

CBO TESTIMONY

Statement of
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before the
Subcommittee on Military Acquisition
and the
Subcommittee on Research and Technology
Committee on Armed Services
U.S. House of Representatives

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NOTICE

This statement is not available for public release until it is delivered at 10:00 a.m. (EDT), Wednesday, April 28, 1993.



CONGRESSIONAL BUDGET OFFICE
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I appreciate the opportunity to testify today regarding the capability and long-term costs of tactical aircraft in the Air Force and the Navy. The Clinton Administration will not submit its long-term plan for tactical aircraft and other defense forces until later this year or early next year. Nevertheless, the Administration's 1994 budget request earmarks \$4 billion for developing four tactical aircraft, which are the focus of this testimony. The issue is whether funds will be available when these planes are ready to be procured in the late 1990s and beyond.

Last year, the Congressional Budget Office (CBO) concluded that, given the plans of the Bush Administration, the four aircraft programs would be affordable only under optimistic assumptions about unit costs and the size of future budgets. Press reports suggest, however, that the services--and particularly the Navy--are considering sharp reductions in forces and modernization programs. These changes would make the four aircraft programs affordable under more plausible assumptions.

It is too soon to conclude, however, that problems of affordability are a thing of the past. Difficulties may remain depending on final decisions about aircraft programs and other forces, particularly those of the Navy. Budget cuts beyond those proposed by the Clinton Administration, even if made later this decade, would also darken the outlook for affordability.

KEY MISSIONS AND TYPES OF AIRCRAFT

My testimony today focuses on the fighter and attack portion of the tactical aircraft fleet. Over the next two decades, the Air Force and the Navy may buy four new or modified aircraft to modernize the U.S. fleet--the F-22, the F/A-18E/F, the A/FX, and the MRF. Those planes would perform two key missions:

- o Fighter missions--engaging enemy planes in the air; and
- o Attack missions--attacking targets on the ground. The mission of attacking ground targets at relatively long distances is termed medium attack.

F-22 Fighter Aircraft

The first of the four planes the Department of Defense (DoD) may buy is the Air Force's new F-22 fighter. The F-22 would replace the Air Force's current top-of-the-line fighter, the F-15 (see Table 1). F-22s are designed to have "stealthy" characteristics--that is, to be much less visible than current aircraft to radar and other detectors. They would also fly at high speed without

TABLE 1. NEW AND MODIFIED AIRCRAFT

New Aircraft	Mission	Older Aircraft That the New Plane Will Replace	When New Plane Enters Production Under Base Case
F-22	Fighter	F-15	1997
F/A-18E/F	Multirole	Earlier models of the F/A-18, interim replace- ment for the A-6 and some F-14s	1997
A/FX	Medium Attack	A-6, F-15E, F-111	2007
MRF	Multirole	F-16	2010

SOURCE: Congressional Budget Office.

using an afterburner and would offer other improvements. According to current Air Force estimates, each will cost more than \$80 million in today's dollars, making them a high-price item, particularly in a time of shrinking budgets.

F/A-18 E/F Multirole Aircraft

The F/A-18E/F is a significantly modified version of the Navy's F/A-18 aircraft, a plane that can carry out both the fighter and attack missions. Compared with the current model of the F/A-18, the E/F will be able to fly farther, have higher thrust engines, and be better able to survive in combat.

The new version of the F/A-18 is likely to become a mