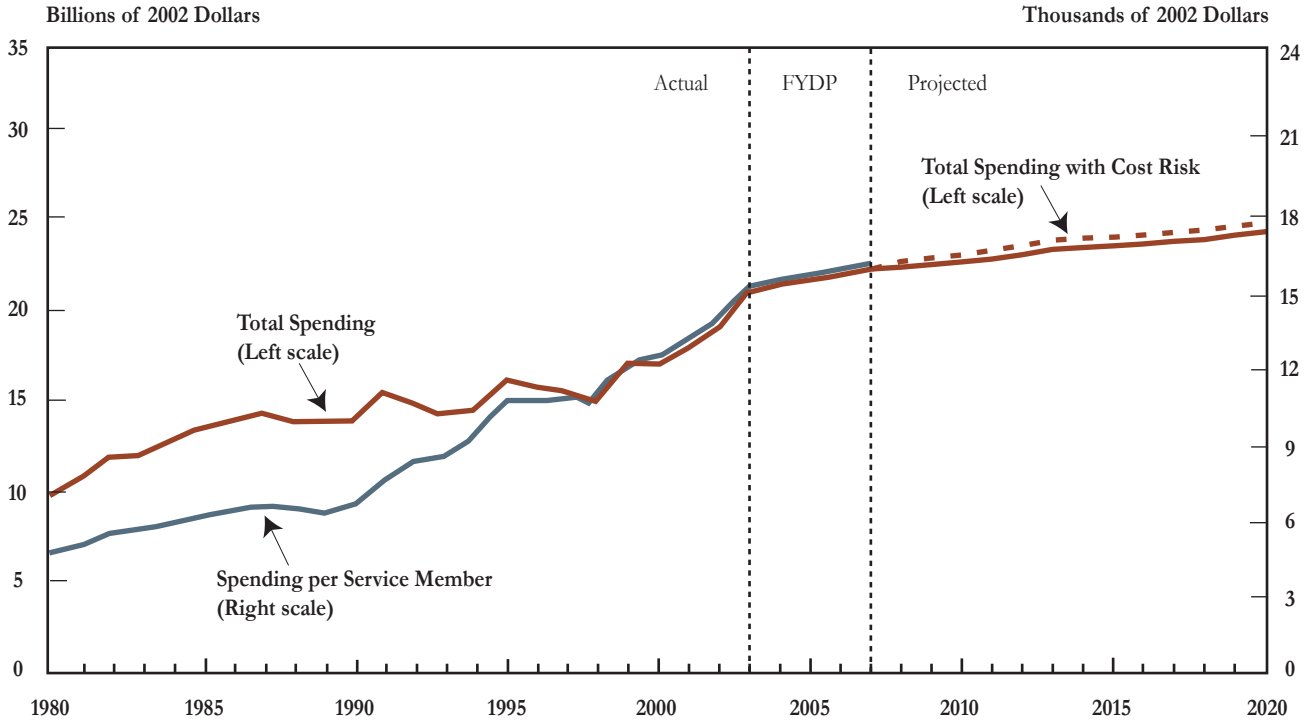
12. See George Cahlink, "Battered Defenses," *Government Executive Magazine*, August 1, 2002, pp. 39-46.

Figure 2-8.

Spending for Headquarters, C3, and Administration



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; C3 = command, control, and communications.

Headquarters, C3, and Administration

Spending for headquarters, central command, control, and communications (C3), and defensewide administration pays for the staff of the Office of the Secretary of Defense, the Joint Staff, the headquarters of the military services, and other operational headquarters, including the combatant commands. That category, which also includes centralized intelligence facilities (such as the National Imagery and Mapping Agency), currently accounts for just under 10 percent of O&S spending.

Headquarters, C3, and administration spending is not proportional to the size of military forces. It has nearly doubled over the past 22 years (from $10 billion in 1980 to $19 billion in 2002) even though forces were reduced by 30 percent from the height of the 1980s buildup through the drawdown of the 1990s. Spending for that category continues to increase in the 2003 FYDP, rising by $3 billion by 2007 *(see Figure 2-8)*.

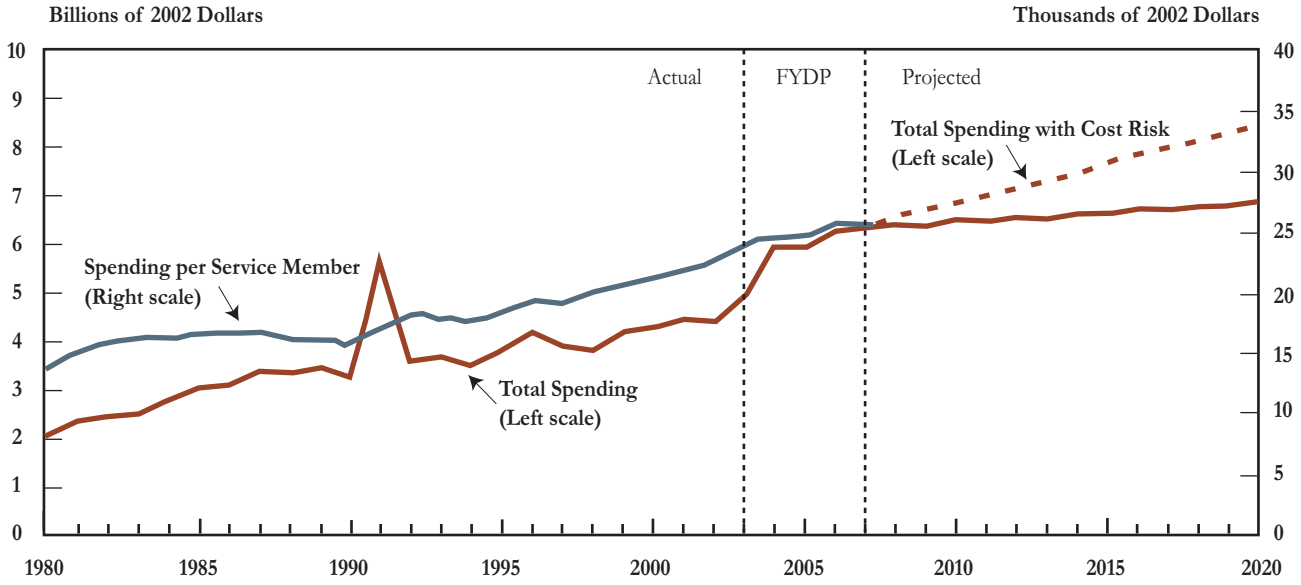
In CBO's projection of the Administration's plans, costs for headquarters, C3, and administration would grow by 9 percent—from $22 billion in 2007 to $24

billion in 2020. That growth of $2 billion by the end of the period springs entirely from pay raises.

The National Defense Authorization Act for Fiscal Year 2000 required a 15 percent reduction in major headquarters staffs from their 1999 levels by October 2002. DoD did not meet that goal, however, and recent conflicts—which attest to the reliance on headquarters, C3, and defensewide administration to prosecute the war on terrorism—cast doubt on whether that 15 percent cut would continue through 2020 even if it were achieved. Consequently, for its projection with cost risk, CBO assumed that the reduction of headquarters personnel mandated under current law would eventually be reversed, adding $1 billion a year to this category of costs by 2020.

Figure 2-9.

Spending for Personnel Support



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Personnel Support

About 2 percent of O&S spending currently goes toward initiatives to improve the quality of military life and support service members' families. The category of personnel support includes such diverse items as morale, welfare, and recreation programs; child care; schools for the children of DoD personnel; and commissaries and other on-base stores.

Personnel support has been one of the more rapidly growing categories of O&S spending in recent years (disregarding the one-time spike in 1991 for costs related to the Gulf War). It doubled between 1980 and 2002—from $2 billion to $4 billion *(see Figure 2-9)*.

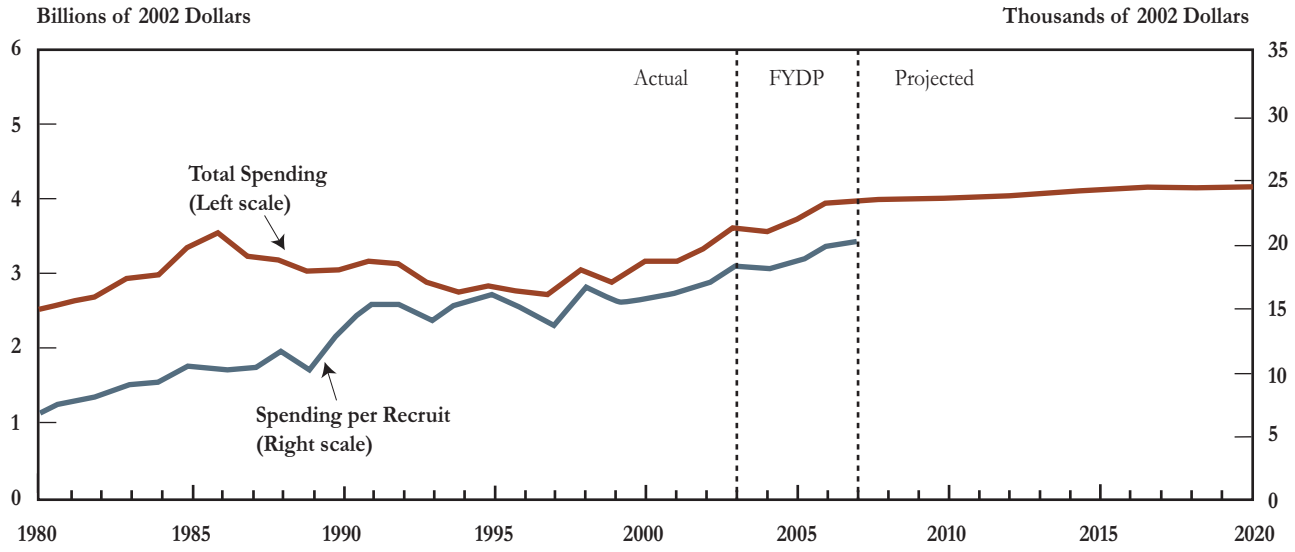
In the current FYDP, annual spending for personnel support is projected to continue to grow, reaching $6

billion by 2007. Major program increases in the FYDP include $300 million more by 2007 for adult voluntary education programs and an additional $400 million by 2007 for schools for DoD dependents. However, much of the apparent increase in personnel spending from 2003 to 2004 (about $1 billion) results from an accounting process for funding commissaries and exchanges. That process allocates funding in current and past budget years—in this case, 2003 and earlier—to a revolving fund for the Defense Commissary Agency, but it tracks funding for future years as an operation and maintenance appropriation in the individual services' budgets.

In CBO's projection of the Administration's plans, personnel support costs rise by 17 percent—from $6 billion a year to $7 billion—over the 2007-2020 period. That increase results only from pay raises for the people engaged in personnel support activities. Personnel support programs could keep growing after 2007, but the Administration has not formulated any specific plans for them beyond that date. If, as in CBO's cost-risk projection, those programs continued to expand at the rates seen since 1980 (about 12 percent a year), annual costs for personnel support would grow by 35 percent rather than 17 percent, reaching almost $9 billion by 2020.

Figure 2-10.

Spending for Recruiting



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Recruiting

DoD's recruiting budget, which currently constitutes 2 percent of O&S spending, covers the costs of attracting new personnel—costs such as advertising campaigns, the salaries and expenses of recruiters, and hiring bonuses for new service members. The military services try to maintain a large pool of young personnel who can withstand the rigors of combat and be retained in sufficient numbers to produce the senior leaders of the future. Under current policies, the services must plan to recruit an average of roughly 200,000 new active-duty enlisted personnel each year, as well as 19,000 new active-duty officers and over 90,000 new reserve personnel.

Recruiting costs are a function of supply and demand. They depend on such factors as the size of the military, turnover rates among current personnel, the military's standards for recruits, the size of the young-adult population, civilian unemployment rates, and how the general public perceives military service. Spending on recruiting generally increased in the 1980s and 1990s, in part because unemployment rates in the civilian sector were relatively low, the population of young adults was small, and the services raised their admission standards. In the current FYDP, that spending continues to increase: from $3 billion in 2002 to $4 billion in 2007 *(see Figure 2-10)*.

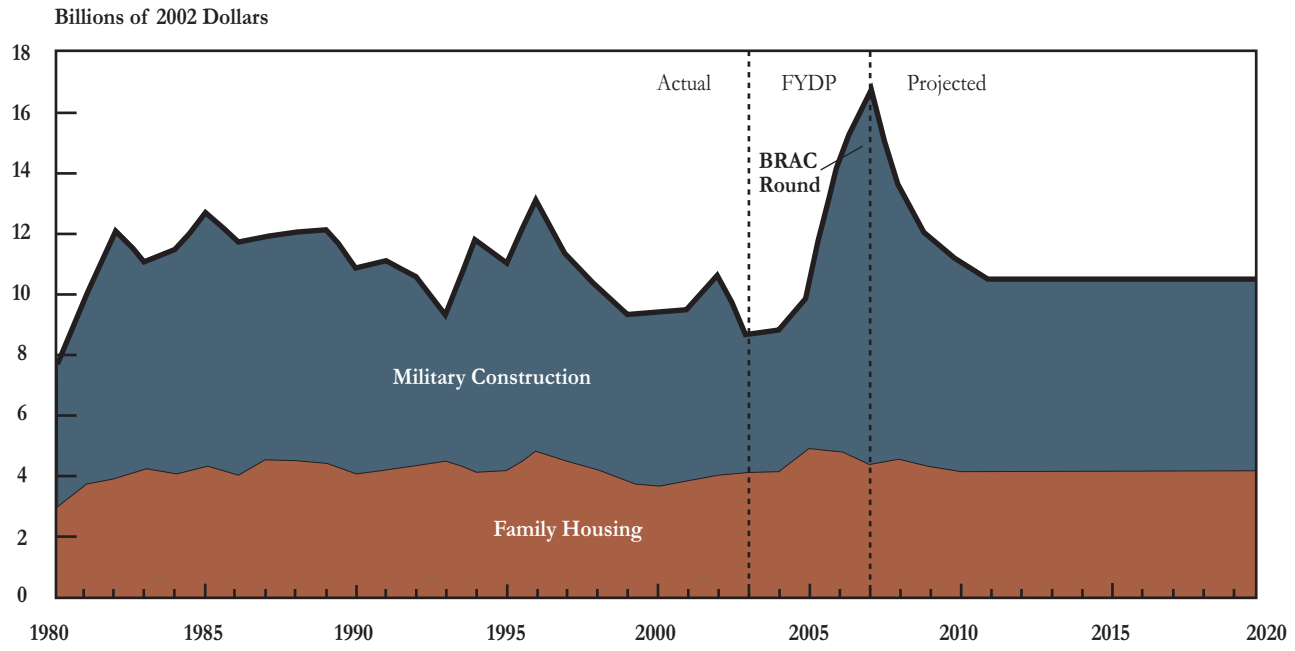
CBO's projection of the Administration's plans assumes that stability in the number of recruits needed and the increasing population of young adults combine to keep the costs of attracting new military personnel from growing. As a result, those costs rise

only because of pay increases, which amount to an additional $300 million annually by 2020, pushing recruiting costs to a little over $4 billion that year.

CBO did not project cost risk for the recruiting budget because the level of funding in the 2003 FYDP appears more than adequate to cover any unforeseen shocks in the supply of or demand for service members. The size of the youth population is expected to grow through 2020, so a greater propensity on the part of young people to go to college or a need for higher recruiting bonuses to attract technically skilled personnel could still be accommodated under the Administration's planned spending levels for recruiting, CBO believes. Even if the services' demand for recruits grew, other factors—such as revised recruiting standards, rising military pay, or worsening civilian employment opportunities—could mitigate the budgetary effects of that growth, postponing the need for additional recruiting resources.

Figure 2-11.

Spending for Military Construction and Family Housing



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; BRAC = base realignment and closure.

Other Costs

In addition to funding for operation and support activities and investment programs, spending for military construction and family housing, plus a defense emergency response fund, round out the DoD budgets proposed in the FYDP. Those three items are relatively small segments of the defense budget—together totaling about $20 billion—but they attract large interest in some DoD and Congressional circles.

Military Construction and Family Housing

Military construction funding pays for the planning, design, construction, and major restoration of various military facilities and for the up-front costs associated with BRAC rounds.[13] Except during years in which base closures were funded, spending for military construction has ranged between $5 billion and $7 billion a year since 1980. In the current FYDP, funding for military construction would rise to $12 billion by 2007 because of the large BRAC round expected to begin in 2005 *(see Figure 2-11)*.

13. BRAC rounds require some up-front investment in repair and restoration to ensure that the bases to be closed are in good condition for transfer to local authorities. Those dollars are placed in the military construction budget until they are needed, at which point they are spread between the budgets for military construction and operation and maintenance.

CBO's projection of the Administration's plans for military construction assumes that facilities have an average life of 67 years, that DoD replaces them steadily as they reach the end of that life, and that their replacement value grows by 0.3 percent per year. Those assumptions translate into budget needs of $6 billion a year for military construction between 2010 and 2020, which is consistent with the average levels of the past two decades. Military construction costs would be higher in 2008 (by $2 billion) and 2009 (by $1 billion) because of continued expenses related to the planned 2005 BRAC round.

Funding for family housing pays for the structures, operating costs, leasing arrangements, and construction of military family housing. Since 1980, that funding has remained at around $4 billion to $5 billion a year—a level that continues in the current FYDP.

The projection of the Administration's plans for family housing assumes that spending follows the path laid out in each service's family housing master plan and that privatization efforts do not reduce family housing costs below that level. Under those assumptions, the resulting budget levels would be $4 billion a year through 2020 for family housing, which is consistent with past funding.

CBO did not project cost risk for military construction or family housing because it considers the most likely major risk to be additional construction or housing projects, which cannot be predicted at this time. Moreover, further study is needed to determine the potential costs or savings that might result from additional BRAC rounds or from implementing the services' plans for family housing.

Defense Emergency Response Fund

The 2003 FYDP also includes $10 billion a year for a general defense emergency response fund for 2004 through 2007.[14] That funding is not allocated to the services or among the budget accounts. Given the uncertain nature of overseas and domestic threats and the military's ongoing commitments, CBO continued to include an emergency fund of $10 billion a year from 2008 to 2020 in its projection of the Administration's plans *(see Figure 2-1 on page16).*

14. In 2003, DoD requested $20 billion for its defense emergency response fund—$10 billion for specific projects and $10 billion for unspecified costs of ongoing operations in the war on terrorism. Although the Congress did not provide the unspecified $10 billion in funding for 2003 in the National Defense Authorization Act, CBO retained that general fund through the FYDP years and in its projection of the Administration's plans through 2020 in order to remain methodologically consistent.

CHAPTER

3

Long-Term Implications for Investment

The Department of Defense currently devotes about one-third of its budget to researching, developing, testing, and buying weapon systems. In 2002, DoD's investment budget was about $110 billion. After Congressional action, $128 billion will be available for investment in 2003. (Dollar amounts are expressed in 2002 dollars.) This analysis defines investment as the sum of funding for research, development, test, and evaluation (RDT&E) accounts and procurement accounts. (Funding for military construction and family housing, which some budget analyses include in investment spending, is discussed in Chapter 2.)

The 2003-2007 Future Years Defense Program, which was associated with the President's 2003 budget request, envisions that funding for investment will grow at an average annual rate of more than 5 percent over the next five years, reaching $142 billion by 2007 *(see Figure 3-1)*. If the plans in the 2003 FYDP were carried out past 2007, investment would continue to grow, the Congressional Budget Office projects—peaking at about $164 billion in 2012. Unlike the pattern for operation and support, which is continuously upward, investment declines after 2012 in CBO's projection as an increase in purchases begun just after the FYDP period is completed.

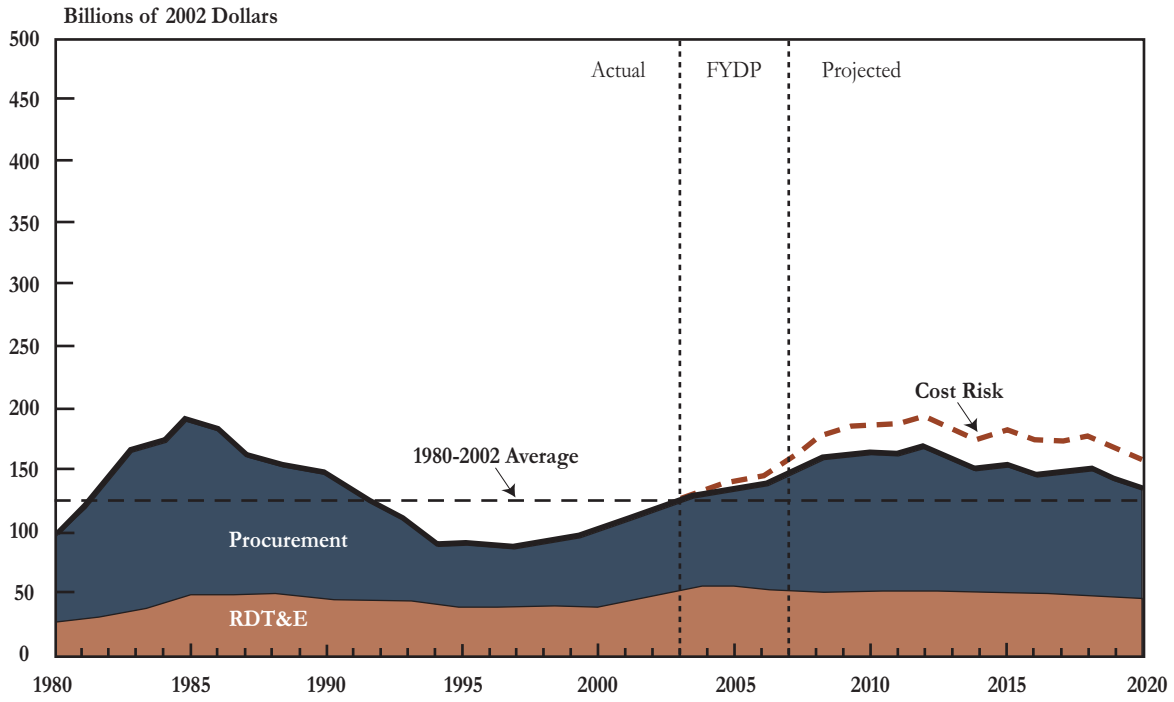
Carrying out the Administration's current plans would boost the share of the defense budget devoted to investment from 32 percent to 35 percent over the next five years *(see Table 3-1)*. That increase would offset some, but not all, of the decline in investment's share of defense spending that occurred during the 1990s. But that share would remain below the more than 40 percent of budgets that investment received in the 1980s—when many of the weapon systems in today's inventories were bought.

The projections above are based on DoD's estimates of future costs and purchases of weapon systems. However, the department has often underestimated the costs of new weapons. If future costs exceed DoD's current estimates to the same degree that they have in the past, the resources associated with carrying out current investment plans could equal about $156 billion by 2007 and top $190 billion in 2012, CBO projects.

In the absence of cost growth, investment spending would need to average about $151 billion a year over the 2008-2020 period to develop and buy all of the equipment implied by the Administration's 2003-2007 plans, CBO projects. With potential cost growth, the average would rise to $178 billion a year. That level of resources for defense investment is not unprecedented: investment spending averaged $164 billion a year (in 2002 dollars) during the Reagan Administration and exceeded $170 billion for three years during that Administration. But spending at those levels would continue much longer under this estimate. The Bush Administration apparently considers the long-term affordability of its defense plans to be an issue, as indicated by the fact that it commissioned numerous studies of alternative program options in its Defense Planning Guidance for 2004 to 2009.

Figure 3-1.

Spending for Investment by Budget Account



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; RDT&E = research, development, test, and evaluation.

The Administration's investment plans would require substantial increases in part because they are intended to counter the problems of aging that are now developing for many categories of DoD weapons. CBO projects that those plans would stabilize or even reduce average ages for several categories of weapons—including Army ground combat vehicles, Army and Marine Corps helicopters, and Air Force tankers. In addition, current plans would buy enough ships and aircraft for the Navy to keep those fleets at average ages that the service considers acceptable. By 2020, aging would remain a concern for only three of the categories of weapons that CBO analyzed: the Air Force's bombers, fighter and attack aircraft, and airlifters.

Another way to assess the sufficiency of planned weapons purchases is to compare them with steady-state purchases—the annual procurement needed to preserve a given force size indefinitely.[1] Funding that is

1. This analysis developed detailed year-by-year projections of the long-term implications of current defense programs through 2020. It used steady-state procurement costs as one of several metrics to assess the sufficiency of the programs underlying those long-term projections. A previous CBO study, *Budgeting for Defense: Maintaining Today's Forces* (September 2000), included steady-state procurement estimates for the military forces and defense acquisition programs planned by the Clinton Administration. However, that study did not provide detailed long-term projections of annual demands for defense resources comparable to the ones presented here.

Table 3-1.

Requested and Projected Funding for Department of Defense Investment

(In billions of 2002 dollars of total obligational authority)

	Average, 2003-2007	Average, 2008-2014	Average, 2015-2020
Investment Funding Envisioned in the Administration's 2003 Future Years Defense Program	131	n.a.	n.a.
Investment Funding in CBO's Long-Term Projection of the Administration's Current Plans			
Without cost risk	131	157	144
With cost risk	141	184	171
Investment Funding as a Percentage of the Total Defense Budget			
Without cost risk	34	37	33
With cost risk	35	40	36

Source: Congressional Budget Office.

Note: n.a. = not applicable.

significantly below the steady-state level would result in inventories that are either aging or shrinking; funding above the steady-state level will cause inventories to grow or become younger. (For more information about how CBO calculated steady-state purchases, *see Box 1-3 in Chapter 1.*)

The steady-state procurement costs associated with sustaining today's forces over the long term would range from about $85 billion to $111 billion a year using DoD's cost estimates and $99 billion to $130 billion a year assuming historical cost growth. The ranges in those estimates reflect varying assumptions about how long systems will last. The procurement funding that CBO projects would be needed over the 2008-2020 period to carry out current plans—about $100 billion a year using DoD's cost estimates and $120 billion a year assuming cost growth—is fairly consistent with those projected steady-state costs (*see Table 3-2).*

In CBO's projections, the Administration's current plan includes only those changes reflected in the 2003 FYDP and related documents. But the Bush Administration has stated that it expects DoD's forces to ultimately be transformed. Transformation could take many forms, depending on the success or failure of concepts that have just begun to be explored. For example, DoD has started research on unmanned aircraft, advanced-technology combat vehicles, and

Table 3-2.

Steady-State Procurement Costs Under a Variety of Assumptions

(In billions of 2002 dollars of total obligational authority)

	Using DoD's Cost Estimates	Assuming Historical Cost Growth
Steady-State Procurement Costs for Currently Planned Forces		
Assuming long service lives	85	99
Assuming short service lives	111	130
Steady-State Procurement Costs for Transformed Forces[a]		
Assuming long service lives	76	84
Assuming short service lives	98	114
Average Annual Procurement Costs to Carry Out Current Plans		
2003-2007 (As requested in the FYDP)	77	81
2008-2020 (As projected by CBO)	101	121

Source: Congressional Budget Office.

Notes: FYDP = Future Years Defense Program.

In the long-service-lives assumption, the Department of Defense keeps weapons as long as it currently projects, which is generally longer than it has in the past. In the short-service-lives assumption, the Department of Defense operates systems only as long as it has previously.

a. See text for more details of CBO's hypothetical example of transformation.

smaller surface combat ships. In addition, the military services and the U.S. Joint Forces Command are experimenting with new ways of organizing and operating forces that might be possible if such systems can be developed. If those—or other—concepts succeed, future military forces could be quite different from the ones assumed in the Administration's current plans and in CBO's year-by-year projections.

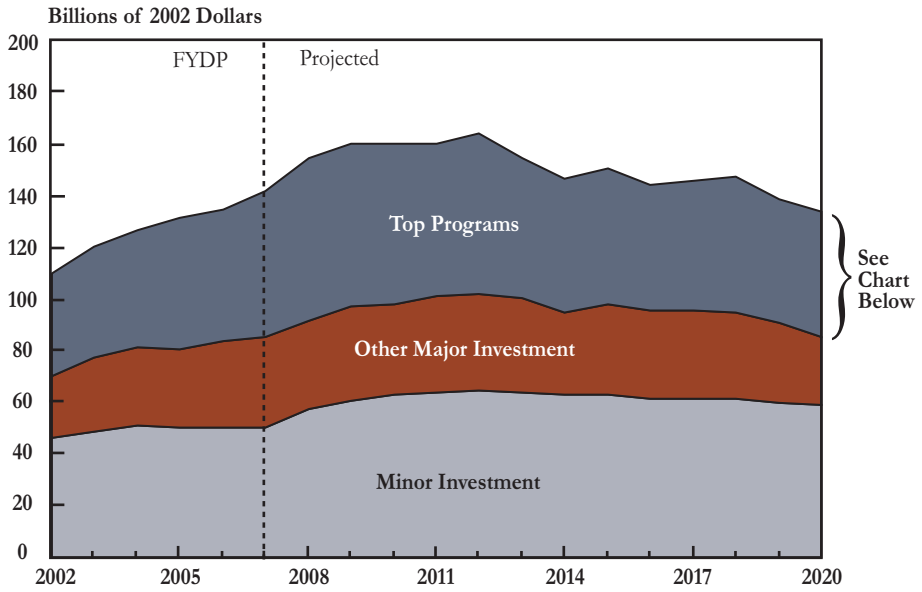
To assess the potential impact of transformation on future resource demands, CBO estimated steady-state procurement costs for one example of what a transformed force might look like. That example assumes that many of the transformation initiatives now being undertaken by the Administration ultimately succeed and are embraced by the military services. (For instance, CBO's example of a transformed force uses unmanned aircraft to replace some of today's manned systems for both the ground-attack and reconnaissance missions. It also assumes that many ships can be dual crewed—using two alternate crews rotating between two ships to operate them more efficiently. That would

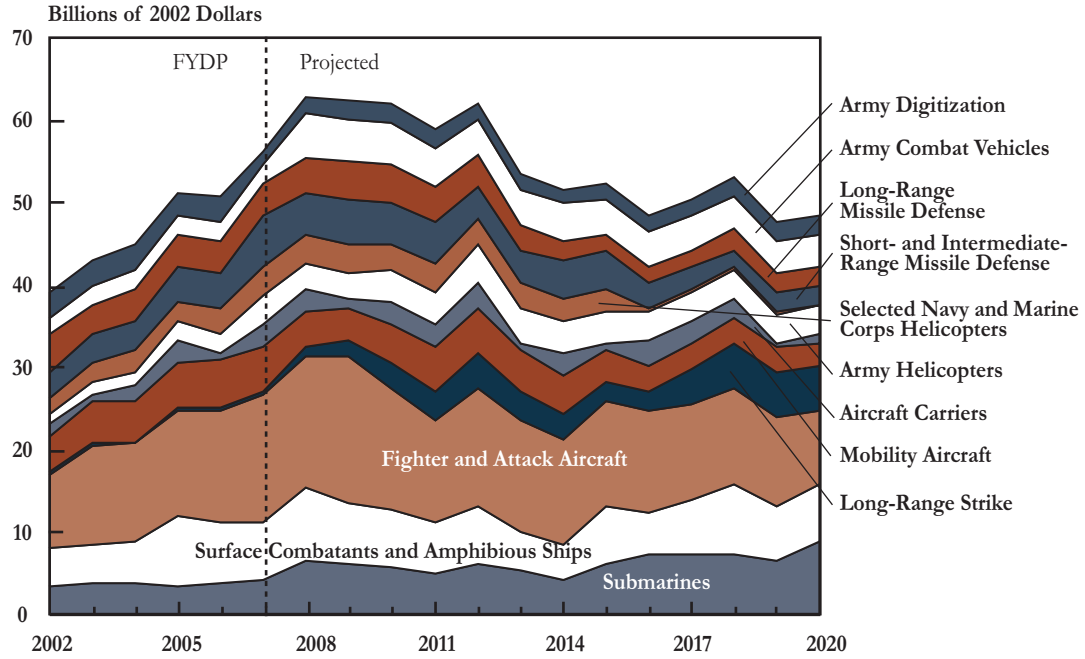
allow a smaller fleet of surface combatants to perform the same number of peacetime missions as today's fleet.) Such a force would be a radical departure from the current force. CBO calculated annual steady-state procurement needs for that transformed force assuming that the cost goals now advertised for those systems can be met. Such goals are generally very optimistic compared with past cost growth in DoD systems. For example, the Global Hawk unmanned reconnaissance aircraft now in use was originally expected to cost $20 million apiece. The actual cost has exceeded $60 million per aircraft, although that amount also buys a more capable aircraft than was originally envisioned.

CBO's estimate of steady-state procurement costs for a transformed force suggests that DoD might reduce its annual procurement needs from those associated with current plans if it is ultimately able to change those plans significantly. Savings of about 10 percent to 15 percent relative to CBO's estimate of the annual steady-state costs of currently planned forces might be possible if the particular example of transformation that CBO examined could be achieved.

Figure 3-2.

Projected Department of Defense Spending for Investment





Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Overview of Investment

Funding for research, development, test, and evaluation activities made up 44 percent of investment spending in 2002 and 2003. RDT&E funding pays for basic and applied research, construction of devices to demonstrate new technology, and development and testing of prototypes and full-scale precursors to production models. It also pays for operational testing early in a system's service life and for testing modifications during the course of the system's operation. The other component of investment spending—procurement—pays for the purchase of new weapons and other equipment for DoD and the modification of existing equipment.

Almost 60 percent of investment funding goes to develop and purchase major systems—such as aircraft, ships, and tanks—for which DoD develops detailed plans. (CBO calls that category major investment.) The other 40 percent (which CBO terms minor investment) funds items for which DoD provides no long-term plans *(see Figure 3-2)*. Those items include such things as ammunition, less expensive communications equipment, and computers.

Major Investment

CBO projected the long-term resource demands for major systems individually, using the Administration's long-range program plans (which can include development schedules, purchase quantities, and annual purchase rates). That information comes from several documents. The Future Years Defense Program provides detailed data about a broad spectrum of DoD programs through 2007. DoD also delivers committee staff backup books for each of the accounts in the procurement title and descriptive summaries for accounts in the RDT&E title to the Congress each year to support the budget request.[2] Those reports provide additional details about DoD programs at the appropriation and account level and, for some programs, include summaries of plans for periods several years beyond the FYDP. For an even smaller number of programs (fewer than those displayed in the FYDP or the backup books), DoD provides Selected Acquisition Reports (SARs), which contain the department's projections of development schedules, purchase rates and quantities, and costs through the duration of a program.[3] DoD is required by the Congress to provide SARs for major programs that meet certain guidelines.

Data for a few major investment programs were lacking or conflicting; in those cases, CBO produced independent estimates. In particular, CBO developed projections for procurement when it appeared that the Administration or one of the services planned to buy a piece of equipment but had not included an estimate of its procurement costs in budgetary backup material. For example, CBO generated a schedule and estimated costs for developing, procuring, and launching a constellation of space-based radar satellites, because the Administration's plans include development funding for such satellites beginning in 2003. Likewise, because of a lack of information about the

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2. Procurement and RDT&E are titles in the national defense budget functions. Those titles are broken into a number of appropriations or accounts, for which DoD provides detailed reports. For example, one account in DoD's procurement title covers spending to purchase ammunition for the Air Force. The report on that account for the 2003 budget request was Department of the Air Force, *Committee Staff Procurement Backup Book, FY 2003 Amended Budget Submission: Procurement of Ammunition* (February 2002). Another account pays for the Army's RDT&E activities during two segments of the development process. The report on that account for the 2003 budget request was *Supporting Data, FY 2003 President's Budget, Descriptive Summaries of the Research, Development, Test, and Evaluation Army Appropriations, Budget Activities 4 and 5, Volume 2* (February 2002).

3. See Department of Defense, *Selected Acquisition Reports for the Quarter Ending 6/30/02* (August 2002), and *Future Years Defense Program 2003-2007* (April 2002). Neither document is publicly available, but information about the 2003 budget year—effectively the first year of the FYDP—is available at a Web site maintained by the DoD Comptroller (www.dtic.mil/comptroller/fy2003budget/index.html).

content of the highly classified National Foreign Intelligence Program, CBO projected that the program would be funded through 2020 at its 2007 level.

CBO also developed its own projections in a few cases in which the Administration changed its plans for a program after submitting the budget. An example is the Army's Crusader, a self-propelled artillery system. The Administration announced in April 2002 that it would cancel the program. That announcement came three months after the Administration submitted its budget request for 2003, so the Administration's budget documentation does not reflect the funding implications of that change. In those and a variety of other cases, CBO consulted personnel in the Office of the Secretary of Defense, the Office of the Chairman of the Joint Chiefs of Staff, or the services about the latest plans before producing its estimates—though CBO's cost and schedule projections were developed independently.

A handful of top spending programs account for slightly less than two-thirds of DoD's major investment funding *(see Figure 3-2)*. Those programs include tactical fighter aircraft (specifically, the Joint Strike Fighter, the F-22, and the F/A-18E/F), surface combatants (the DDG-51, the new DD-X destroyer, and the smaller littoral combat ship), and Army helicopters (the Longbow Apache and Comanche attack helicopters as well as the CH-47 cargo helicopter and modifications to the Blackhawk utility helicopter). Funds for missile defense are also included in that part of CBO's projection. Spending for those programs drives total investment spending and thus mostly exhibits the same trends: rising rapidly through 2007, peaking in the following five years, and then gradually declining. CBO projects that annual resource demands for those investment programs would exceed a total of $60 billion at their peak in 2008, remain close to that level through 2012, and then decrease to about $50 billion by 2020.

Minor Investment

Procurement funding in CBO's minor-investment category pays for the purchase of such items as artillery rounds, radios, passenger vehicles, and spare parts to fill up supply bins when a system is initially fielded, as well as for relatively low-cost modifications to systems that are already in use. (Spare parts to replenish stocks are funded in the operation and maintenance accounts.) RDT&E funding in the minor-investment category pays for basic and applied research, development of advanced technologies, management activities in support of development, and some lower-cost programs to develop modifications to fielded systems.

Since DoD provides no detailed plans for those items and activities, CBO projected their long-term resource demands on the basis of trends in their funding since 1980 and the relationship between that funding and spending for major programs. The relationship between major and minor spending within the sum of funds in RDT&E and procurement varies among the three military departments, so CBO produced a separate estimate for major investment funding and minor investment funding for each department. Funding for some highly classified (or black) programs is implicitly captured in those relationships.

The Bush Administration has set a goal of allocating at least 3 percent of total defense spending to the science and technology portion of the RDT&E accounts to support basic research, applied research, and development of advanced technology. That goal is not achieved in the 2003 FYDP, but CBO assumed that DoD would increase funding steadily for those activities after 2007, meeting the 3 percent goal in 2011.

Cost Risk

CBO's projections of investment spending depend on assumptions made about costs—particularly the assumption that future investment costs will equal

DoD's current estimates of them. In the past, DoD has often underestimated what new systems will cost to develop and purchase. Consequently, CBO also projected investment resources assuming that DoD's past experience with cost growth is repeated in the future.

Those projections are largely based on information from a RAND analysis of the cost growth that has occurred since 1969 for all major programs for which DoD submitted annual Selected Acquisition Reports to the Congress through 1999.[4] RAND compared the cost estimates that DoD made for SAR systems at the Milestone B (system development and demonstration) stage, when extensive development activity begins, with its cost estimates for those systems when they were produced and became operational.[5] The analysis developed estimates of increases or decreases for both development and procurement costs for eight categories of systems, including ships, ground combat vehicles, and aircraft.

RAND's analysis—based on 3,047 SARs submitted to the Congress over the 1969-1999 period for 274 programs—suggests that most DoD programs increase in cost. In addition, those programs are often delayed, and DoD may eventually purchase smaller numbers of weapons than it originally expected to buy. RAND adjusted systems' procurement prices to account for cuts in quantity (although its analysis showed both adjusted and unadjusted numbers). RAND also estimated the cost and schedule changes that occurred by service and by type of weapon.[6] Army ground combat vehicles and space programs have experienced the largest growth rate in development costs—both about 70 percent relative to early estimates. Army ground combat vehicles have also experienced the greatest growth rate in procurement costs—again about 70 percent. Ships have had the smallest growth in both development and procurement costs: 16 percent and 11 percent, respectively. For its cost-risk case, CBO applied RAND's cost-growth factors for those and other categories of weapon systems to programs that have not yet entered production.[7]

The Administration has launched a policy initiative to make DoD's cost estimates more realistic. It includes incorporating factors to reflect DoD's experience with

4. RAND's most recent published study on its SAR database is Jeanne M. Jarvaise, Jeffrey A. Drezner, and D. Norton, *The Defense System Cost Performance Database: Cost Growth Analysis Using Selected Acquisition Reports,* MR-625-OSD (Santa Monica, Calif.: RAND, 1996). The estimates of cost growth that CBO used in this analysis are based on unpublished updates of the 1996 report prepared by Robert S. Leonard, Fred Timson, and John C. Graser in 1999 through 2002.

5. Major DoD programs go through a series of stages that are outlined in DoD's acquisition regulations. Milestone B (formerly Milestone II) is when a program enters the system development and demonstration stage (formerly known as full-scale development, or FSD, and as engineering and manufacturing development, or EMD). For a discussion of those milestones, see the Web site of the Undersecretary of Defense for Acquisition, Technology, and Logistics at www.acq.osd.mil/ap/dodi_5000_2_final_version_april_05_2002_Instruction.doc.

6. The Institute for Defense Analyses (IDA) has also analyzed trends in weapons costs using a database from DoD's Selected Acquisition Reports. Like RAND, IDA produced separate estimates for the different military services and for various types of systems. IDA used slightly different methods in estimating cost growth—adjusting for model changes as well as for changes in total quantity—and its estimates cover a somewhat different group of systems. Nonetheless, its estimates of past cost growth mostly equal or exceed those reported by RAND. See Karen W. Tyson and others, *The Effects of Management Initiatives on the Costs and Schedules of Defense Acquisition Programs* (Alexandria, Va.: Institute for Defense Analyses, 1992), and Karen W. Tyson, Bruce R. Harmon, and Daniel M. Utech, *Understanding Cost and Schedule Growth in Acquisition Programs* (Alexandria, Va.: Institute for Defense Analyses, 1994.)

7. DoD's costs also grow after systems enter production, although CBO did not incorporate that in its projections. One factor that causes cost growth during production is model changes. For example, the C/D models of both the F-15 and F-16 were more expensive than the A/B models that preceded them.

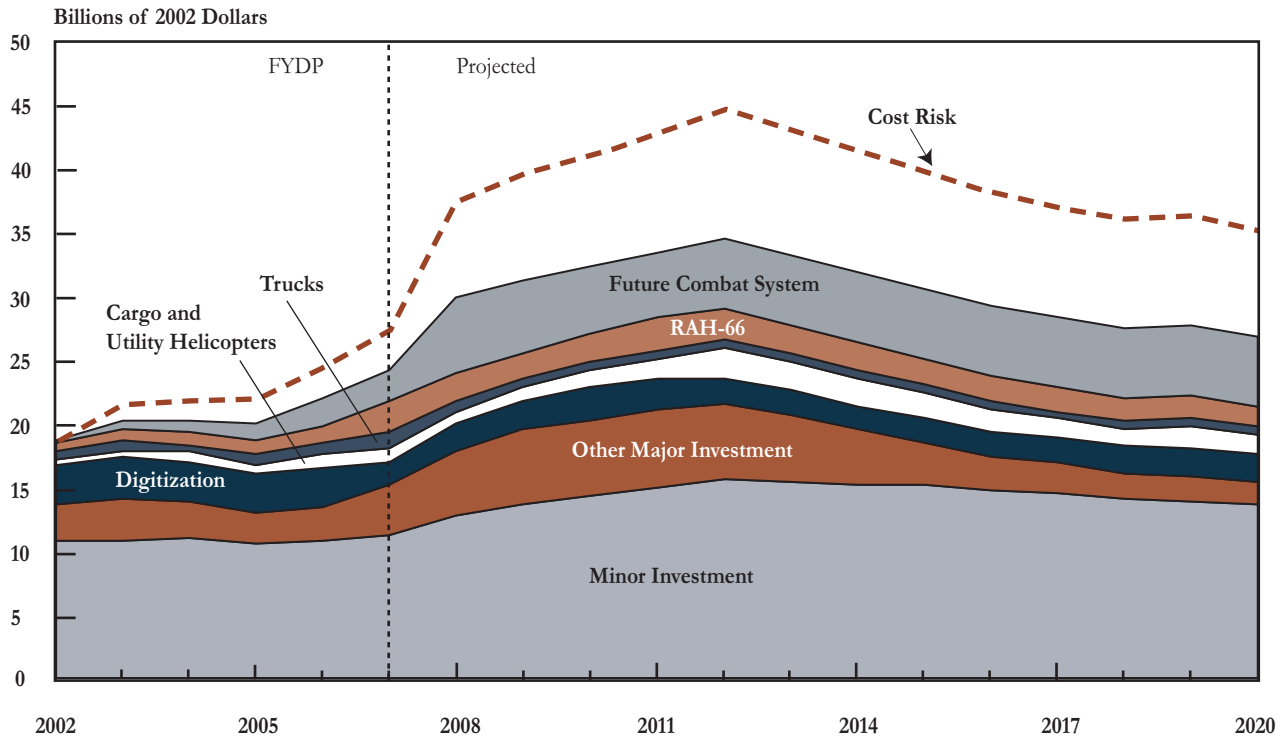
cost growth in projections for major programs in future budgets. Independent estimates developed by the Cost Analysis Improvement Group (CAIG) in the Office of the Secretary of Defense are to be used as baselines for major programs in the future. CAIG estimates have often been closer to actual costs than estimates developed by the military services, which were most often used in the past to develop budgets.

Despite that change, DoD's investment costs could continue to grow beyond expectations, for at least three reasons. First, DoD has not fully implemented the policy initiative yet, and many new programs, such as space-based radar, lack CAIG estimates. Second, even when the policy is fully implemented, it will not apply to the many programs that are delegated to the services for oversight. The CAIG does not routinely estimate the costs for such programs. (In 2012, about 20 percent of CBO's projection for total investment without cost risk and about one-third of its projection for major investment reflects programs for which CAIG cost estimates have been made.) And third, DoD programs have experienced some cost growth in the past even relative to CAIG estimates.

DoD can offset the effect of cost increases on its yearly budgets to some extent by delaying the start of programs, stretching out their schedules, and reducing quantities purchased. (Such program changes often come at the cost of increased development funding or higher unit costs for procurement.) In particular, analysis suggests that the department often produces fewer weapons than it originally projected. If quantities were reduced or programs were delayed, annual resource demands could be lower than in CBO's projection with cost risk—but such a revised plan would be different from the overall defense program that CBO is analyzing, and program requirements, as they are now defined, would not be met without those higher expenditures. Therefore, CBO's projection focuses on proceeding with programs as they are currently planned, not on how those programs might change later to conform to future budget constraints.

Figure 3-3.

Projected Army Spending for Investment



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

The Army

The Army plans to increase investment funding by about a quarter during the FYDP: from $19 billion in 2002 to $24 billion in 2007. To carry out current plans, Army investment funding would have to rise much more rapidly immediately thereafter, CBO projects. It would need to grow by $6 billion between 2007 and 2008 and reach a peak of $35 billion in 2012—or about 80 percent more than today's funding *(see Figure 3-3)*.

Those substantial resource demands result from the Army's plans to purchase several new major systems simultaneously, including the Future Combat System—which is supposed to ultimately replace Army ground combat vehicles—and the RAH-66 Comanche helicopter. (Those programs are examined in more detail in the next two sections.) Resource demands could also rise after 2007 for other major investment programs, including a variety of next-generation tactical missiles, new heavy trucks, and new high-capacity tactical radios.

Missile defense systems are funded in the DoD-wide portion of the defense budget while they are being developed, rather than in the services' budgets. Once a system enters procurement, its funding is to be moved to the budget of the service that will operate it. Thus,

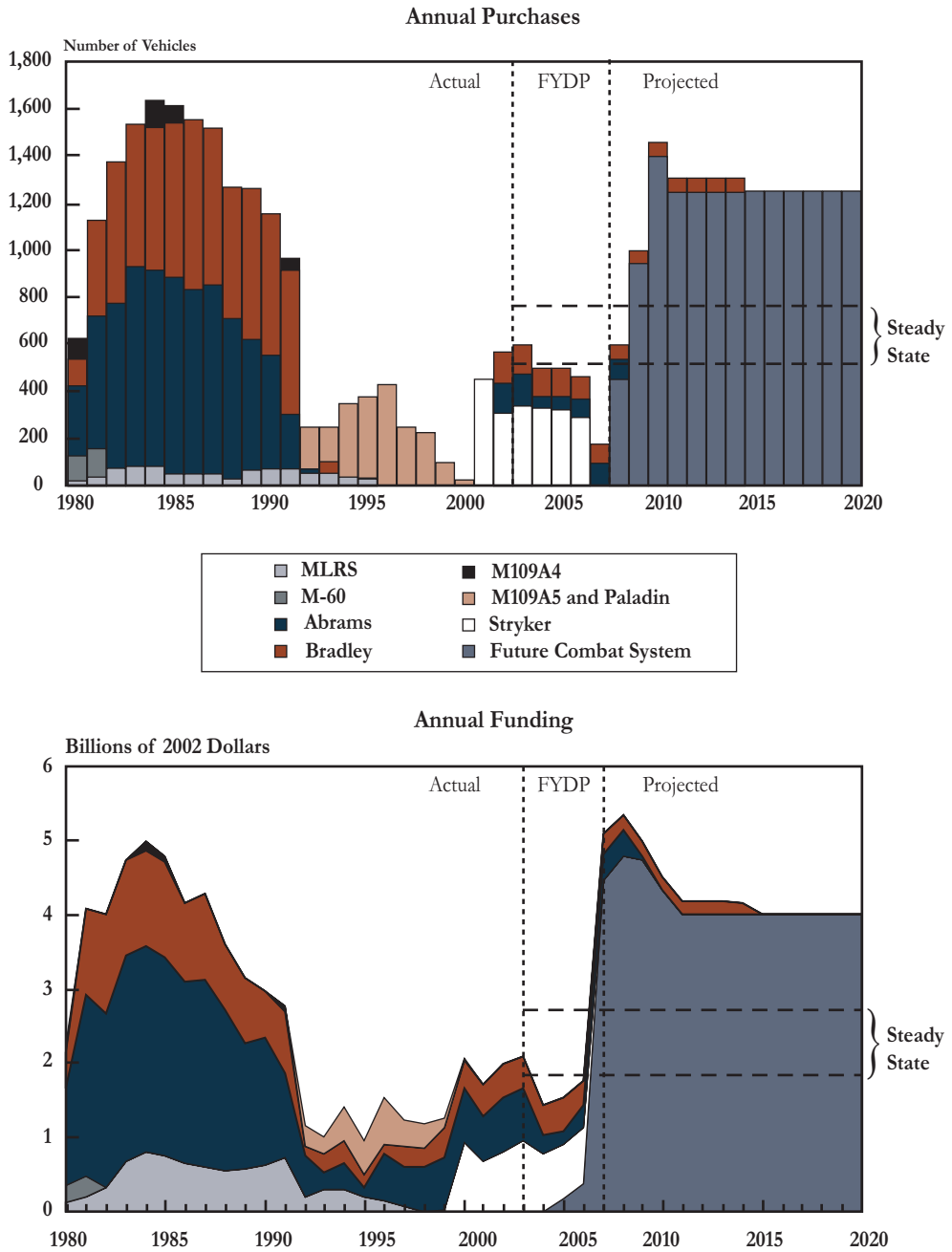
CBO's projection of Army investment includes procurement spending to field ground-based missile defenses, which is projected to increase. (CBO's projections for missile defenses are discussed in detail later in this chapter.)

A major component of the Army's plans is a set of programs that CBO grouped under the term digitization. The Army expects those programs to meet its needs to increase the transfer of data among its own units, between itself and the other services, and between fielded forces and those at headquarters. Much of the Army's current doctrine is predicated on dramatically improving both the quantity and quality of information that can be provided to soldiers on the battlefield. The digitization category includes spending for the programs associated with those improvements.

Growth in the resources needed to carry out current investment plans would be even higher if the Army did not succeed in holding down the costs of its new weapon systems. If their costs grew at past rates, the Army's annual investment could rise to a peak of $45 billion in 2012, more than double today's level.

Figure 3-4.

Procurement of Army Ground Combat Vehicles



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program; MLRS = multiple-launch rocket system.

The M109A5 and Paladin were funded as a single program.

Army Ground Combat Vehicles

After the end of the Cold War, DoD cut the number of active and reserve Army divisions from 28 to 18, creating surplus stocks of many kinds of ground combat equipment. As a result, procurement of ground combat vehicles—such as tanks, armored personnel carriers, and self-propelled artillery—slowed dramatically *(see Figure 3-4)*. The Army bought an average of about 430 ground combat vehicles per year in the 1990s, compared with annual purchases averaging more than 1,300 in the 1980s. Thus, Army procurement funding for those vehicles dropped sharply during the 1990s.

Those cutbacks were eventually felt, and the average age of the Army's ground combat vehicles began to rise *(see Figure 3-5)*, reaching 10 years by 2000. CBO's analysis suggests that the average age of those vehicles will continue to rise through 2008, when it will approach 15 years, before deliveries of projected purchases begin to lower it.

The Army plans to change the composition of its fleet of ground combat vehicles radically over the next several decades. Today's heavy forces were developed for a Cold War battle in Europe against heavy ground combat vehicles of the former Soviet Union. Division sets of equipment, including tanks and other heavy equipment, were prepositioned in Germany, where they could be easily transported by ground to where they would be needed if war occurred. In addition, during the four decades of the Cold War, an extensive network of logistical support had been built up for forces deploying from the United States.

Today, the Army is questioning whether the heavy vehicles of the 1980s are significantly less useful, given the uncertain nature and location of potential foes and future conflicts. Tanks and other ground combat vehicles may be too heavy to transport quickly to distant theaters. In addition, future battles might occur in places where logistical support was rudimentary at best. And the tanks that were needed to counter Soviet tanks may not be as useful in wars against terrorists with small arms or unconventional weapons. Finally, improvements in the accuracy of munitions may have made some of the Army's heavy forces overly vulnerable to attack.

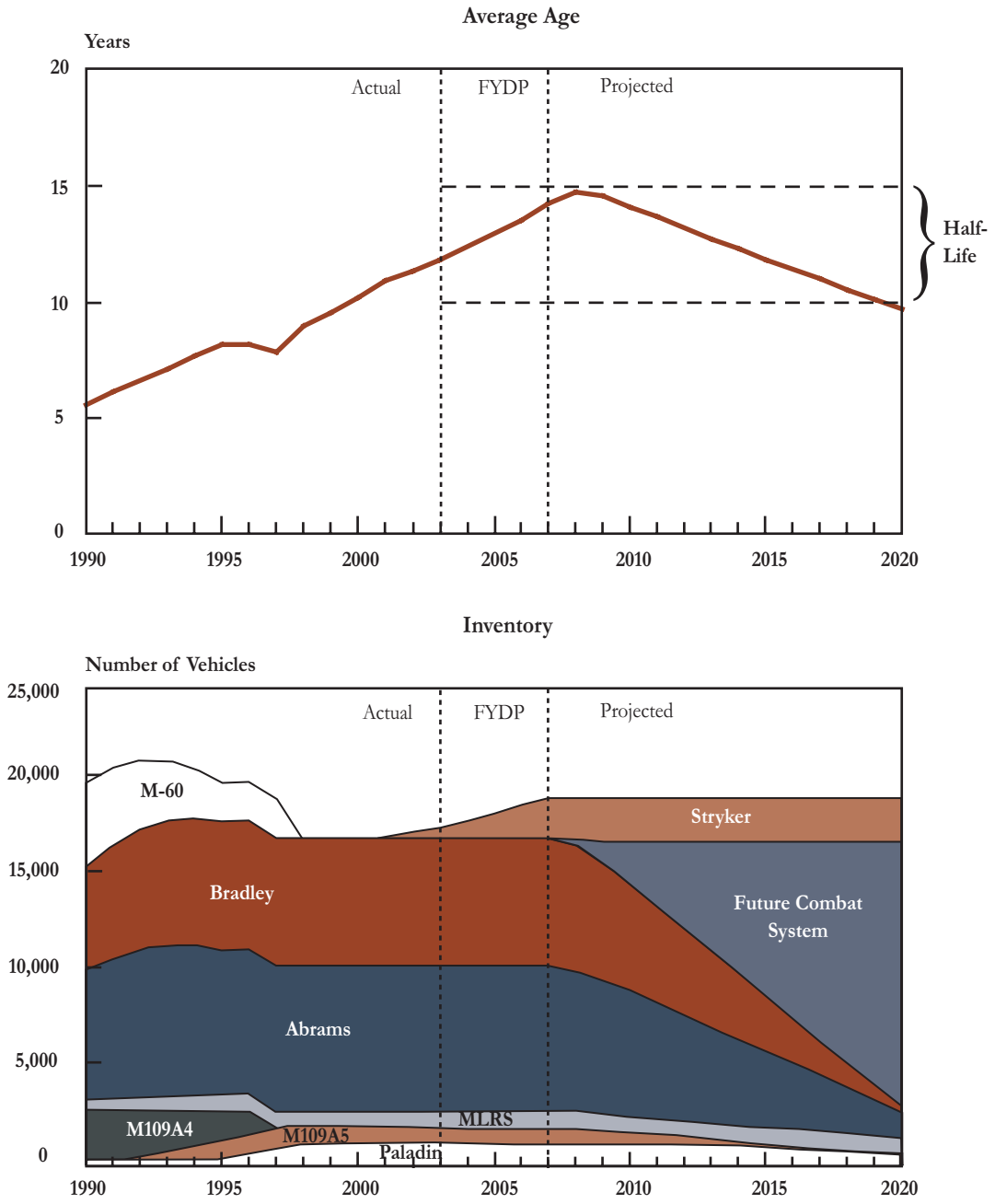
The Army is trying to address some of its concerns about the weight, mobility, and vulnerability of current forces by developing and fielding several new systems. The Stryker, a wheeled armored vehicle now in production, is intended to replace some of the equipment in existing light infantry brigades, thus creating what the Army calls interim combat brigades. The Stryker is lighter than the Army's Bradley fighting vehicle or Abrams tank, so brigades equipped with the Stryker can be transported more rapidly than can heavy combat brigades.

The Future Combat System (FCS) is the next step in the Army's transformation plans. The FCS program is intended to produce a variety of vehicles that would weigh about one-third (or less) of the weight of an Abrams tank. The Army expects these vehicles to replace heavy main battle tanks and other ground combat vehicles beginning in 2008. According to the Army, FCS variants will use advanced technologies to achieve the same or better lethality than today's much heavier tanks and other armored vehicles, while being just as survivable. All-electric drives, advanced active protection (rather than the passive protection provided by heavy armor), and unmanned, autonomous operation are among the technologies being considered for the FCS.

Once the Future Combat System enters production, it is supposed to replace most of the combat vehicles that now equip Army divisions. The Army hopes that, at peak production, enough FCSs will be built to equip three brigades per year. The capabilities that each element of the FCS will provide are still being defined, so it is unclear whether every combat vehicle now in an Army brigade will be replaced by one FCS. If that happened, the Army's peak production of FCS vehicles would be about 1,200 per year. CBO's funding projection for the FCS adopts the current unofficial cost goal of the Army Staff: to buy three brigade sets of FCS equipment per year at a cost of about $4 billion.

Figure 3-5.

Age and Inventory of Army Ground Combat Vehicles

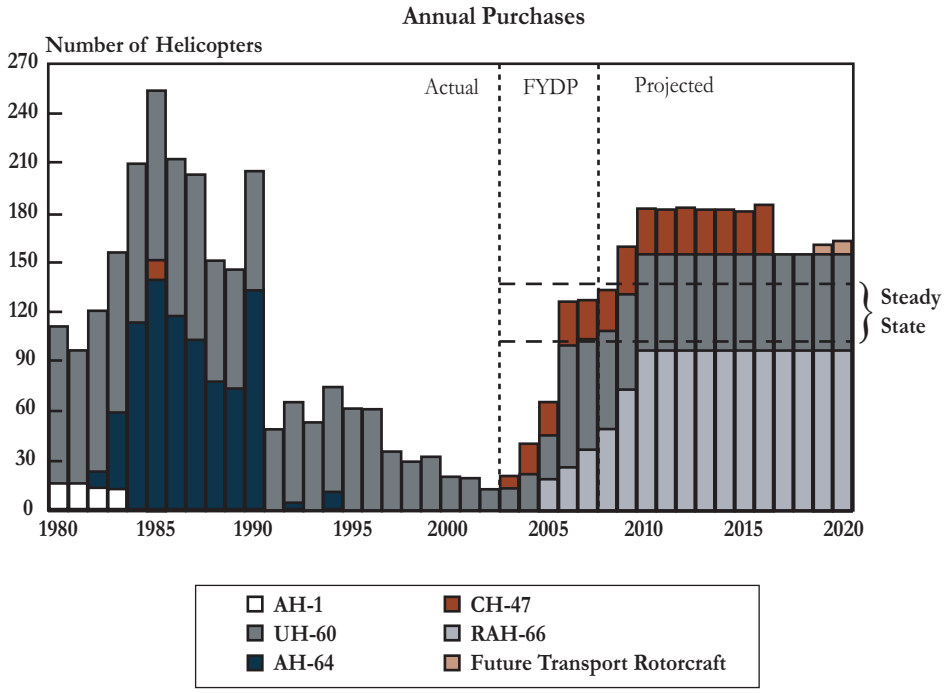


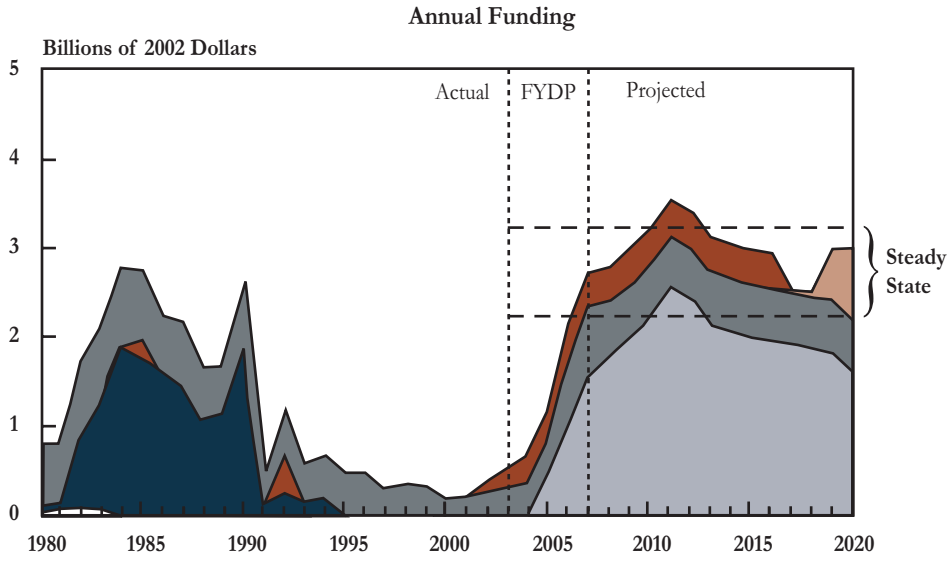
Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; MLRS = multiple-launch rocket system.

Figure 3-6.

Procurement of Army Helicopters





Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

The OH-58s and UH-1s shown in Figure 3-7 were purchased before 1980.

Army Helicopters

Like the Army's fleets of ground combat vehicles, its attack and utility helicopters have been reduced since the end of the Cold War. From about 7,900 helicopters in 1991, the Army now has fewer than 4,000. That inventory will decrease even more over the next several years as the Army retires utility helicopters—largely from the Army National Guard and Army Reserve—without replacing them. Under current plans, the number of Army helicopters would drop slightly below 3,000 by 2004 and remain close to 3,000 throughout CBO's analysis period.

The Army has followed the same cyclical pattern in its helicopter purchases that it has for ground combat vehicles. Those purchases peaked at more than 250 helicopters in 1985 and exceeded 100 per year during most of the 1980s *(see Figure 3-6)*. Helicopter purchases fell sharply in the 1990s and reached a nadir of 12 aircraft in 2002. Under the 2003 FYDP, annual purchases of new and refurbished helicopters are planned to grow rapidly, topping 100 in 2006—about eight times the 2002 quantity. In CBO's long-term projection of current plans, annual purchases of new and refurbished helicopters would reach about 180 by 2010. Those quantities would equal or exceed the purchases needed to sustain today's helicopter fleet indefinitely (96 to 138 aircraft per year, depending on how long helicopters are expected to last).

Even if costs did not grow above the Administration's current estimates, the Army would pay an average of $18 million for each helicopter that it buys over the next 20 years under current plans, or $7 million more than the average cost during the 1980s. Those higher procurement costs occur mainly because the Army intends to buy up to 96 relatively expensive RAH-66 Comanche light-attack/reconnaissance helicopters a year.[8] In CBO's projection, resource demands for helicopter procurement would average $2.6 billion over the 2003-2020 period—about four times the average of the 1990s. Moreover, helicopter procurement costs would exceed the peak spending level of the 1980s in 10 out of the next 20 years, CBO estimates.

If the Army can afford those purchases, it should be able to support its planned forces and do so with a slightly younger fleet of helicopters *(see Figure 3-7)*. The average age of Army helicopters was about 12 at the beginning of the 1980s, but it grew during that decade because the service retained a large number of older OH-58 reconnaissance helicopters and Vietnam-era UH-1 utility helicopters. Although purchases of UH-60 Blackhawk utility helicopters and AH-64 Apache attack helicopters were substantial, they were below the rates needed to sustain a force approaching 8,000 aircraft; thus, the Army's helicopter fleet was about 18 years old, on average, by 1991. Despite declining purchases, average age did not increase significantly during the 1990s because the Army began to retire large numbers of its oldest helicopters. The average age of the fleet will decline somewhat between 2002 and 2004 as the Army finishes retiring all of its UH-1s. After that, average age is projected to rise again until Comanche helicopters start being delivered in large quantities after 2012.

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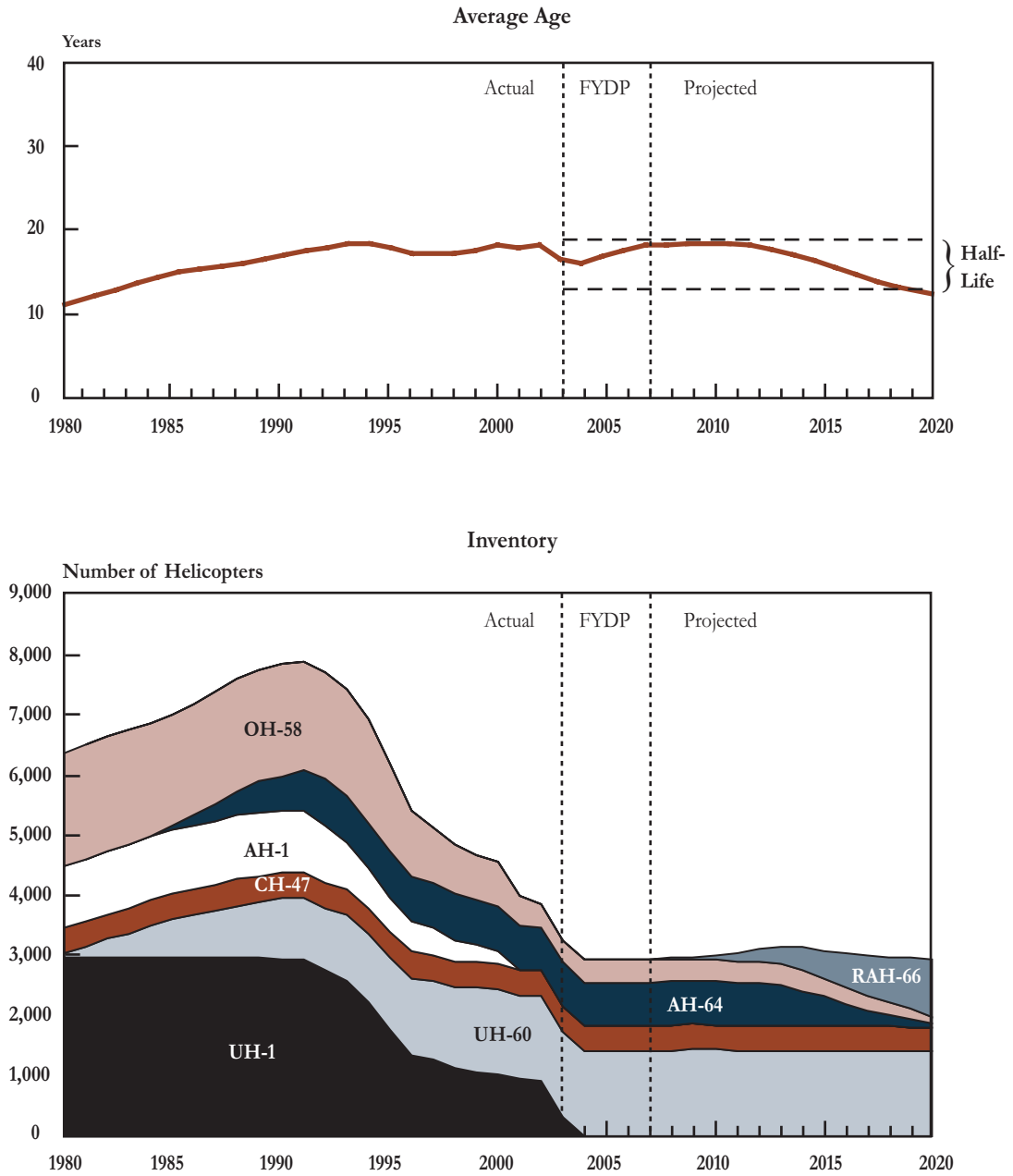
8. Erin Q. Winograd, "Aldridge Signs RAH-66 Comanche ADM, Procurement Cut in Half," *Inside the Army*, October 21, 2002, p. 1. The Administration reportedly has decided to cut the Comanche procurement rate to 60 a year. CBO has not reflected the smaller quantity in its long-term projection since that decision will be incorporated in the FYDP plans that accompany the President's 2004 budget request, to be submitted in February 2003. Reducing annual purchases by 36 Comanches would lower CBO's estimate for helicopter procurement by roughly $680 million a year, on average, over the 2010-2020 period (when yearly purchases were projected to have reached 96 but would now reach only 60).

Figure 3-7.

Age and Inventory of Army Helicopters



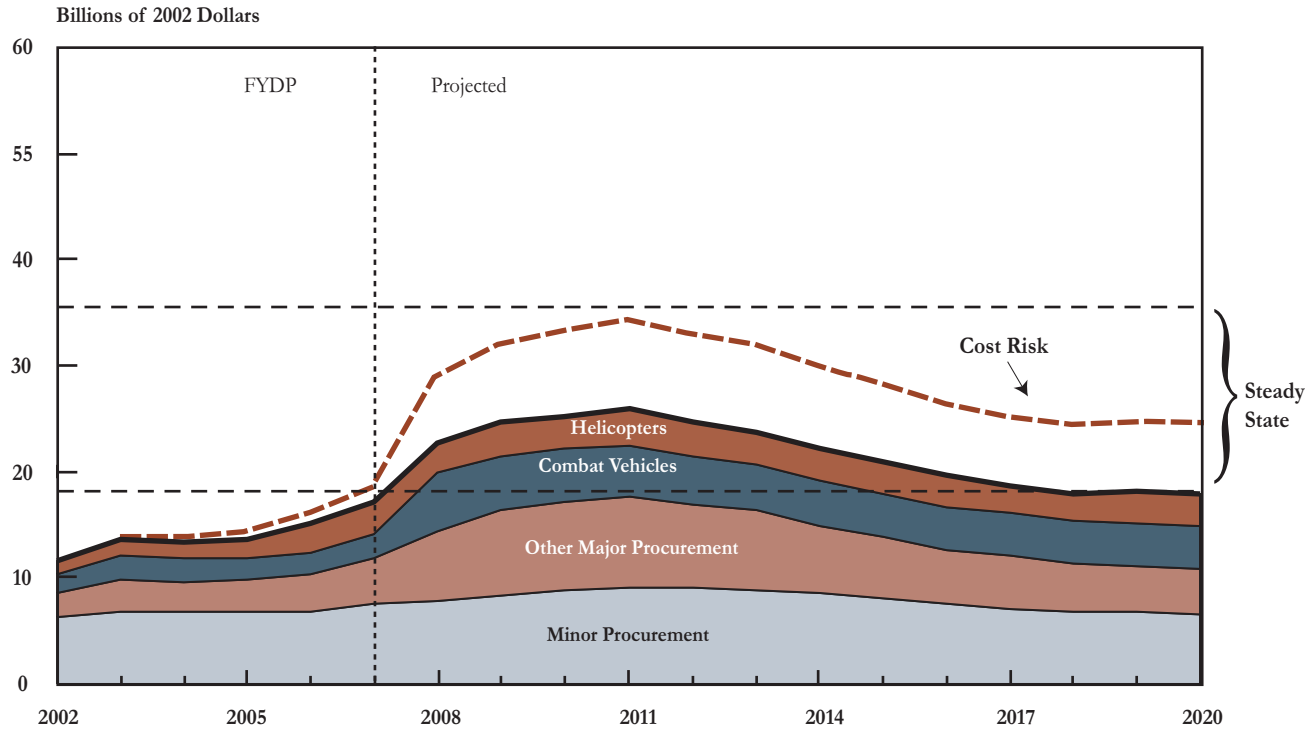
Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

Future Transport Rotorcraft are supposed to be purchased before 2020 but not delivered.

Figure 3-8.

Projected Army Procurement Funding Versus Steady-State Costs



Source: Congressional Budget Office using data from the Department of Defense.

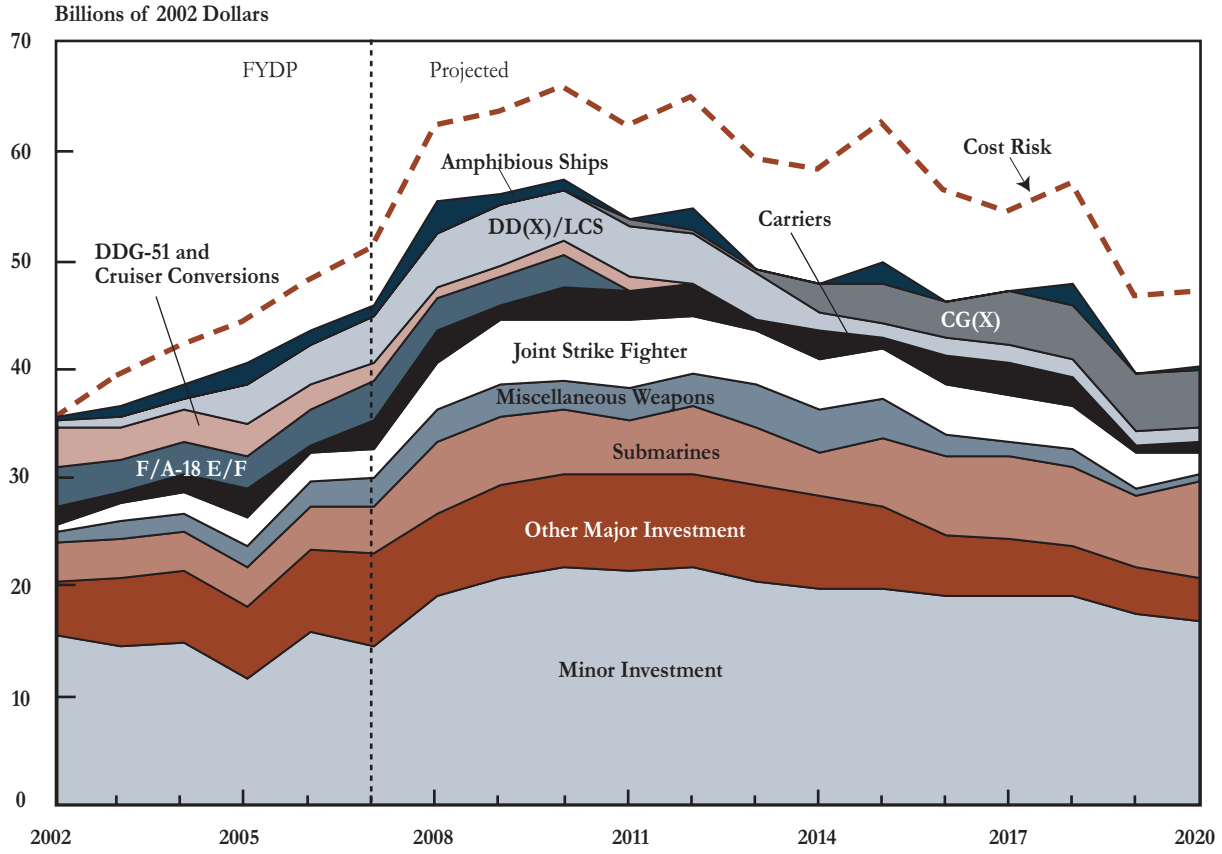
Note: FYDP = Future Years Defense Program.

Procurement Funding for the Army

If the Army's current plans for procurement were carried out through 2020, the service would buy enough weapons to keep its inventories at about current levels and maintain average fleet ages within limits that the Army has found acceptable in the past. To do that, however, the Army's annual procurement funding would need to double, from about $12 billion today to a peak of about $26 billion in 2011, under optimistic assumptions about prices. If procurement costs grow as they have historically, the cost of implementing current plans would approach $35 billion in 2011. After that, annual procurement costs would decline slowly through the rest of CBO's projection period. The average of that planned funding over the 2008-2020 period falls within the range that CBO estimated the Army would need (steady-state funding of $18.5 billion to about $35 billion) to sustain current forces indefinitely *(see Figure 3-8)*.

Figure 3-9.

Projected Navy and Marine Corps Spending for Investment



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; LCS = littoral combat ship.

The Navy and Marine Corps

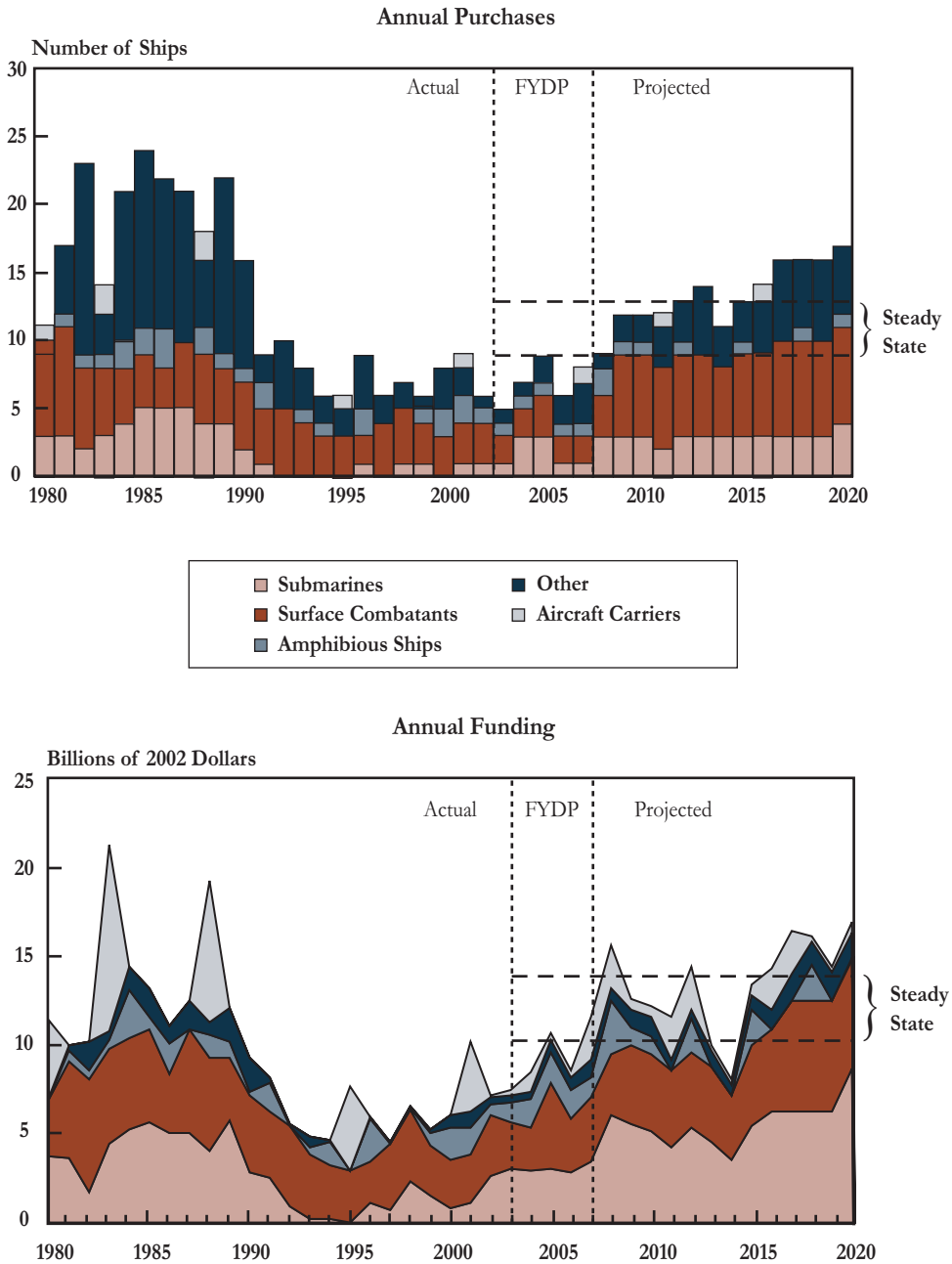
Investment for the Department of the Navy (which includes the Marine Corps) would grow by more than 60 percent over the next eight years under the 2003 FYDP plan and CBO's projections of its long-term implications *(see Figure 3-9)*. From a level of about $36 billion in 2002, that spending would peak at about $58 billion in 2010 and then decline thereafter. Spending would average $50 billion a year between 2008 and 2020. By the end of the projection period, Navy and Marine Corps investment spending would return to about $40 billion a year. If investment costs grow as they have in the past, however, investment spending for the two services could rise to a peak of $66 billion by 2010 and average $58 billion a year between 2008 and 2020, falling back to about $47 billion by the end of the period.

During the 1990s, with the Cold War over, the Navy retired many of its older ships and aircraft. Consequently, it was left with relatively young fleets and did not need to purchase many weapon systems to sus-

tain the force structure. However, those young systems of the 1990s will become the old systems of the 2010s. Thus, the Navy will need to boost its procurement spending in coming years to prevent its ship and aircraft fleets from reaching average ages that exceed half of their planned service lives. (Exceeding that age means that the Navy might have to buy weapon systems at rapid rates or extend service lives to sustain current forces. Such actions might not be a problem if they affected only a few systems, but having to rapidly replace systems in a number of mission categories could be costly.)

Figure 3-10.

Procurement of Battle Force Ships



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Navy Battle Force Ships

During the Reagan-era defense buildup of the 1980s, the Navy purchased an average of 20 battle force ships (ships designed to participate in or directly support combat operations) each year, at an average spending level of $14 billion *(see Figure 3-10)*. Averages are important when looking at procurement spending for battle force ships because big-ticket items, such as aircraft carriers, can produce large spikes in spending during the years when they are purchased. In the 1990s, the Navy took a procurement holiday, and the shipbuilding rate fell by more than half: to an average of eight ships a year (many of them relatively inexpensive support ships) at $6 billion annually. Those reductions accompanied substantial cuts in force structure: the size of the Navy's battle force fleet dropped from 550 ships in 1990 to 314 today *(see Figure 3-11)*.

The lower levels of spending and purchases seen in the 1990s continue in the 2003 FYDP. However, not all the plans and programs that the Navy has announced are fully reflected in that FYDP. CBO estimates that those plans would eventually lead to a fleet of 354 battle force ships. That number is much larger than today's fleet largely because of the Navy's plan to buy 56 corvettes (littoral combat ships), which is not reflected in the funding projections in the 2003 FYDP.[9]

To maintain a fleet of about 354 ships, the Navy would need to spend more money on ship construction than it has in recent years or plans to under the 2003 FYDP. Ship purchases would have to average between nine and 13 per year (depending on assumptions about average service lives) to keep the fleet at 354 battle force ships indefinitely.[10] Under CBO's long-term projection of current and future ship procurement plans, the Navy would meet those construction rates by 2010. It would buy an average of 14 ships per year between 2010 and 2020, spending around $13 billion annually to do so—almost as much as during the defense buildup of the 1980s. In short, if the Navy were to receive the funding to implement its ship construction programs and plans, it would increase the size of the battle force fleet from 314 ships now to 323 in 2020. If that level of annual funding could be sustained indefinitely, the fleet would grow to about 350 in the mid- or late 2020s and remain there.

Although construction of battle force ships fell by more than 50 percent in the 1990s, the average age of the fleet declined by four years (from 17 to 13) over the same period as older ships were retired and younger ones were retained. Since then, average age has begun increasing. If the Navy's plans for a larger fleet were fully funded, that rise in age would halt.

Submarines

Perhaps the greatest procurement challenge facing the Department of the Navy is sustaining a force of 55 attack submarines (SSNs).[11] The attack submarine force saw its deepest cuts in recent history in the 1990s, during which the Navy built only five SSNs.

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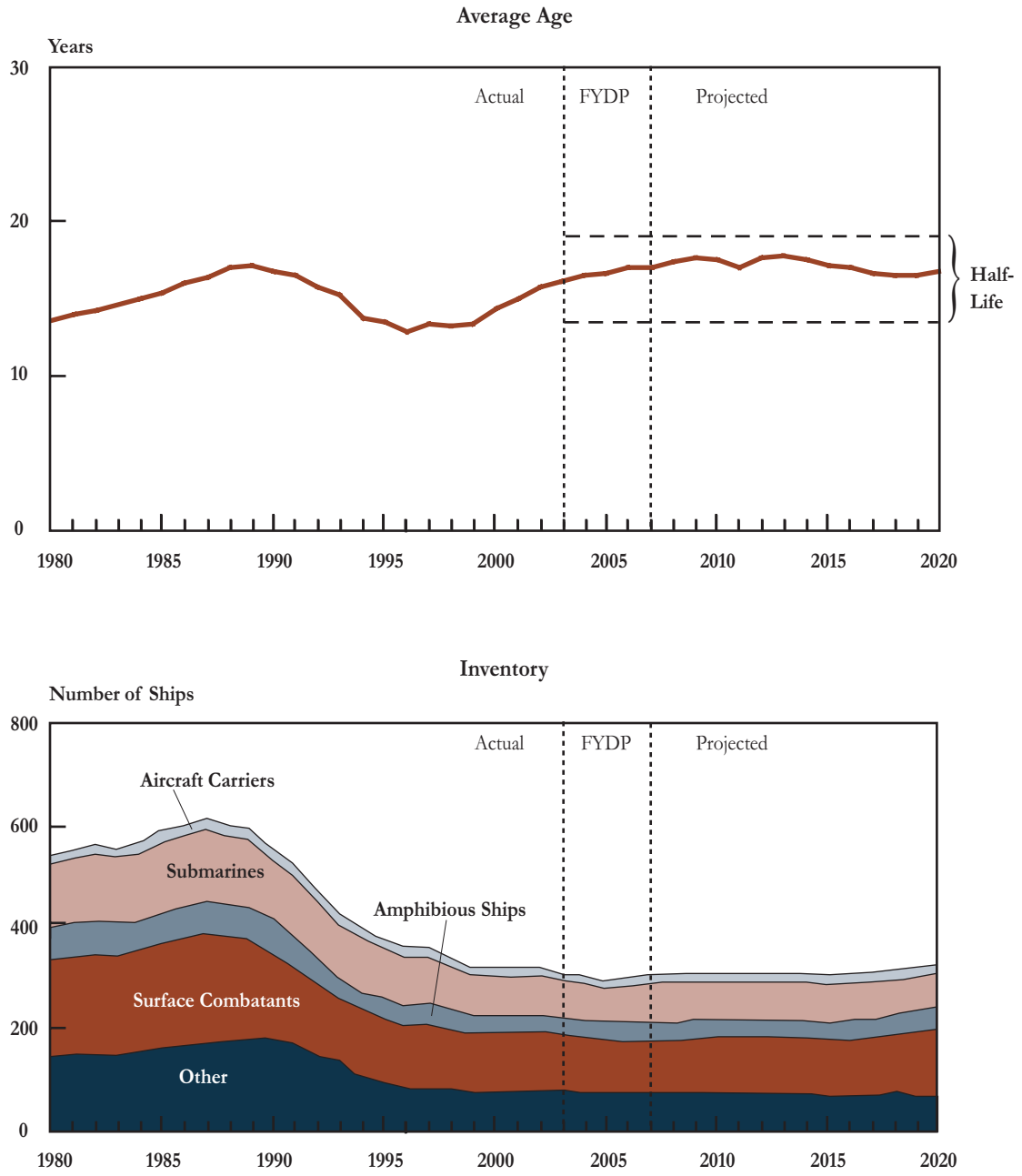
9. The Navy has not officially determined how many surface combatants it would like to have. The best information available to CBO at the time of this writing suggests that the service wants 160 surface combatants, including 56 corvettes, which are relatively small ships designed to operate in the world's coastal waters. Combining those ships with the Navy's other ship programs and goals results in a 354-ship fleet. (The service's new proposed force goal is 375 battle force ships. Part of the difference between that goal and the 354-ship fleet is that the Navy would count an additional nine mine-clearing ships as battle force ships that are not included in that category now. In addition, the Navy may need more support ships, which CBO did not include in its analysis of the Navy's plans because the number is not yet determined. CBO is preparing a study on transforming surface combatants that will address that issue in more detail.)

10. For a 354-ship Navy, if the average service life per ship is 28 years (which is in line with historical norms), the Navy would need to buy 13 ships annually. If the average service life is about 40 years (which is how long the Navy hopes to operate many of its ships), it would need to purchase about nine ships every year.

11. See Congressional Budget Office, *Increasing the Mission Capability of the Attack Submarine Force* (March 2002), for a more detailed discussion of attack submarines.

Figure 3-11.

Age and Inventory of Battle Force Ships



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

The Navy currently buys SSNs at a rate of one per year—a rate that would keep the force at about 55 SSNs through 2015 (assuming that all Los Angeles class submarines that have service life remaining on their hulls when their nuclear fuel cores wear out are refueled and kept for their entire 33-year service life). After 2015, however, the size of the force would fall precipitously as large numbers of Los Angeles class submarines were retired.

To prevent that from happening, the Administration's program would have the Navy begin building three attack submarines a year in 2008 and continue that rate through 2020 and beyond. That higher rate would more than double the $2.7 billion a year now being spent on building and reconfiguring submarines. (The Navy is converting four Trident submarines to a guided-missile, or SSGN, configuration. If the SSGNs can be considered substitutes for SSNs, the rise in construction rates could be delayed for two years.) Without an increase in annual spending for SSNs of several billion dollars, it would be virtually impossible to sustain 55 SSNs through 2020.

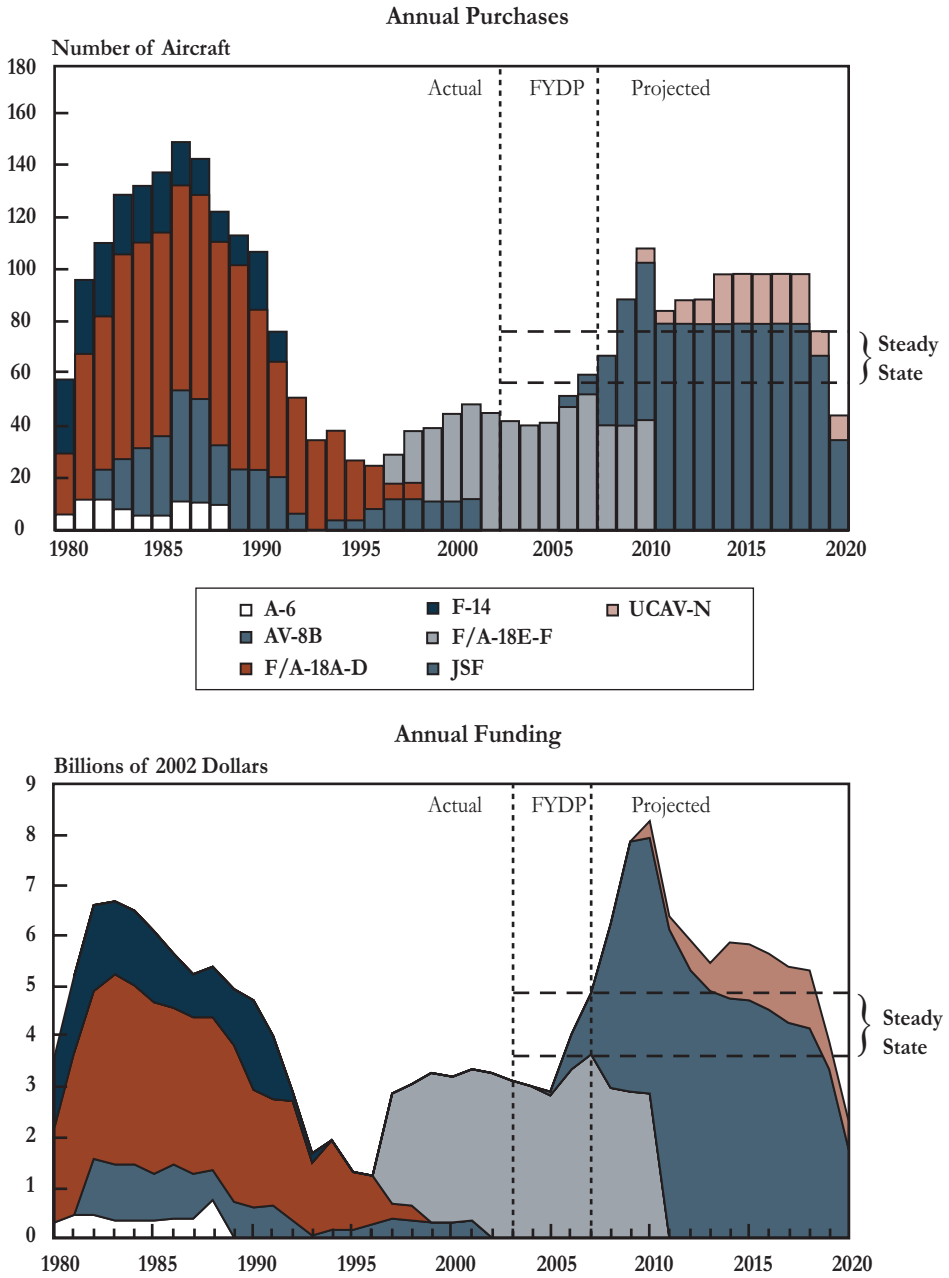
Surface Combatants

Spending on surface combatants did not decline as rapidly during the 1990s as did spending on attack submarines. During that period, the Navy built more surface combatants than were necessary to maintain a force of 116 ships, the goal laid out in DoD's 2001 Quadrennial Defense Review. Between 1990 and 2002, the Navy bought an average of 3.5 surface combatants per year, compared with the 2.9 to 3.9 needed to keep the force at 116 indefinitely.

The Navy has stated that it wants to increase the size of the surface combatant force to 160 ships (including 56 littoral combat ships). That would mean spending even more on surface combatants: an average of six ships per year between 2010 and 2020, at a procurement cost of $5 billion annually. That level is roughly equal to what was spent on surface combatants during the Reagan-era defense buildup; it is two-thirds greater than what the Navy is spending on those ships today. CBO projects that if the Navy received that funding, the number of surface combatants would rise from 115 now to 136 by 2020.

Figure 3-12.

Procurement of Navy Fighter and Attack Aircraft



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; JSF = Joint Strike Fighter; UCAV = unmanned combat air vehicle.

Navy Fighter and Attack Aircraft

As it did with ships, the Navy cut back substantially on the quantities of fighter and attack aircraft that it bought following the large buildup of the 1980s *(see Figure 3-12)*. Annual purchases of those planes averaged 49 during the 1990s, compared with an average of 127 during the 1980s. Under the Navy's current plans, aircraft purchases average 56 per year between 2000 and 2009, and potential resource demands average about $4.2 billion a year. Those numbers would rise further in the next decade: to an average of 92 aircraft and about $5.0 billion per year over the 2011-2020 period. That sum is almost equal to what the Navy spent on fighter and attack aircraft in the 1980s and is roughly two-thirds more than it will spend on them in 2003.

Overall, the Navy's fighter and attack aircraft are newer than those of the Air Force. The average age of those Navy aircraft, which was fairly constant in the 1980s, declined during the early 1990s and reached a low of 8.7 years in 1996 *(see Figure 3-13)*. After that, average age began to grow. It would continue to rise over the next five years under the 2003 FYDP, reaching an average of 14.8 years in 2008.

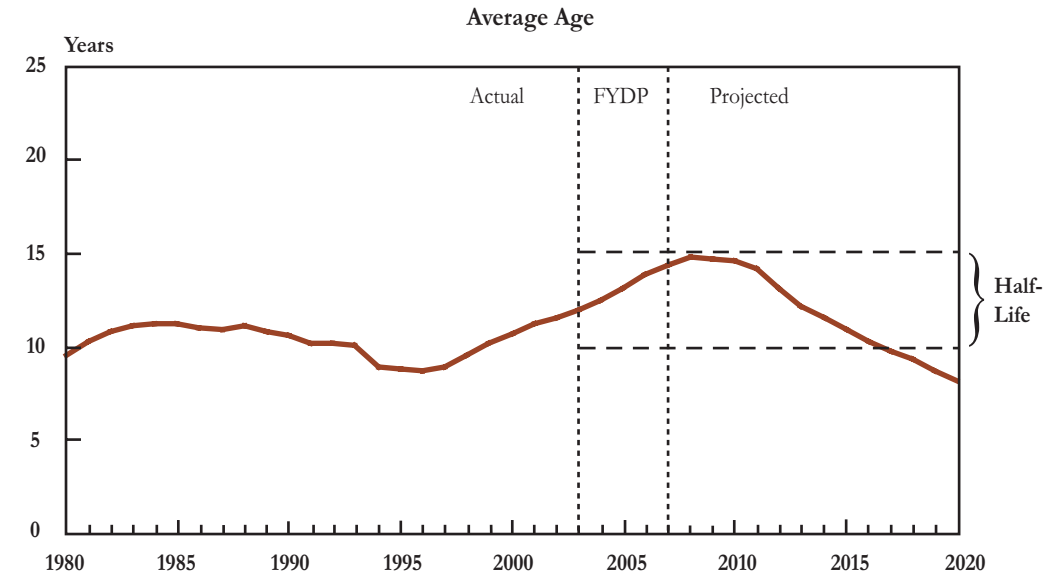
The Administration's longer-term plans, if executed as CBO envisions, would slow the growth in average age after 2008, keeping it from exceeding 15 years (the upper bound of the half-life range) through 2020. The average age of fighter and attack aircraft would fall once the large numbers of Joint Strike Fighters (JSFs) that the Navy plans to buy are delivered, dropping below 10 years (the bottom of the half-life range) by the middle of the next decade.

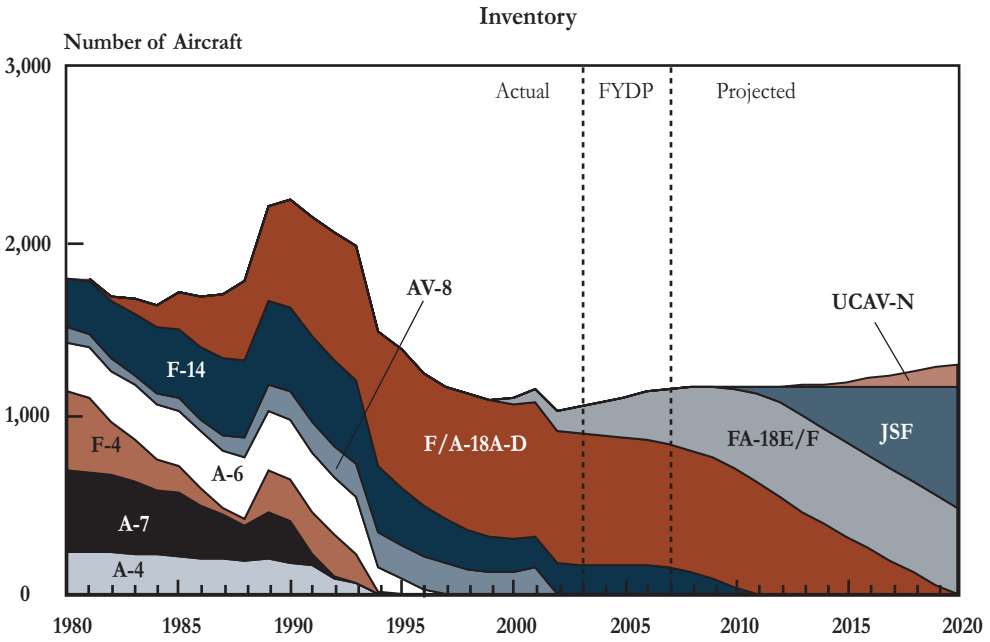
The Navy's current requirement for fighter and attack aircraft is about 1,300 planes (plus replacements for attrition). Thus, in order to maintain the average age of the fleet at half its service life or less, the Navy must buy 56 to 77 aircraft per year, depending on whether those planes' service lives are assumed to be 20 or 30 years.

The Navy's plans are particularly dependent on having a successful development program for the Joint Strike Fighter. If that program was unsuccessful, the Navy could instead buy F/A-18E/Fs to use on its aircraft carriers for roughly the same cost as the JSF (or perhaps less, if the developmental fighter grows in cost). But delays in the JSF schedule would present problems for the Marine Corps. The Marine Corps version of that plane must be able to operate from amphibious ships and thus take off over a short distance and land vertically. Other new U.S. fighters do not have that capability, so the Marine Corps does not have a viable alternative to the short takeoff, vertical landing variant of the JSF if the JSF were to be delayed or canceled.

Figure 3-13.

Age and Inventory of Navy Fighter and Attack Aircraft



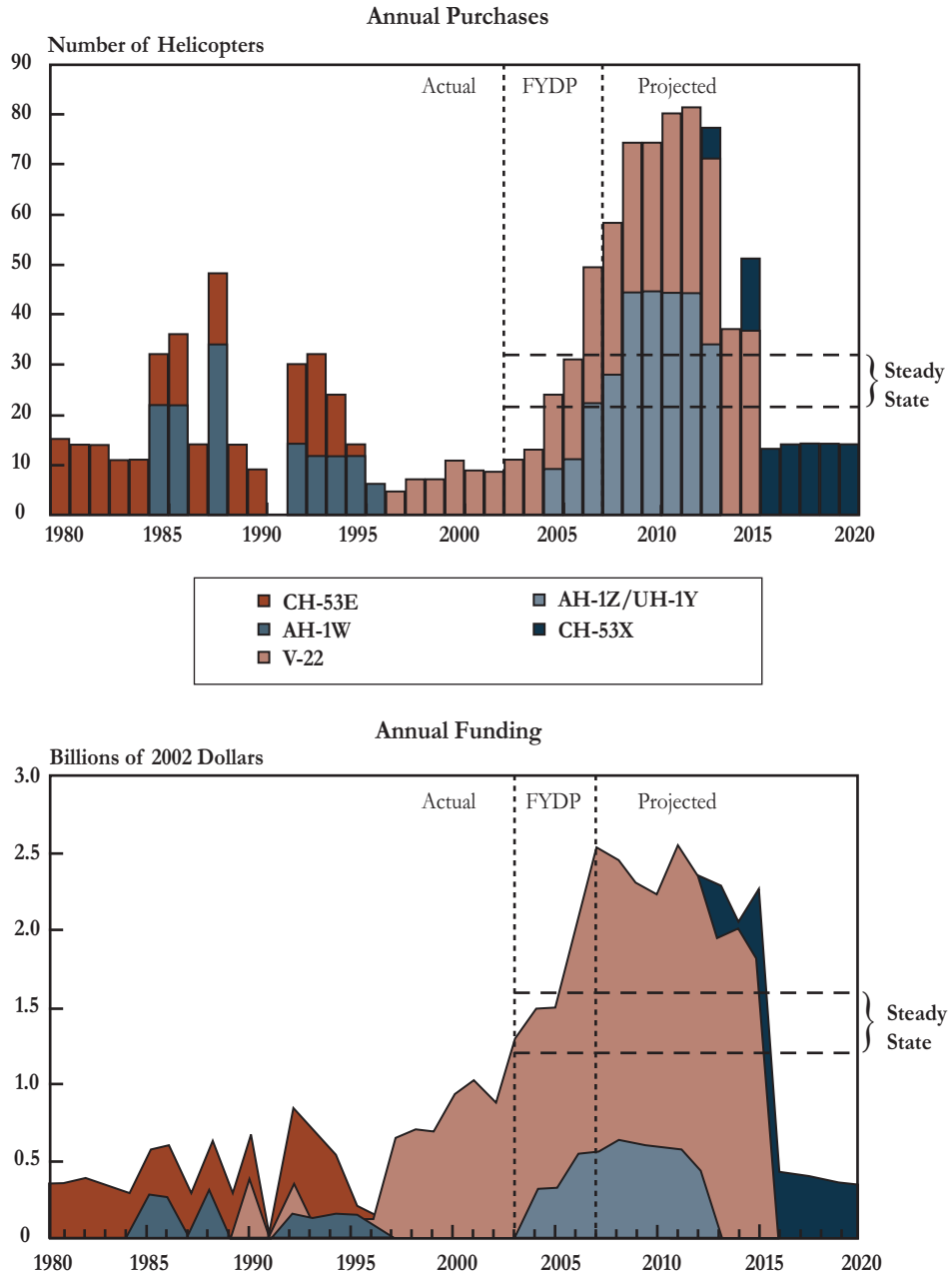


Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; JSF = Joint Strike Fighter; UCAV = unmanned combat air vehicle.

Figure 3-14.

Procurement of Marine Corps Helicopters



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

The AH-1Z and UH-1Y were funded as a single program.

Marine Corps Helicopters and Tilt-Rotor Aircraft

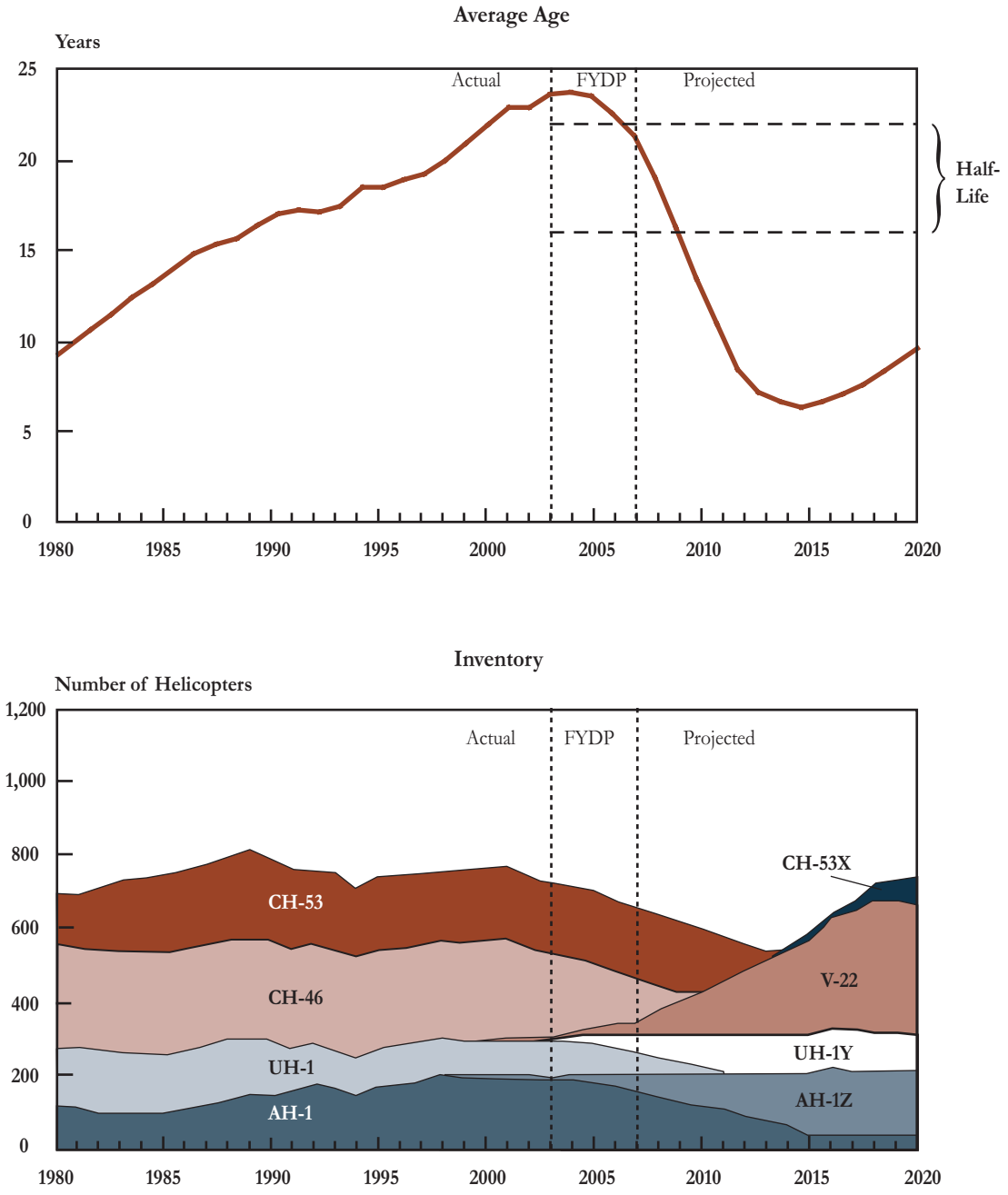
The Marine Corps's helicopter and tilt-rotor fleet faces some of the most serious procurement and aging challenges of any category of weapon systems discussed in this report. Unlike its procurement of most types of systems, DoD did not buy great quantities of Marine helicopters during the defense buildup of the 1980s *(see Figure 3-14)*. Instead, it purchased an average of just 21 per year during that decade. The pattern continued through the 1990s, when Marine helicopter purchases averaged 13 per year, compared with an estimated steady-state level of about 20 to 30. Under the Administration's current plans and CBO's projection of their long-term implications, purchases of helicopters and tilt-rotor aircraft to replace some Marine helicopters would rise dramatically over the next 15 years: to an average of 29 aircraft per year between 2000 and 2009 and 43 per year between 2010 and 2020. Meeting those procurement goals would require spending more than twice (in peak years) what the Department of the Navy spent on that category of funding for the Marine Corps in the 2002 budget.[12] The lion's share of that funding would be consumed by the V-22 tilt-rotor transport, an aircraft whose development program has suffered a series of problems, including three fatal crashes.

Whether or not the V-22 proves to be a viable aircraft, the Marine Corps will need some sort of new medium-lift helicopter to stop the fleet aging that has been occurring since 1980. Because of the small purchases since then, the average age of Marine Corps helicopters has more than doubled, from about 10 years in 1980 to 23 years in 2002, which is above the fleet's half-life *(see Figure 3-15)*. In particular, the Marine Corps would need to purchase between 23 and 32 helicopters per year to bring the average age of the fleet into its half-life range. The Administration's current plans would buy enough Marine Corps helicopters to reduce their average age well below that range, once those planes were delivered. But those plans depend both on the success of the V-22 program and on doubling spending for Marine Corps helicopters between now and 2007.

12. Funding for development and procurement of helicopters and other aircraft for the Marine Corps is contained in the Department of the Navy's aviation budget.

Figure 3-15.

Age and Inventory of Marine Corps Helicopters

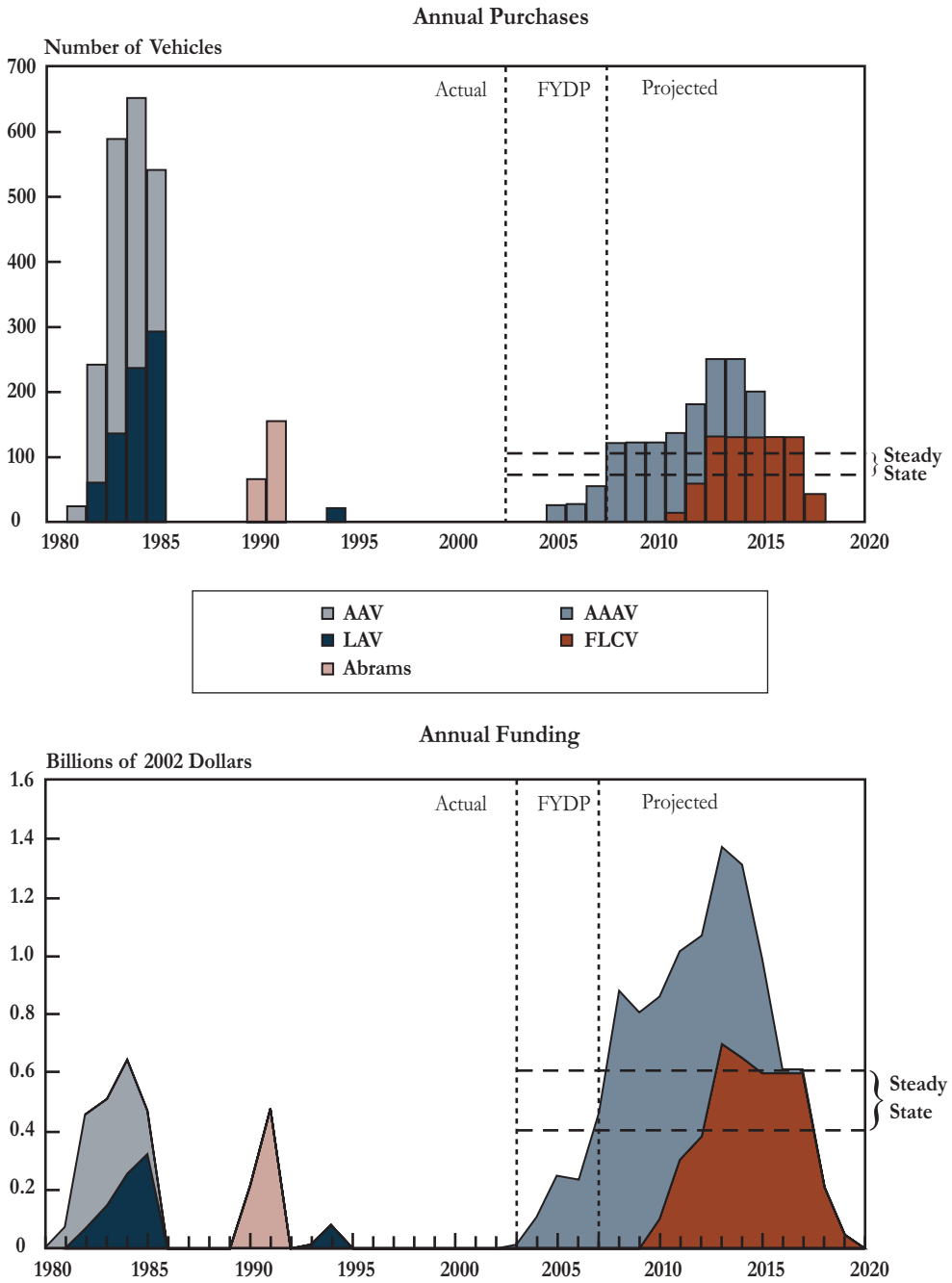


Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Figure 3-16.

Procurement of Marine Corps Ground Combat Vehicles



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; LAV = light armored vehicle; FLCV = future light combat vehicle; AAV = amphibious assault vehicle; AAAV = advanced amphibious assault vehicle.

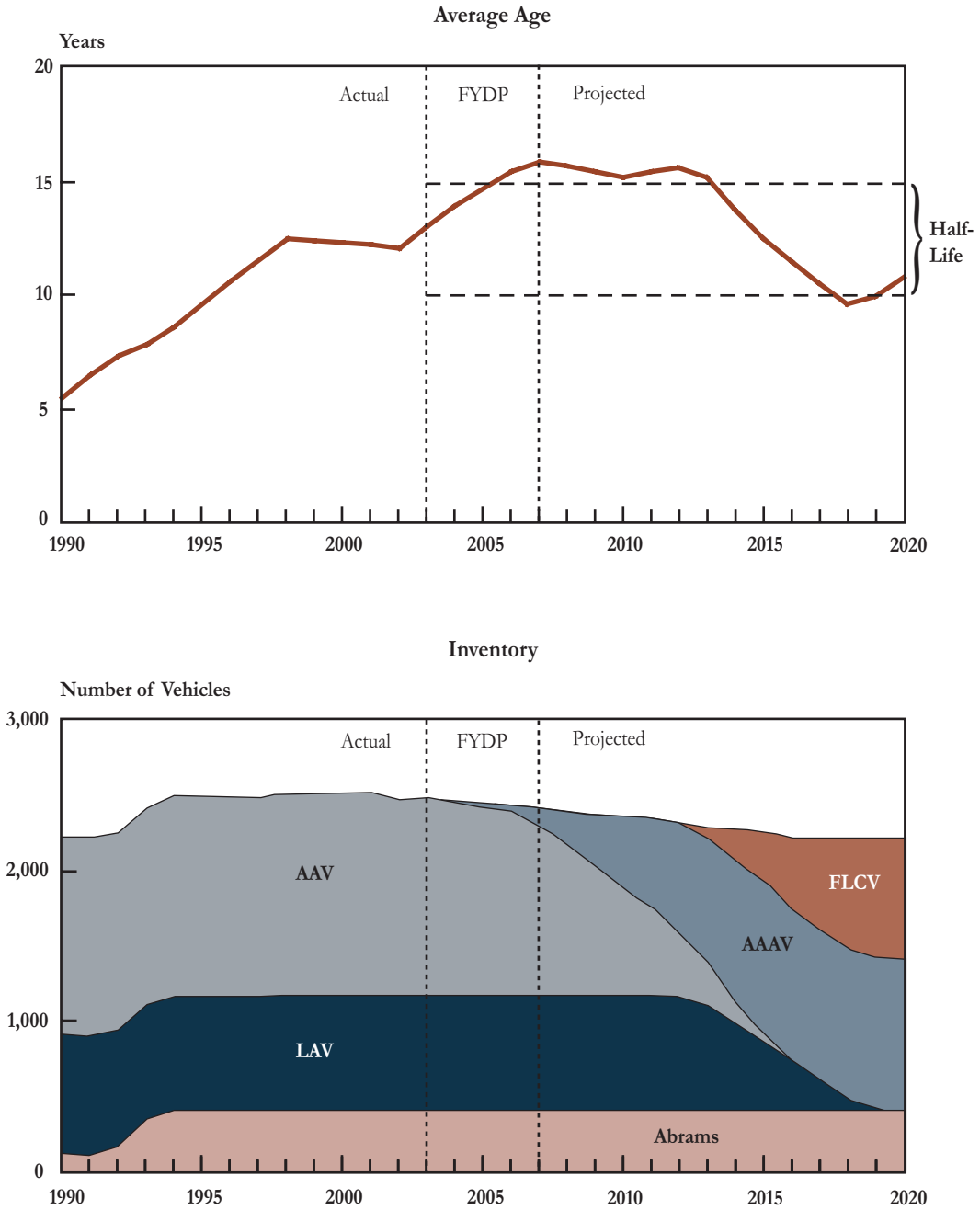
Marine Corps Ground Combat Vehicles

Marine Corps ground combat systems face a challenge similar to that faced by Marine helicopters, although more ground combat vehicles were purchased during the Reagan-era defense buildup *(see Figure 3-16)*. During the 1980s, the Marine Corps bought a total of more than 2,000 ground combat systems—including the amphibious assault vehicle (AAV), the light armored vehicle (LAV), and the Abrams tank—to replace older systems that had reached the end of their useful service lives. With all of its major ground systems new, the Marine Corps purchased very few combat vehicles throughout the 1990s, and it does not expect to begin buying replacements for those systems until 2005. When it does, however, the new equipment—the advanced amphibious assault vehicle (AAAV) and the future light combat vehicle (FLCV)—will require a major investment of resources. Under CBO's projection, procurement costs for major ground combat vehicles for the Marine Corps would average $750 million per year between 2008 and 2020, compared with almost no procurement funding requested in the President's 2003 budget. (There is development funding for the AAAV in the Department of the Navy's RDT&E accounts.)

Those purchases would maintain the inventory of Marine Corps ground combat vehicles at a little more than 2,000 *(see Figure 3-17)*. They would also cause the vehicles' average age to begin to decline in 2013, reenter the half-life range in 2014, and remain in or below that range through 2020.

Figure 3-17.

Age and Inventory of Marine Corps Ground Combat Vehicles



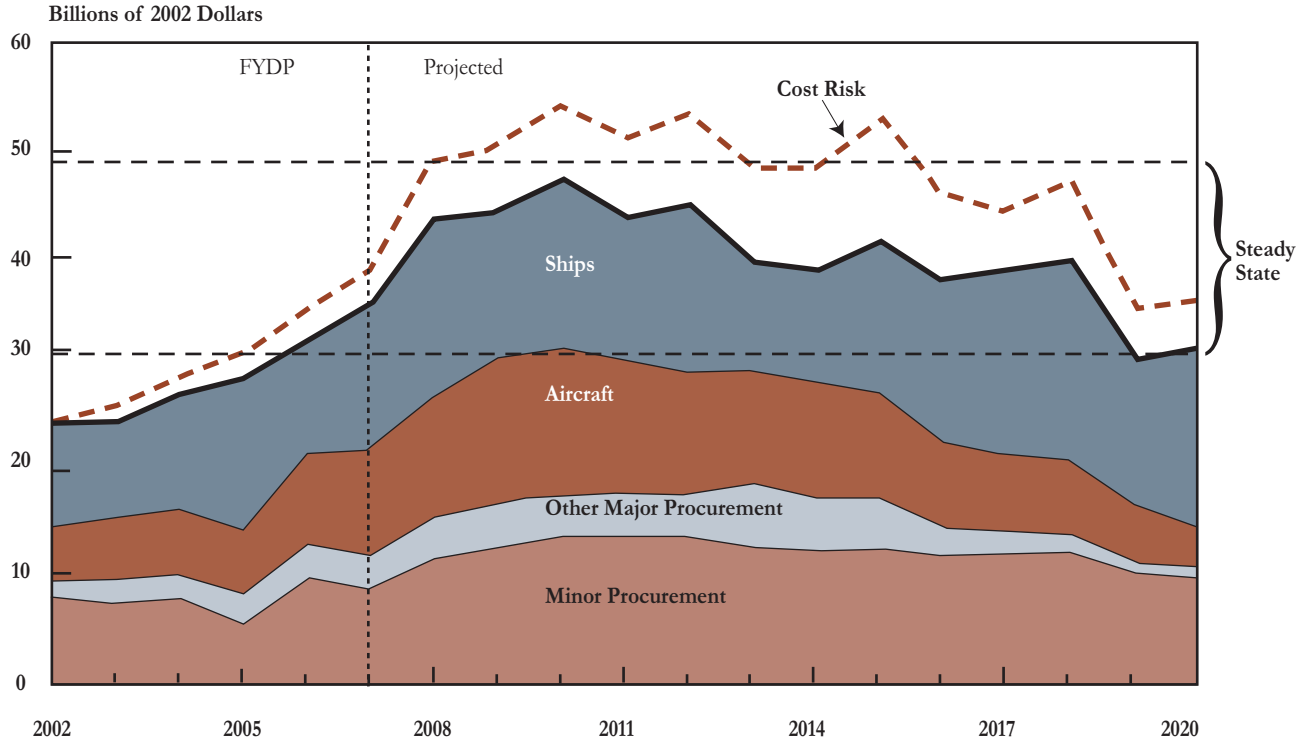
Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program; AAV = amphibious assault vehicle; AAAV = advanced amphibious assault vehicle; LAV = light armored vehicle; FLCV = future light combat vehicle.

An AAV product improvement program funded in the 1990s reset the age of those vehicles to zero, which caused the average age of ground combat vehicles to decline.

Figure 3-18.

Projected Navy and Marine Corps Procurement Funding Versus Steady-State Costs



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

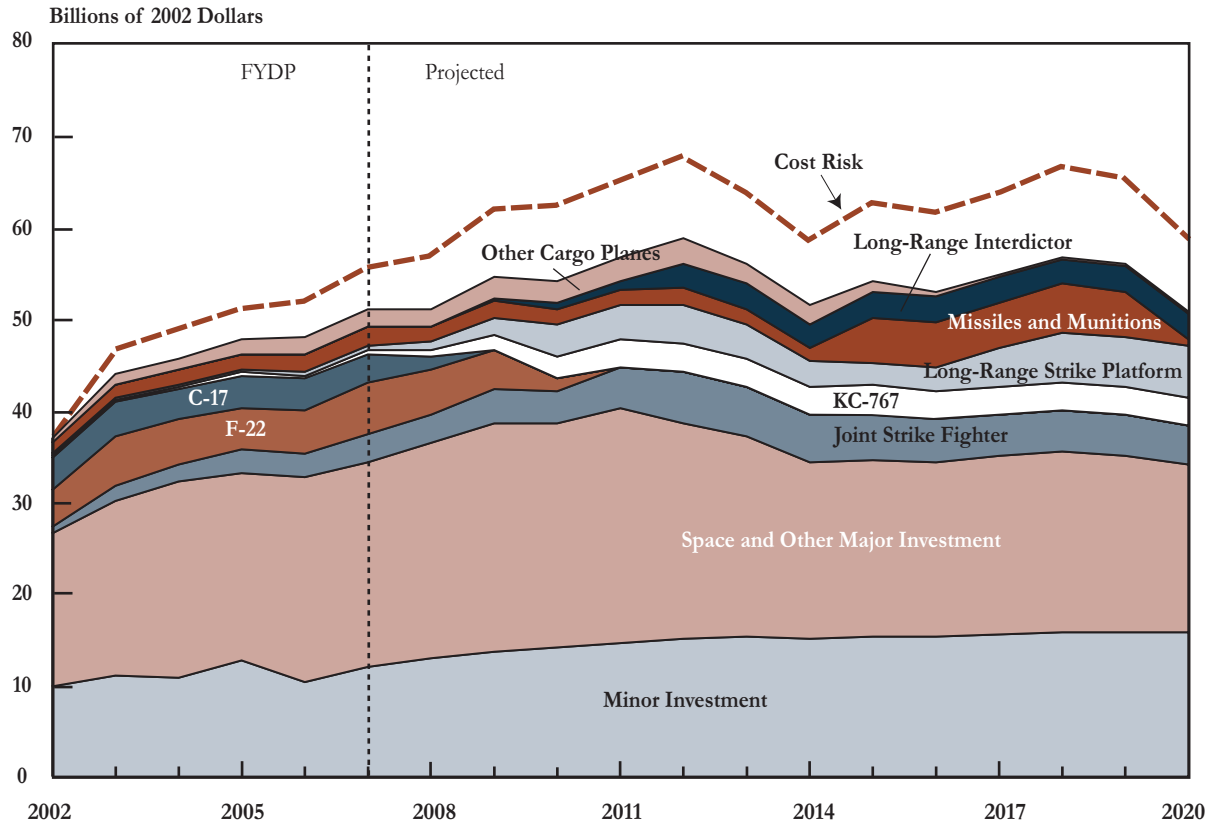
Navy and Marine Corps Procurement

If the Administration's current plans for Navy and Marine Corps investment were carried out in the long term, those services would be able to buy enough weapons to sustain inventories at about current levels through 2020. The range of steady-state costs (the procurement funding needed to sustain current Navy and Marine Corps forces indefinitely) is broad because it covers various asssumptions about service lives and the possibility of cost increases *(see Figure 3-18).* The bottom of that range assumes longer service lives for weapon systems and DoD's estimates of future procurement costs. The top of the range incorporates shorter service-life assumptions and accounts for the risk that costs will exceed DoD's estimates. CBO's projection of annual resource demands for Navy and Marine Corps procurement is generally close to the upper end of the steady-state range. Therefore, CBO projects, even if weapons proved to be more expensive than anticipated (as they have historically), currently planned purchases would be close to steady-state levels, and inventories would decline only modestly or the fleet would have to grow older. If costs did not grow significantly, most purchases would equal or exceed levels for sustaining today's force sizes in a steady state.

However, the levels of funding to carry out current plans over the long term are significantly higher than the Department of the Navy's current procurement budget. To implement those plans, annual procurement funding would have to be about 50 percent more than today's levels (without cost risk) to 75 percent more (with cost risk) between now and 2010.

Figure 3-19.

Projected Air Force Spending for Investment



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

CBO assumed that the Air Force's Long-Range Interdictor would be a version of the F-22.

The Air Force

Under the Administration's 2003-2007 FYDP, funding for research, development, test, and evaluation and for procurement in the Air Force would rise from about $37 billion in 2002 to about $50 billion in 2007 *(see Figure 3-19)*. Carrying out the Administration's plans for the Air Force would require annual investment funding to keep growing beyond 2007, CBO projects. That funding would reach a peak of about $59 billion in 2012 and then fluctuate through 2020, averaging $54 billion over the 2013-2020 period.

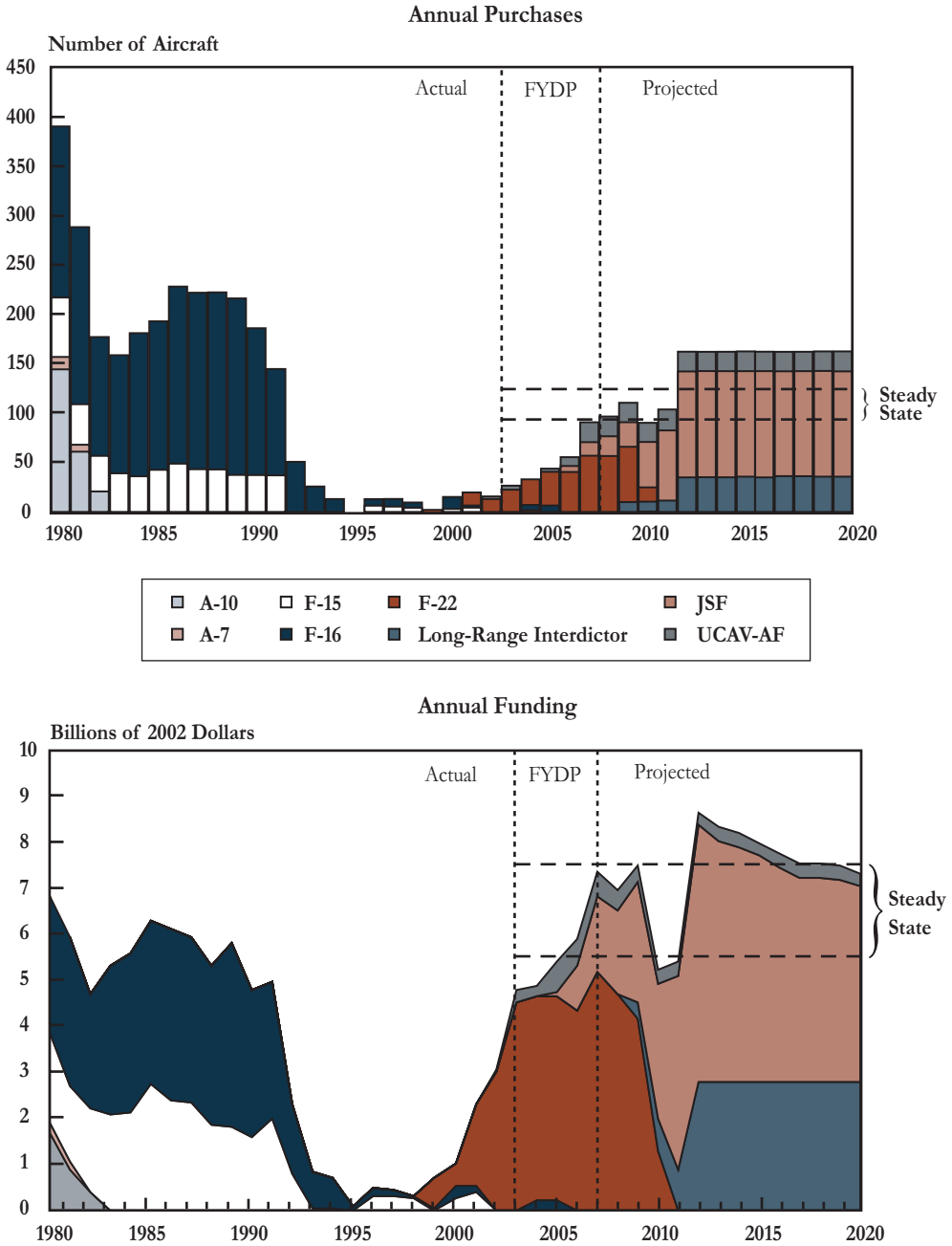
If the costs of developing and purchasing Air Force systems grew beyond the service's current estimates to the same extent that they have in the past, carrying out current plans would require an additional $9 billion in the peak year (2012). After that, resource demands would fluctuate, as they would in the absence of cost growth, but they would average $8 billion more ($63 billion) a year between 2013 and 2020.

A large share of that projected growth comes from rising RDT&E or procurement for two new

fighter aircraft: the F-22 and the Air Force's version of the JSF. CBO's projection of current plans also includes funding for airlifters (transport aircraft that operate within or between theaters), for a tanker plane to refuel those fighter and airlift fleets, and for initial development of missiles and long-range strike systems that would replace today's intercontinental ballistic missiles and augment or replace today's conventional bombers. Additionally, CBO's projection includes a number of space systems that DoD is contemplating, such as various satellites and boosters to launch them.

Figure 3-20.

Procurement of Air Force Fighter and Attack Aircraft



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program; JSF = Joint Strike Fighter; UCAV = unmanned combat air vehicle.

CBO assumed that the Air Force's Long-Range Interdictor would be a version of the F-22.

Air Force Fighter and Attack Aircraft

The F-22 and the Joint Strike Fighter are the center of the Air Force's current plans for tactical fighter and attack aircraft (ones that operate in a theater, rather than over long distances). Purchases of the F-22 fighter are scheduled to rise over the next five years, reaching 56 aircraft per year in 2007 *(see Figure 3-20)*. Purchases of the Air Force's version of the JSF are scheduled to begin in 2006. By 2012, they would reach a yearly procurement rate of 110 planes. In addition to those manned fighter and attack aircraft, the Air Force plans to buy unmanned combat air vehicles (UCAVs), with the first squadron to be operational around 2010. To pay for those aircraft purchases, annual procurement would have to nearly triple over the next decade—from about $3 billion today to more than $8 billion in the peak purchase years of the early to mid-2010s, CBO projects.

The Air Force's planned fighter purchases, and the funding required for them, exceed steady-state procurement levels.[13] But higher purchases might be needed to offset the decline that occurred in the aftermath of the Cold War—when Air Force fighter forces were almost halved and procurement of new aircraft fell dramatically (to well below steady-state needs). CBO compared actual and planned purchases for the 25-year period from 1995 to 2020 with the steady-state purchases that would have been necessary then to support today's forces. Using 2020 (the endpoint of CBO's projection) as a benchmark and assuming a 25-year service life, CBO estimated that the accumulated shortage in deliveries of new aircraft will equal about 700 in 2003 and grow to about 1,100 by 2010. After that, deliveries of the Joint Strike Fighter will begin to replace a significant portion of the tactical fighter force.

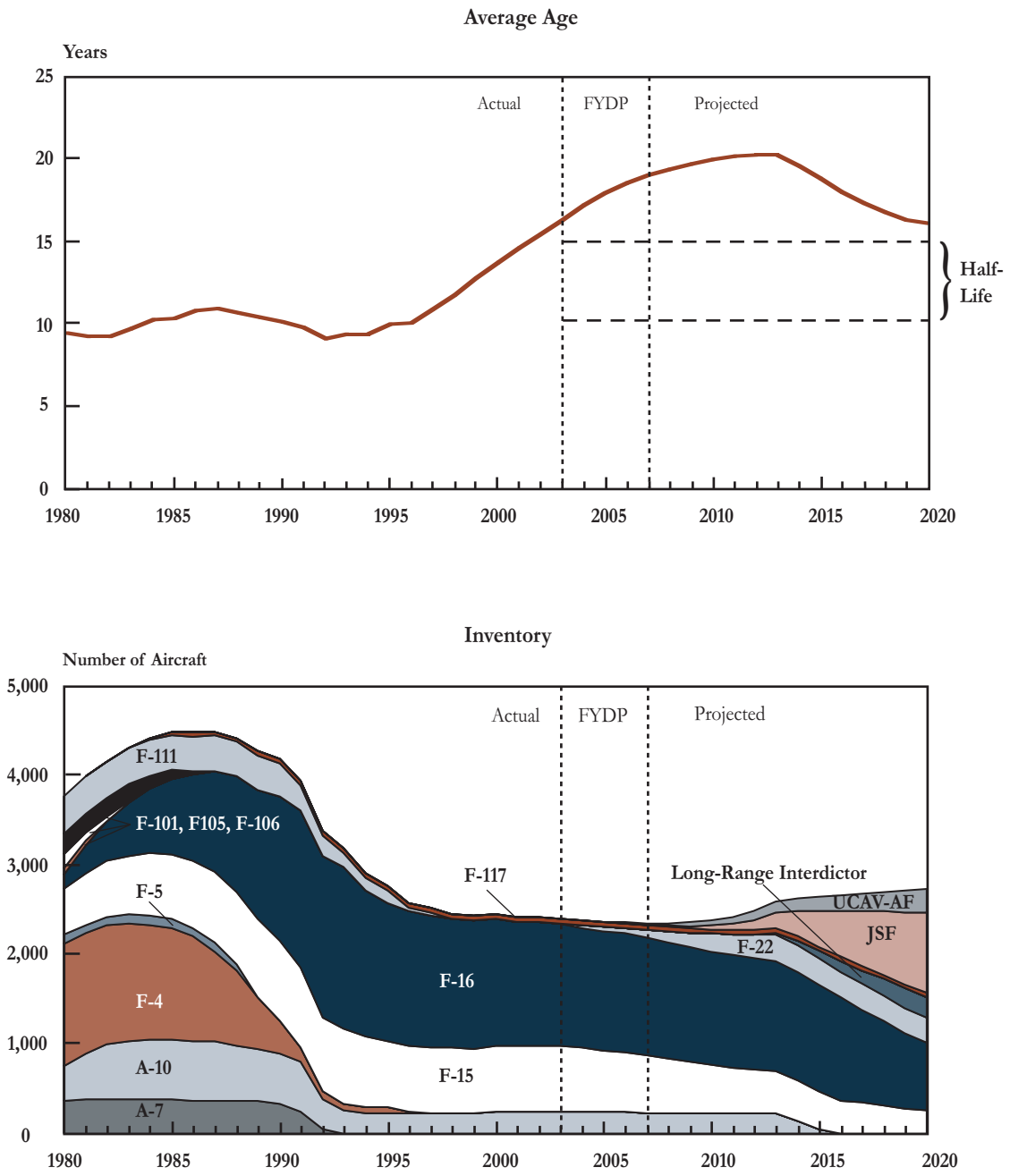
Another way of looking at how well the Air Force's planned purchases support planned fleets is to consider trends in average fleet age. Air Force fighters are much older today, on average, than they have been in the past *(see Figure 3-21)*. Their ages are also significantly higher than the ages that the Air Force considered acceptable in previous years. (During the Cold War, aircraft were typically slated for retirement when they reached 20 years old.)

In the aftermath of the Cold War, Air Force fighter inventories dropped from more than 4,000 aircraft in the mid- to late 1980s to about 2,400 by the mid- to late 1990s. During that contraction, the Air Force was able to reduce fighter purchases to low levels without causing fleets to grow older because it could retire older planes. But once inventory reductions were completed, average age began to increase, reaching 14 years by 2000. Under current plans, the average age of fighter aircraft will continue to grow through the early 2010s—reaching an average age of more than 20 years by 2013. After that, the aging trend will begin to reverse as JSFs are delivered in quantity. However, the average age of fighter and attack aircraft will remain above the desired level of half their service life through 2020, CBO projects.

13. Assuming service lives of 20 to 30 years for fighter and attack aircraft, the Air Force would need to buy about 80 to 120 aircraft a year—at an annual cost of about $5 billion to slightly more than $7 billion—to support planned force levels indefinitely.

Figure 3-21.

Age and Inventory of Air Force Fighter and Attack Aircraft



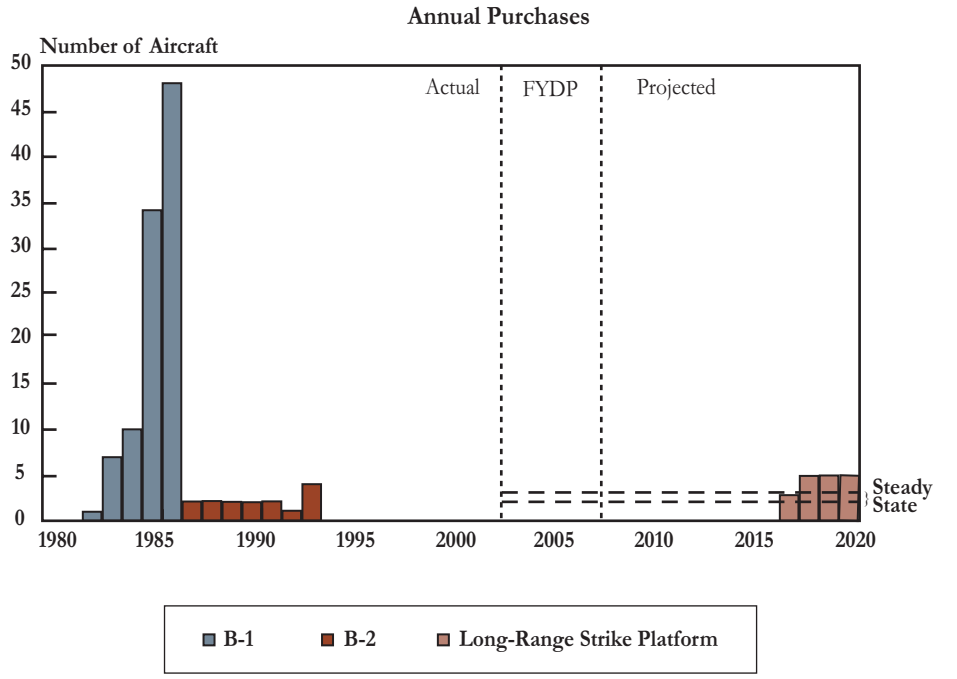
Source: Congressional Budget Office using data from the Department of Defense.

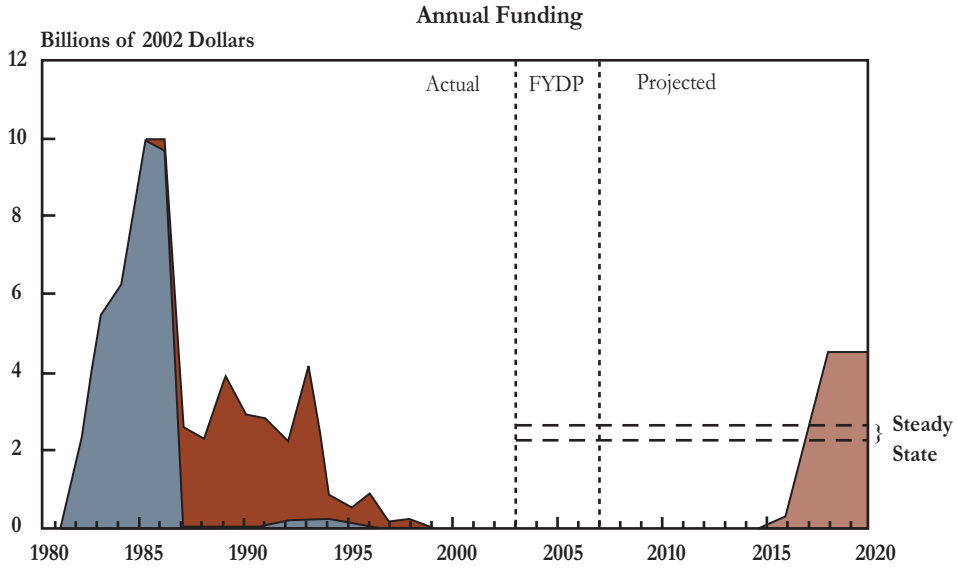
Notes: FYDP = Future Years Defense Program; JSF = Joint Strike Fighter; UCAV = unmanned combat air vehicle.

CBO assumed that the Air Force's Long-Range Interdictor would be a version of the F-22.

Figure 3-22.

Procurement of Air Force Bombers





Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Air Force Bombers

Strategic bombers—whose primary mission during the Cold War was carrying nuclear payloads but which have been used frequently in recent conflicts to conduct conventional strike missions—add little to funding requirements in CBO's projection. The Air Force has not purchased a bomber since 1993, and the modest number it may buy in the future will not enter procurement until the second half of the next decade *(see Figure 3-22)*. On the one hand, that long hiatus between purchases will lead to a relatively old bomber fleet. On the other hand, as the long-lived B-52 demonstrates, bombers can be operated for many years if enough funding is provided for maintenance and upgrades.

After the Cold War, the Air Force's fleet of strategic bombers was cut by an even greater percentage than its fleet of tactical fighters. From an inventory of about 400 planes in the early and late 1980s, the fleet has fallen to less than 200 planes *(see Figure 3-23)*. That decline resulted from the retirement of the Air Force's intermediate-range FB-111s, many of its long-range B-52s, and a number of B-1s that had been assigned to the Air National Guard.

After remaining steady for almost two decades, the average age of Air Force bombers is on the rise. In the 1980s, their average age was about 20 years—largely because of the age of the B-52s, which the Reagan Administration was describing as old even then.[14] The delivery of new B-2s and the retirement of those older bombers reduced the fleet and kept its average age from growing.

14. See Secretary of Defense Caspar W. Weinberger, *Annual Report to the President and the Congress, Fiscal Year 1983*, p. I-40.

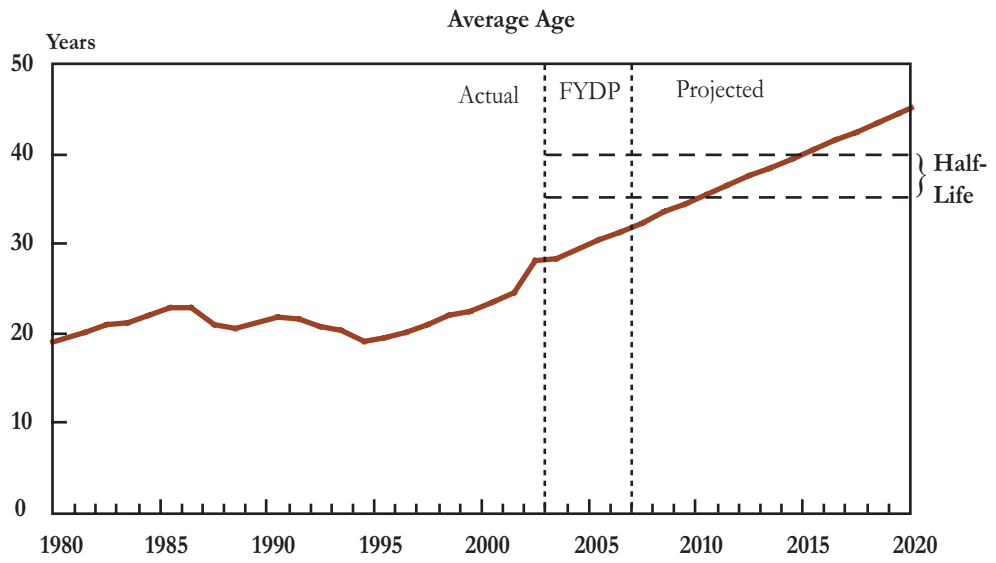
However, when no aircraft are retired and none are delivered, the fleet grows a year older, on average, each year. CBO is projecting neither deliveries nor retirements of Air Force bombers until at least 2017, when CBO assumes that an aircraft to replace the Air Force's strategic bombers would begin deliveries. As a result, the fleet will grow steadily older and reach an average age of more than 45 years by 2020 *(see Figure 3-23)*.

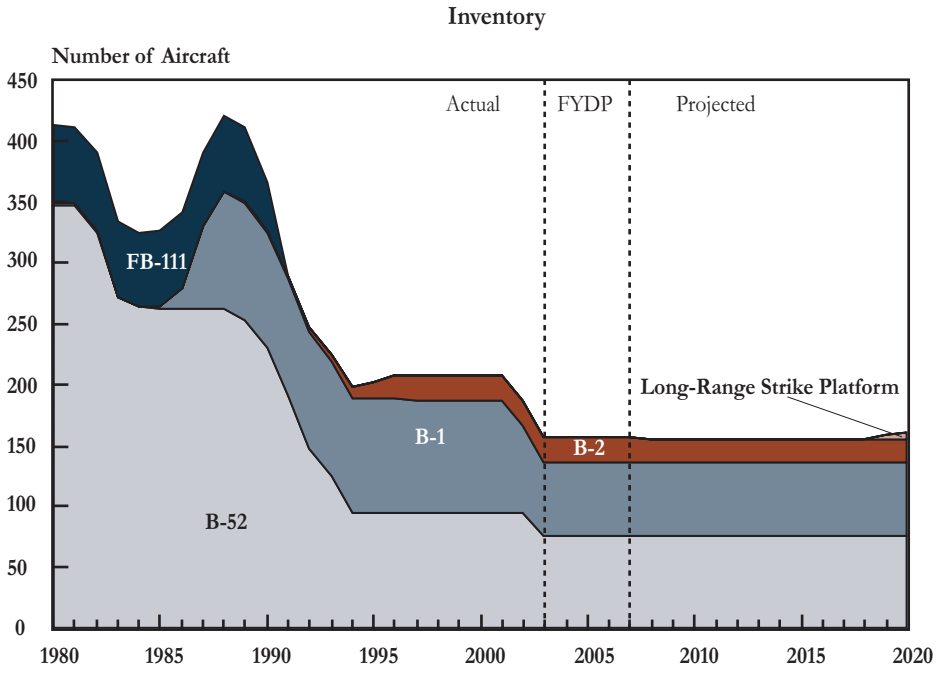
Even those out-year bomber purchases are speculative. The 2003 FYDP includes funds for the Air Force to investigate new long-range strike capabilities. Statements by Administration officials and Air Force leaders call for a new system capable of attacking targets distant from U.S. bases.[15] CBO assumes that this effort will eventually become a major program, with a development schedule similar to that of the B-2 bomber. If that program started over the next few years and followed the B-2's schedule, purchases of a new long-range strike platform might begin in 2017. But the Administration has not announced any specifics about the schedule of any replacement plans for bombers. There is also uncertainty about what the long-range strike platform could be. The Administration is currently studying several concepts—including a standard endo-atmospheric manned bomber, a space plane, and an unmanned aerial vehicle—to provide long-range strike capabilities.

15. See John A. Tirpak, "Heavyweight Contender," *Air Force Magazine* (July 2002), p. 34. That article suggests that the Administration and the Air Force may be calling for the long-range strike program to produce an aircraft that can "deploy from U.S. bases, proceed directly to its targets, and recover at a forward location to quickly rearm and refuel for another mission." The goal of attacking targets directly would most likely require an aircraft with ranges comparable to those of today's strategic bombers.

Figure 3-23.

Age and Inventory of Air Force Bombers



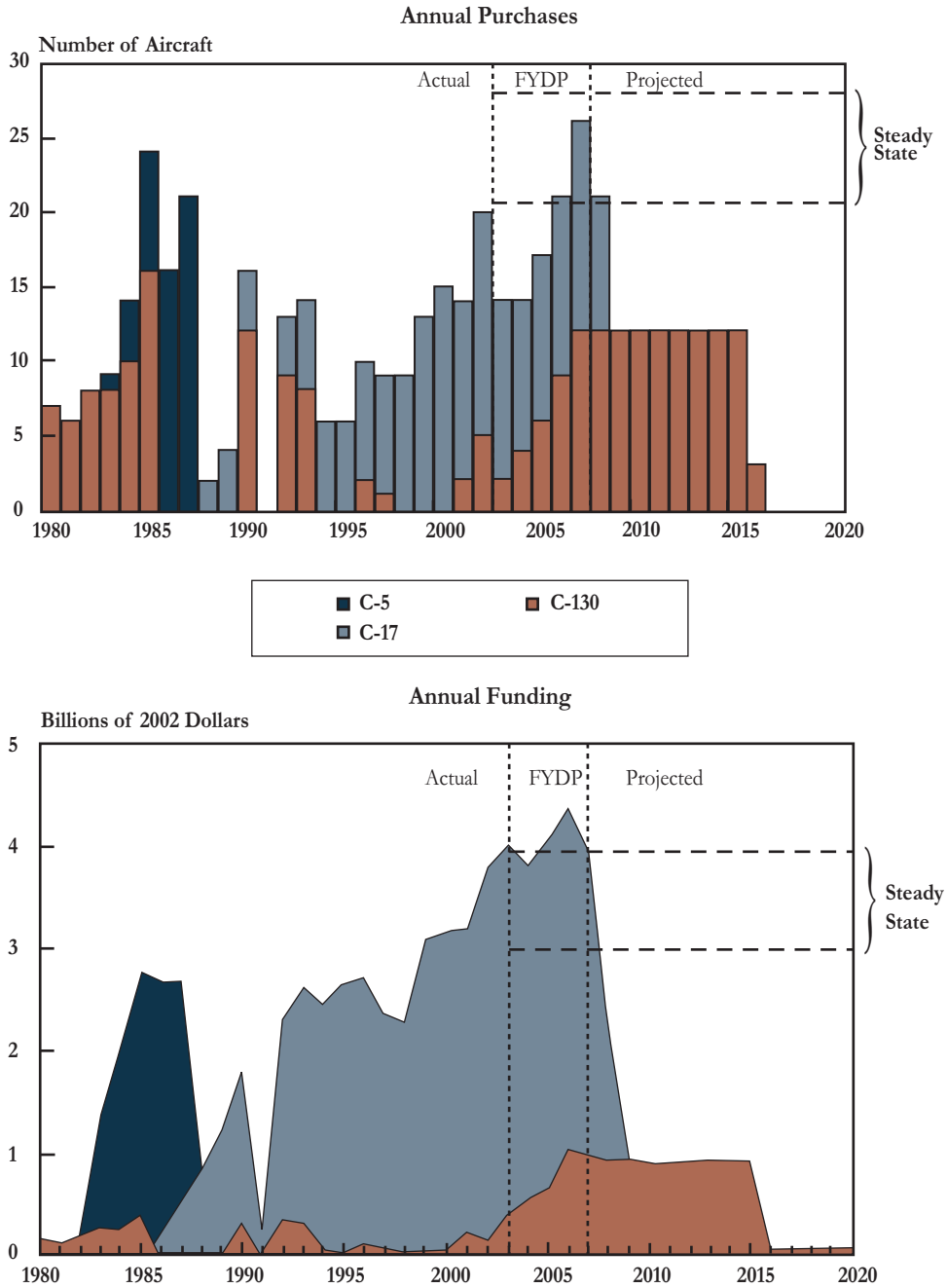


Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Figure 3-24.

Procurement of Air Force Airlifters



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

Many aircraft that make up the bulk of the airlift fleet, C-141s and many C-130s, were purchased before 1980.

Air Force Airlifters

Requirements for airlift aircraft have remained fairly constant in the post-Cold War era. During that period, the two airlifters that the Air Force bought in quantity were the C-17 and the C-130 *(see Figure 3-24)*. The C-17 replaced the C-141 in performing intertheater airlift missions (carrying troops and equipment from the continental United States to overseas theaters of operations or between theaters around the world).[16] The Air Force has bought 124 C-17s through 2003 and expects to purchase 56 more over the 2004-2008 period. The C-130, for its part, performs a variety of missions for the services, including intratheater airlift (transporting items from one base to another within a theater).[17] The Air Force bought (or made major modifications to) several versions of the C-130 during the 1990s. It expects to buy more C130s over the next decade.

The fact that the airlift fleet declined by only 11 percent (100 planes) after the end of the Cold War while other fleets shrank more dramatically demonstrates the priority that defense officials have accorded to the airlift mission. The airlift fleet has aged over the past two decades: from an average age of about 15 years in 1980 to 23 years today *(see Figure 3-25)*. That age is above the airlifters' half-life, assuming that the planes can be expected to last between 30 and 45 years.[18] The average age is expected to dip over the next five years as large numbers of older C-141s are retired and both the C-17 and C-130 are delivered. After that, the average age of airlifters is projected to rise to 29 years by 2020—nearly 40 percent above the top of the half-life range—primarily because of the aging of the C-130 fleet.

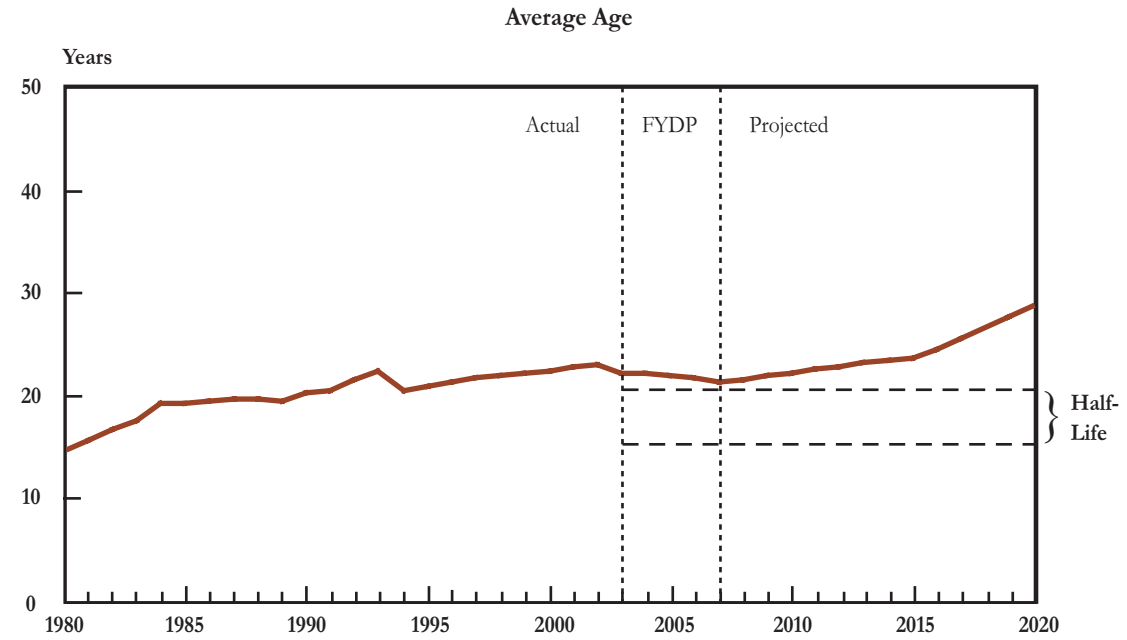
16. C-17s also have a short take-off and landing capability that could make them more useful in transporting materials within a theater than the older C-5 (the Air Force's largest airlifter) or the C-141.

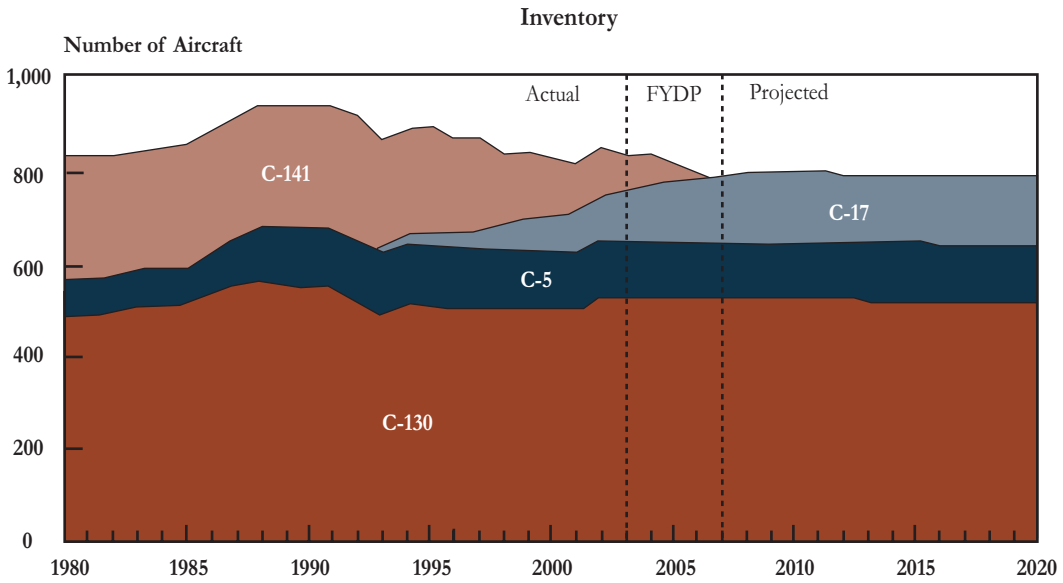
17. The Air Force also uses variants of the C-130 as search-and-rescue aircraft, gun ships, planes for special-operations forces, and for a variety of other specialized tasks. The Marine Corps also employs C-130s.

18. CBO used projections of service lives developed by the military services when they were available. Rather than assuming that a modification sets a plane's age clock to zero, the Air Force typically assigns longer service lives to planes that receive life-extending modifications, which might include strengthening a plane's structure, updating its avionics, or equipping it with a new engine. A number of Air Force aircraft, including tankers and airlifters, have received such modifications.

Figure 3-25.

Age and Inventory of Air Force Airlifters



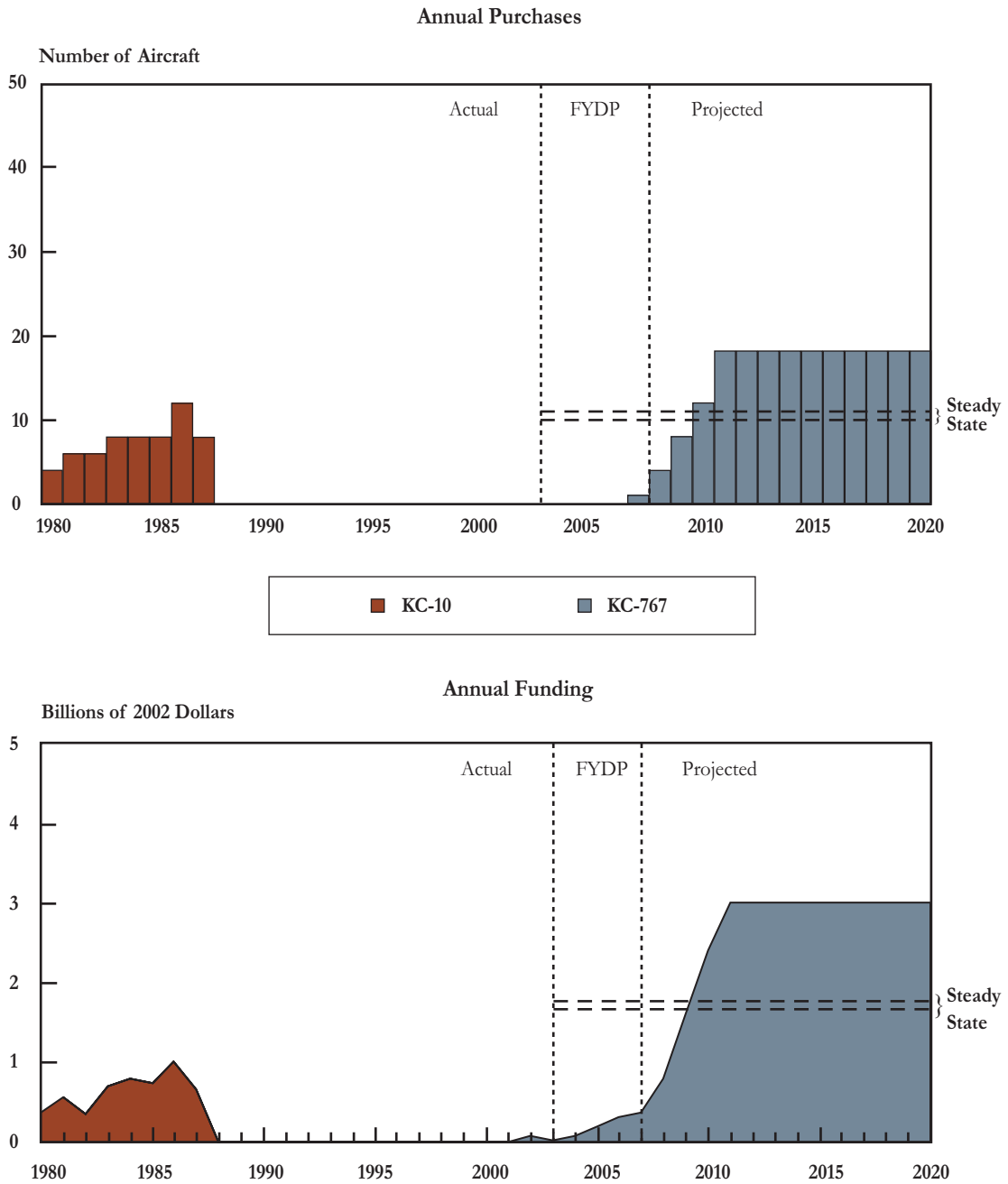


Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Figure 3-26.

Procurement of Air Force Tankers



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program.

The KC-135s that make up the bulk of the Air Force's tanker fleet were purchased before 1980.

Air Force Tankers

The Air Force has acquired no new tanker aircraft since the mid-1980s *(see Figure 3-26)*. The current tanker fleet consists of more than 500 KC-135s, augmented by about 60 KC-10s *(see Figure 3-27)*. The KC-135 fleet was delivered to the Air Force in the 1950s and 1960s. But the Air Force has refurbished portions of that fleet several times since it originally purchased the planes. The most recent program replaced engines and repaired airframe corrosion. The Air Force expects those refurbished planes, the KC-135Rs, to last 50 or more years. But the tanker fleet includes more than 100 older KC-135E models that had only minor refurbishment and engine upgrades performed and may not last as long as the R models. Air Force leaders have been considering tanker replacement options for KC-135Cs as well as for the rest of the tanker fleet.

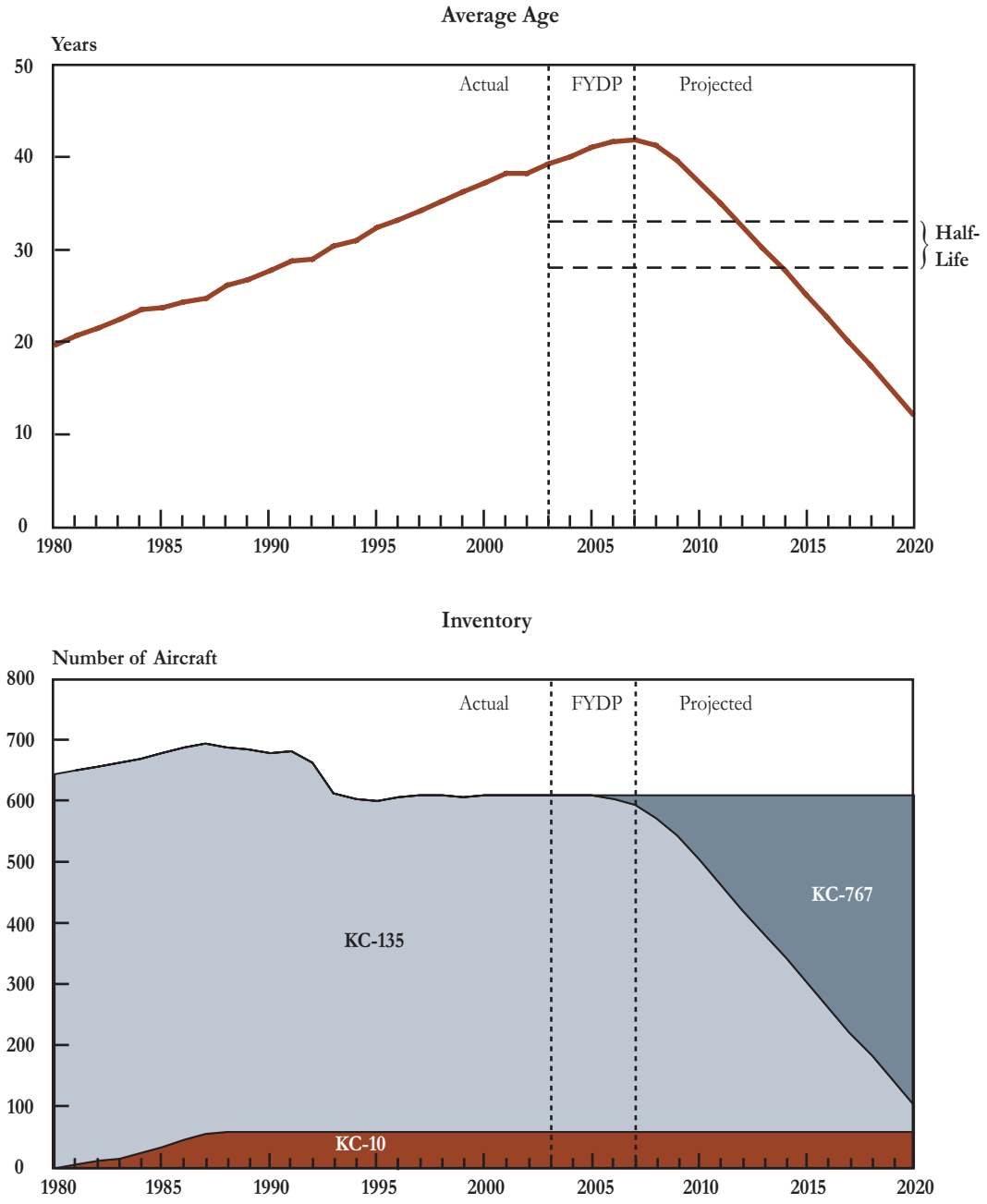
The Air Force is exploring an option to replace the KC-135E with a modified Boeing 767 commercial aircraft. The 2002 Defense Appropriations Act authorized a pilot program to lease up to 100 commercial aircraft and modify them for tanker service, and the Defense Appropriations Act for Fiscal Year 2003 includes $3 million to establish a system program office for the KC-767 program. Although it would be more costly in the long run, the Air Force would prefer to lease the aircraft rather than use standard procurement methods to acquire them outright, because leasing allows the Air Force to avoid a large, upfront commitment of budget authority.

DoD and the Office of Management and Budget are still evaluating the merits of leasing and the details of the lease agreement between Boeing and the Air Force. Thus, CBO assumed in its analysis that the Air Force would purchase the aircraft outright—which is consistent with plans incorporated in the 2003 FYDP—starting in 2007 and would buy up to 18 KC-767s annually. CBO also assumed that the Air Force would eventually acquire 500 aircraft to replace almost all of the KC-135 models. At a cost of about $150 million per plane, that program would increase the service's investment needs by roughly $2.7 billion annually.

The average age of the tanker fleet has been growing since 1980, because annual purchases of the KC-10s were not sufficient to offset the aging of 600 KC-135s. CBO projects that if deliveries of new tankers begin in 2008, the average age of the fleet would begin to decline and reach about 12 years by 2020. That age now averages in the high 30s—more than half of the plane's service life if it lasted the 60 or more years now projected for the KC-135Rs.

Figure 3-27.

Age and Inventory of Air Force Tankers



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Air Force Space-Related and Other Programs

In addition to the major programs discussed above, the Air Force budget contains investment funding for space-related programs and various other major activities.[19] Under the current FYDP, investment in that part of the Air Force budget would grow by 33 percent over the next five years, reaching $22 billion in 2007. CBO projects that carrying out current plans for the programs in this combined category would require annual funding to rise by another 15 percent by 2011, to a peak of about $26 billion. That growth would result from the procurement of transformation-related programs begun by the Administration in 2003 as well as the continuation of programs inherited from the previous Administration. After 2011, investment funding for space-related and other activities could decline to about $19 billion per year, provided no additional initiatives were funded.

The Bush Administration has attached special importance to space programs, which it views as a key element in its efforts to transform the military. CBO projected in detail essentially all of the Air Force's major space booster programs and satellite programs that are unclassified. For example, the service is responsible for developing and launching the majority of DoD's communication satellites. Programs now in the development phase include the advanced extremely high frequency satellite system and the advanced wideband system, which will provide special-purpose communications for all four military services. CBO's projection assumes that those and the other communication satellites now being developed are launched on the schedules that DoD currently envisions.

The planned lifetime of a communication satellite is typically seven to 10 years, so in some cases replacement satellites will need to be launched or be in development before the end of CBO's projection period. DoD has not yet defined in detail its plans for the successors to the communication satellites now being developed.[20] In the absence of detailed information, CBO assumes that the schedules and costs to develop and procure successor satellites will be similar to those of their predecessors.

CBO's projection also includes development and procurement of the space-based infrared system in high-Earth orbit (which will detect launches of ballistic missiles worldwide) as well as procurement of the space-based infrared system in low-Earth orbit (which is designed to provide global capability to track ballistic missile warheads in flight).[21] Again, CBO's projection assumes that successor programs will have similar costs. Other space-related elements in CBO's projection include:

- Development and launch of the national polar-orbiting environmental satellite sensing (NPOESS) system, a constellation of weather satellites being developed in cooperation with the Department of Commerce;[22]

- Continuation of the currently planned global positioning system satellite program;

- Development and launch of a constellation of space-based radar satellites to identify and track moving targets on the ground worldwide;[23] and

- Development and procurement of a space maneuver vehicle and a common aerospace vehicle, which are intended to allow the military to attack targets worldwide on very short notice.[24]

19. CBO included Air Force funding for the National Foreign Intelligence Program in this combined category. CBO assumes that funding for the classified activities that make up that program will stay at the 2007 level through 2020.

20. The 2003 FYDP includes funding for a transformational satellite communications program that could use a variety of methods, including lasers, to provide high-capacity communications.

For some time, DoD has also been pursuing a low-cost family of expendable space boosters for launching satellite systems (such as those discussed above) into orbit. The Air Force is developing the evolved expendable launch vehicle, which is planned as the successor to all booster rockets now used by DoD. CBO's projection incorporates the schedules, funding, and planned launches outlined in the program's December 2001 Selected Acquisition Report.

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21. Consistent with the 2003 FYDP, CBO includes only procurement funding for that system in its Air Force projection. Development funding is included in CBO's projection for defense agencies.

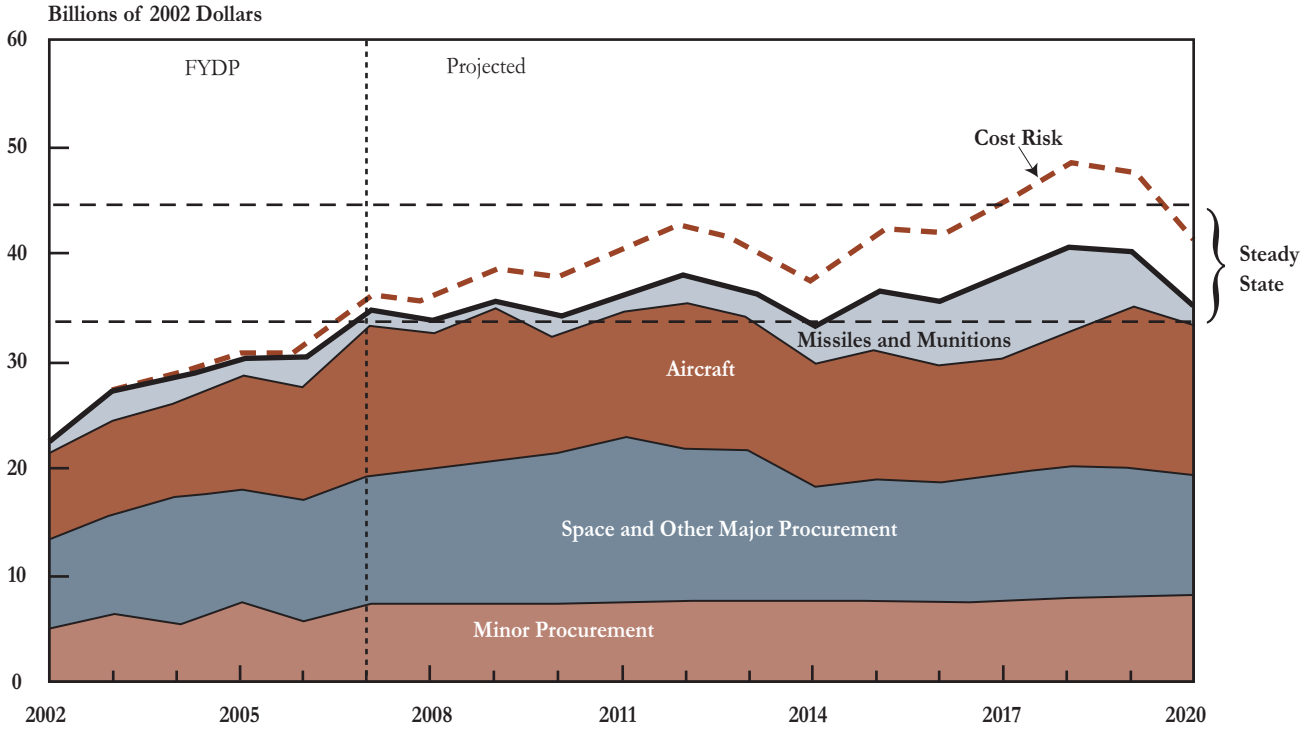
22. The Department of Commerce also budgets money for NPOESS. CBO's projection includes only the resources that DoD allocates to the program.

23. The 2003 FYDP contains funding to begin development of that program as a part of the Administration's emphasis on transformation. CBO's projection assumes that this nascent effort continues through production and deployment of an operational system.

24. The 2003 FYDP contains resources to start developing those programs as a part of the Administration's emphasis on transformation. CBO's projection assumes that those programs continue through production and deployment of operational systems.

Figure 3-28.

Projected Air Force Procurement Funding Versus Steady-State Costs



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program.

Total Air Force Procurement

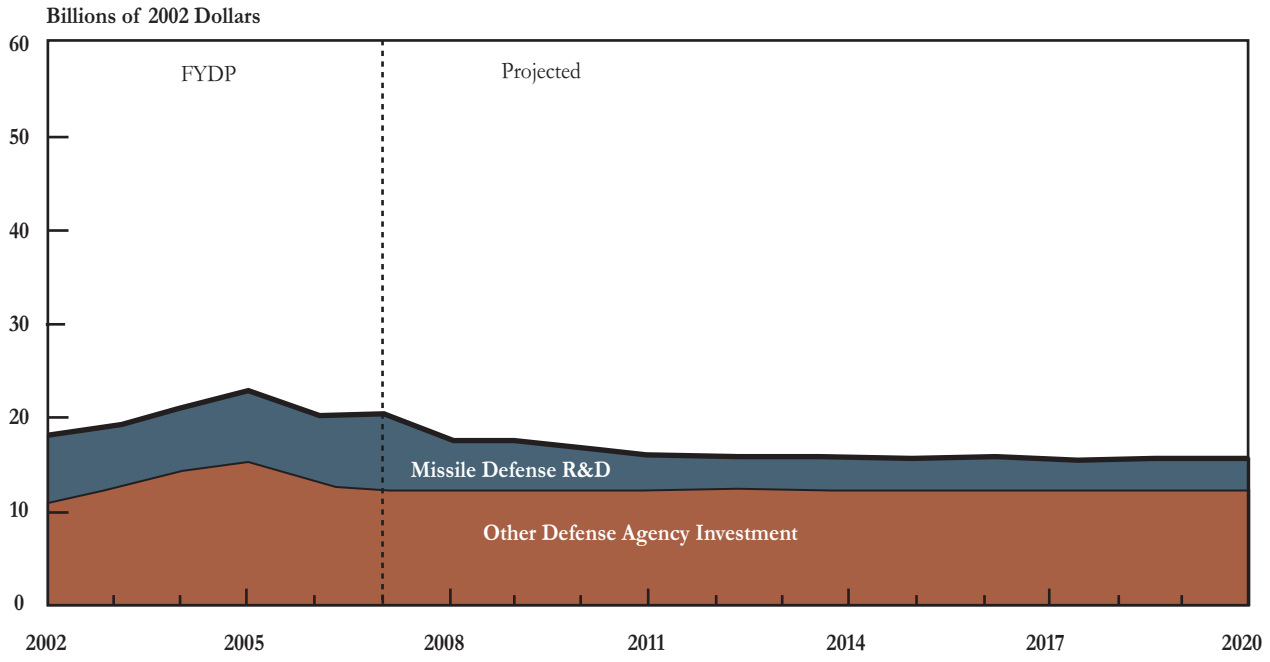
If the Administration's plans for Air Force procurement were carried out, the service would buy enough weapons to sustain most inventories at about current levels through 2020. However, the average age of bombers and intratheater airlift fleets would exceed desired levels. And despite procurement of more than 1,600 tactical fighters, the average age of that fleet in 2020 (16 years) would exceed its desired half-life by one year.

The Air Force would have to spend an average of $34 billion to $45 billion per year on purchasing equipment to sustain currently planned forces indefinitely. (That steady-state range depends on how long systems are assumed to last and how much they are expected to cost.) In CBO's projection, the Air Force procurement funding needed to carry out current plans averages $36 billion a year from 2008 to 2020, which is about equal to steady-state funding if systems last as long and cost only as much as DoD estimates *(see Figure 3-28)*. If costs exceeded current estimates, the spending needed to execute current plans would average about $42 billion per year. Provided those cost increases were paid for, most purchases would still be at steady-state levels.

However, Air Force procurement spending would have to grow by 50 percent to 100 percent from today's level to pay for those purchases. Moreover, in the Air Force's case, steady-state purchases would not be enough to correct aging problems quickly, because procurement of fighters, bombers, and tankers was so far below steady-state levels in the 1990s.

Figure 3-29.

Projected Investment Spending for Defense Agencies



Source: Congressional Budget Office using data from the Department of Defense.

Note: FYDP = Future Years Defense Program; R&D = research and development.

Defense Agencies and Missile Defenses

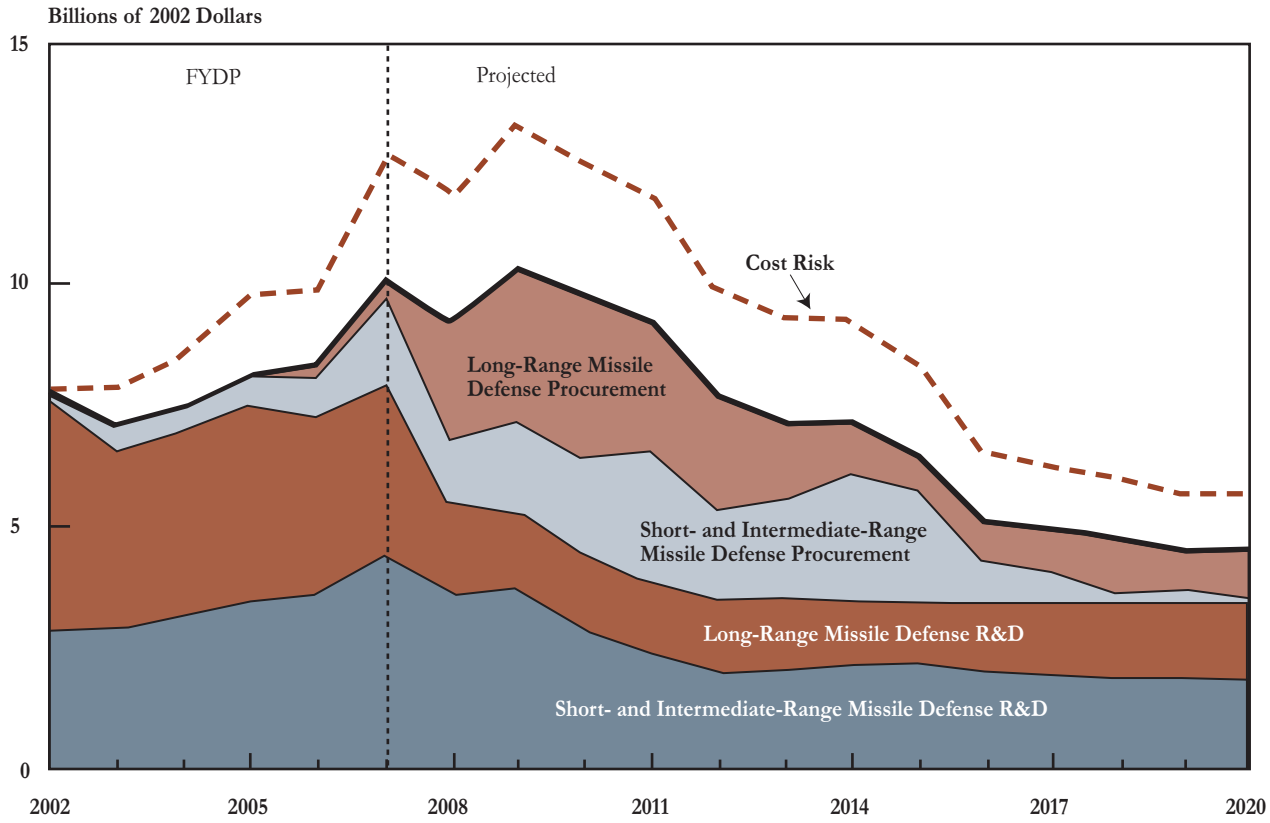
In addition to funding for the Departments of the Army, Navy, and Air Force, the DoD budget provides money for a variety of specialized agencies that deal with matters such as missile defenses, research projects, special operations, and information systems. The 2003 FYDP anticipates that investment funding for defense agencies will total $19 billion to $23 billion a year during the 2003-2007 period *(see Figure 3-29)*. Those funds pay for a wide array of activities:

- Research on missile defenses, which averages about $7 billion a year over the 2003-2007 period;[25]
- Basic and applied research by the Defense Advanced Research Projects Agency, which averages about $3 billion a year from 2003 to 2007;
- Research, development, and procurement of equipment for the U.S. Special Operations Command, which averages just over $1 billion a year from 2003 to 2007; and

25. According to the Bush Administration, research and development of missile defenses will be budgeted under the Missile Defense Agency. Once a program progresses to the procurement phase, funds will be budgeted under the military service that will be responsible for operating that system. CBO's projection followed that policy.

Figure 3-30.

Projected Investment Spending for Missile Defenses



Source: Congressional Budget Office using data from the Department of Defense.

Notes: FYDP = Future Years Defense Program; R&D = research and development.

The Department of Defense plans to fund research and development of missile defense programs in the budget of the Missile Defense Agency (see Figure 3-29). Once those programs make the transition to procurement, they will be funded in the budgets of the services that will operate them. The service-wide procurement charts shown earlier in this chapter (Figures 3-8, 3-18, and 3-28) incorporate those funds.

- The investment-related activities of the other defense agencies, including the Defense Threat Reduction Agency (which monitors and verifies arms control treaties and examines the effects of nuclear weapons), the Defense Information Systems Agency (which provides communications and information technology services), the Joint Chiefs of Staff (which produce studies and develop models), and the Office of the Secretary of Defense (which produces studies, develops a variety of different kinds of models, and administers certain research activities, such as the high-performance computing program).

CBO's projection of defense-agency investment assumes that all investment activities other than those associated with missile defenses will continue to be funded through 2020 at their 2007 levels (a total of about $12 billion a year). The rest of this section discusses in detail CBO's projection of investment spending for missile defenses.

Current Plans for Missile Defenses

CBO based its long-term projection for missile defenses on the Bush Administration's recent policy statements as well as on the progress that has been made so far on individual programs being pursued by the Missile Defense Agency *(see Figure 3-30)*. The Administration has stated that through 2007, its missile defense program will focus on researching, developing, and testing a broad range of technologies and potential systems. On the basis of those efforts' results, decisions will eventually be made about which systems should proceed to procurement and operational deployment. Despite that emphasis on research and testing, however, the Secretary of Defense has stated that the purpose of the Missile Defense Agency is not only to develop but also to deploy an integrated set of layered missile defenses—that is, missile defenses operating from land, ships, aircraft, and in space.

Recently, a panel of the Defense Science Board reportedly recommended that DoD focus its missile defense efforts in the next few years on deploying a system with two layers. One layer would consist of long-range, land-based interceptor missiles; the second would consist of shorter-range, ship-based interceptors.[26] Long-range defenses can intercept ballistic missiles and warheads flying between continents. Short-range and intermediate-range defenses can intercept missiles flying trajectories of a few hundred to several thousand kilometers. CBO's projection assumes that the panel's recommendation is carried out.

Long-Range, Land-Based System. DoD has begun building a missile defense test bed that will include placing a small number of interceptor missiles and building a radar in Alaska, as well as making upgrades to existing facilities. CBO assumes that after 2007, DoD would expand that effort to include deployment of 250 ground-based interceptor missiles at two sites: Fort Greely, Alaska, and Grand Forks, North Dakota. That long-range, ground-based system, which would be operated by the Army, would also include nine X-band radars, six upgraded early-warning radars, and three communications facilities at various sites. Accounting for activities contained in the 2003 FYDP, CBO estimates that deployment of that system could be completed sometime in 2013 or 2014, at a total investment cost of about $25 billion.

CBO also assumes that DoD would deploy a 27-satellite constellation of space-based infrared sensors in low-Earth orbit (known as SBIRS-low) to support the ground-based system. Those satellites would provide the capability to track ballistic missile warheads at long range and to discriminate warheads from potential decoys. That information would enable ground-based interceptors to be guided to their intended targets. Consistent with the plans reflected in the 2003 FYDP, CBO projects that the full SBIRS-low constellation would be in orbit by 2015.[27]

Shorter-Range, Ship-Based System. For the second layer of the two-layer approach, CBO's projection assumes deployment of an intermediate-range, sea-based missile defense system. That system would consist of new interceptor missiles using exo-atmospheric kill vehicles (the payload that separates from the missile, senses a target, and guides itself to collide with that target before it enters the atmosphere). The Navy has tested a precursor to those missiles, consisting of a lightweight exo-atmospheric projectile mounted on a standard missile. CBO assumes that those new interceptors would be deployed after 2010 on the Navy's air-defense-capable cruisers and destroyers, at a total investment cost of about $17 billion.

26. Bradley Graham, "Missile Defense Choices Sought: Panel Urges Focus on Two Approaches," *Washington Post*, September 3, 2002, p. A1.

27. CBO used information in its January 2002 letter to Senator Thomas Daschle on "Estimated Costs and Technical Characteristics of Selected National Missile Defense Systems" as the basis for estimating the costs and schedule to deploy a two-site, ground-based missile defense system, including a 27-satellite SBIRS-low constellation.

Other Missile Defense Programs. For several years, the Air Force has been developing a missile defense system based on airborne lasers. That system is planned to consist of high-energy chemical lasers mounted within Boeing 747 aircraft. Consistent with the plans in the 2003 FYDP, CBO's projection assumes that the Air Force will build six full-power lasers and install them on 747s and that a test aircraft now being built and equipped with a low-power laser will be retrofitted after 2007 with a full-power laser.[28] Thus, CBO's projection includes the resources needed to develop and deploy an airborne-laser missile defense system with seven aircraft.

CBO's projection also includes DoD's currently planned purchases of the Patriot Advanced Capability-3 short-range missile defense system, as well as continued development and eventual procurement of the intermediate-range Theater High Altitude Area Defense system. Both of those would be mobile ground-based systems that the Army would procure and operate.

Besides the ground-, air-, and sea-based defenses described above, the Bush Administration is pursuing several other concepts, including space-based and sea-based boost-phase defenses. (Boost-phase defenses attempt to destroy a ballistic missile while it is still in powered flight—that is, before it can deploy its warheads on ballistic trajectories toward their intended targets.) Those concepts are still in the preliminary stages of development. CBO assumes that research on them will continue through 2020 at the levels funded in 2007 but that no procurement or deployment of those concepts will occur during the projection period.

CBO's Long-Term Projection for Missile Defenses

CBO's projection of missile defense investment includes both the research and development funding tallied in the projection of total defense agency investment and the procurement funding tallied under the investment projections for the various services described earlier in this chapter *(see Figure 3-30)*. In CBO's projection, the research and development spending needed to carry out current plans for missile defenses declines steadily after 2007 as the ground-, sea-, and air-based systems that are assumed to be deployed move from development to procurement. Total investment in missile defenses peaks in 2009 at about $10 billion and then decreases as systems finish procurement and become operational. CBO assumes that all of the deployments in its projection would be complete by about 2016. After that, DoD would spend about $5 billion a year for minor, evolutionary upgrades to operational systems, CBO projects, as well as for continued research on such concepts as space-based defenses.

If costs grow as they have historically, however, pursuing the programs in CBO's missile defense projection would cost an additional $3 billion a year, on average, peaking at about $13 billion in 2009. That estimate of cost growth is based on applying the results of the RAND study discussed earlier in this chapter to all missile defense programs that have not entered the production phase (in other words, all of the programs in CBO's missile defense projection except the Patriot).

28. Funds to fabricate and test the low-power laser are included in CBO's projection of defense agency investment. Funds to procure the six operational full-power airborne lasers and to retrofit the test aircraft with a full-power laser are included in CBO's projection of Air Force investment.

Transformation

CBO's long-term projections of current defense plans assume that only the force and program changes that the Bush Administration has explicitly announced will take place. Those changes would result in a force structure very much like today's. Apart from canceling the Crusader self-propelled howitzer, the Administration has not significantly altered ongoing investment programs. However, the Administration has argued that it expects to transform DoD, shifting the composition of military forces from traditional approaches to new approaches.[29] Those new approaches are intended to incorporate advanced technologies that the Administration expects will improve combat capability for the same or lower cost and make U.S. forces better able to meet the challenges of 21st century warfare. To illustrate the effects that such changes might have on resource demands, CBO estimated steady-state procurement costs for two cases: one that reflects the force structure underlying CBO's long-term projections and another that features one example of a transformed force.

Current Forces

In its current-forces case, CBO assumes that today's forces will be maintained indefinitely unless the Administration has explicitly stated otherwise. In addition, the services are assumed to replace equipment on a one-for-one basis with the successor systems that are now planned. Those systems are generally similar to ones in the current force structure—for example, a manned fighter aircraft replaces a manned fighter aircraft.

29. In its Defense Planning Guidance for 2004 through 2009, the Administration initiated numerous studies, including assessments of potential changes to a variety of major weapons programs. Those studies are meant to inform decisions that will be made in developing the 2004 FYDP, which is due to be submitted to the Congress in February 2003. Thus, the possibility exists that significant changes to ongoing programs could be incorporated in the new defense plan.

CBO projected steady-state procurement funding first assuming that costs do not grow beyond DoD's current estimates and then again assuming that cost growth follows historical patterns, based on the RAND analysis *(see Table 3-2 on page 38)*. Likewise, it estimated steady-state procurement costs under two assumptions: if DoD operates systems for as long as it now intends, as well as if retirement ages are more in line with past experience. Combining those assumptions yields an estimate of total steady-state procurement costs that ranges from about $85 billion a year (assuming DoD's cost estimates and long service lives) to about $130 billion a year (assuming historical cost growth and shorter service lives).

Transformed Forces

In its hypothetical example of transformed forces, CBO assumes that the transformation initiatives just started by the Administration succeed and are embraced by the military services. For example, the Departments of the Army, Navy, and Air Force are assumed to use unmanned combat air vehicles instead of manned combat aircraft to perform ground-attack missions *(see Tables 3-3 through 3-5)*.

In terms of ships, CBO assumed that the Navy would transform both its fleet and the way it operates the ships that compose it. The transformed Navy cuts the number of cruisers and destroyers as well as the number of attack submarines. But the Navy would use two alternating crews on some of its surface combatants and base a total of seven attack submarines in Guam, enabling smaller fleets to perform the same number of peacetime missions that larger fleets perform today. CBO also assumes that the Navy would convert another four SSBNs to SSGNs (a configuration that carries cruise missiles and special-operations forces), for a total of eight SSGNs.

A transformed Air Force is assumed not only to replace current fighters with UCAVs but also to rely on unmanned systems for nearly all of the combat missions now performed by manned aircraft. Thus, CBO

Table 3-3.

Current and Transformed Forces for the Army

Type of Weapon	Currently Planned Inventory	Inventory in a Transformed Force	Difference
	Manned Helicopters		
Comanche (Scout/reconnaissance/ light attack)	1,200	0	-1,200
UH-60 (Light and medium utility)	1,400	1,680	280
	Unmanned Air Vehicles		
UCAV or UCRC (Reconnaissance/ light attack)	0	2,400	2,400

Source: Congressional Budget Office.

Notes: UCAV = unmanned combat air vehicle; UCRC = unmanned combat rotorcraft.

This table shows only the systems that differ between CBO's current-forces and transformed-forces cases. Any systems not shown here are assumed to be at currently planned levels.

assumes that reconnaissance aircraft such as the U-2 and RC-135 would be replaced by unmanned systems and that today's bombers would be replaced by unmanned long-range aircraft with a similar payload capacity.

In CBO's projection for transformed forces, steady-state procurement funding for the Army differs little from the steady-state costs associated with current plans *(see Table 3-6)*. The reason is that systems identified with transformation—to result from the Army's Future Combat System program—compose a fairly large portion of the Army's plans today. The major change that CBO made in postulating a transformation case for the Army was that UCAVs similar to current armed versions of the Predator UAV would replace the planned purchase of 1,200 Comanche helicopters. Since the weapons payload of those UCAVs might be about half that of Comanche, CBO assumed that the Army would need two UCAVs to replace the capability provided by each Comanche. CBO also assumed that the service life of those UCAVs would be roughly half that of Comanche. Thus, to sustain the force in steady state, the Army would need to buy about four times as many UCAVs per year as it had planned to buy of Comanche helicopters. However, CBO assumed that the cost of the Army's UCAV would be about one-quarter the cost of Comanche, using Predator as a basis. Consequently, transforming Army aviation by replacing manned attack helicopters with UCAVs would produce no significant savings in steady-state procurement costs relative to current plans.

Table 3-4.

Current and Transformed Forces for the Navy and Marine Corps

Type of Weapon	Currently Planned Inventory	Inventory in a Transformed Force	Difference
	Ships		
DDG-51			
Single-crewed	61	33	-28
Dual-crewed	0	17	17
CG-47	27	0	-27
CG-X(Dual-crewed)	0	15	15
DD-X	16	0	-16
Corvettes	56	60	4
Littoral Support Craft	0	5	5
SSBN	14	10	-4
SSN			
CONUS-based	55	34	-21
Guam-based	0	7	7
SSN Converted to SSGN	4	8	4
	Aircraft		
Fighter and Attack	1,175	341	-834
Electronic Warfare	134	0	-134
Combat Support	124	129	5
Carrier Early Warning	75	0	-75
Maritime Patrol	232	0	-232
Trainers	407	118	-289
Attack Helicopters	194	0	-194
Antisubmarine Warfare Helicopters	252	0	-252
Heavy-Lift Helicopters	205	0	-205
UCAV-N	152	1,156	1,004
UCRC	0	678	678

Source: Congressional Budget Office.

Notes: SSBN = nuclear-powered ballistic missile submarine; SSN = nuclear-powered attack submarine; CONUS = continental United States; SSGN = nuclear-powered guided-missile submarine; UCAV-N = unmanned combat air vehicle designed for Navy aircraft carrier operations; UCRC = unmanned combat rotorcraft.

This table shows only the systems that differ between CBO's current-forces and transformed-forces cases. Any systems not shown here are assumed to be at currently planned levels.

Table 3-5.

Current and Transformed Forces for the Air Force

Type of Weapon	Currently Planned Inventory	Inventory in a Transformed Force	Difference
	Manned Aircraft		
Bombers	175	0	-175
Multirole/Close Air Support	1,380	0	-1,380
Reconnaissance/Battle Management/ Command, Control, Communications, and Intelligence	97	0	-97
Trainers	1,200	687	-513
	Unmanned Air Vehicles		
HAEUAV	50	147	97
UCAV	257	1,841	1,584
Bomber UCAV	0	175	175

Source: Congressional Budget Office.

Notes: HAEUAV = high-altitude endurance unmanned aerial vehicle, a potential replacement for existing manned reconnaissance aircraft; UCAV = unmanned combat air vehicle.

This table shows only the systems that differ between CBO's current-forces and transformed-forces cases. Any systems not shown here are assumed to be at currently planned levels.

The example of transformation that CBO chose assumes that many of the transformation initiatives now being undertaken by the Bush Administration ultimately succeed and are fully embraced by the military services. In that event, DoD might be able to reduce its annual procurement needs below the level associated with current plans if it can ultimately change those plans significantly. For the particular example of transformation examined by CBO, procurement savings could equal 10 percent to 15 percent relative to the annual steady-state costs of current plans. Specifically, if forces were transformed as CBO has assumed, steady-state procurement funding would range from $76 billion for a low-cost, long-service-life fleet to $114 billion a year—a savings of $9 billion to $16 billion from the steady-state procurement costs associated with current plans *(see Table 3-6)*.

Of course, those estimates hinge on the detailed assumptions that CBO made about the composition

Table 3-6.

Steady-State Procurement Costs for Current and Transformed Forces

(In billions of 2002 dollars of total obligational authority)

	Using DoD's Cost Estimates		Assuming Historical Cost Growth	
	Short Service Lives	Long Service Lives	Short Service Lives	Long Service Lives
Current Forces				
Navy	42	31	49	36
Air Force	40	33	44	36
Army	27	18	35	23
Defense Agencies	2	2	2	2
Total	111	85	130	99
Transformed Forces				
Navy	33	24	36	27
Air Force	35	30	40	31
Army	29	19	36	24
Defense Agencies	2	2	2	2
Total	98	76	114	84
Cost or Savings (-) from Transformation				
Navy	-9	-6	-13	-10
Air Force	-5	-3	-4	-6
Army	1	1	1	1
Defense Agencies	0	0	0	0
Total	-13	-9	-16	-14

Source: Congressional Budget Office.

Notes: In the long-service-lives assumption, the Department of Defense keeps weapons as long as it currently projects, which is generally longer than it has in the past. In the short-service-lives assumption, the Department of Defense operates systems only as long as it has previously.

For details of the difference in weapon systems between current and transformed forces, see Tables 3-3 through 3-5.

of transformed forces. Larger or smaller savings might result depending on how transformation ultimately plays out. Although CBO's transformed forces are radically different in composition from today's forces, CBO did constrain cuts in capabilities, preserving, for example, payloads comparable to its current-forces case. If, for example, transformation enabled DoD to substantially reduce the payloads its weapons can deliver, greater savings than CBO projects might be possible. Conversely, savings could be much less or costs could increase if—as happened in the past—the currently hoped-for cost goals of new systems cannot be met. Such goals are generally very optimistic relative to historical experience with cost growth in DoD systems, as the example of the Global Hawk UAV indicates.[30]

And if changes to purchases did result in procurement savings like those shown in Table 3-6, they could take some time to materialize. Savings depend on developing and fielding new systems. DoD could take at least 10 years to develop those new systems and perhaps that amount of time or more to fully replace fleets of their predecessors. Thus, transformation of any force is unlikely to be fully realized by the 2020 endpoint of CBO's projection.

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30. CBO has not analyzed the potential savings in operation and support costs that transformation might yield. Those savings could be substantial, particularly if transformation enabled DoD to reduce forces and personnel.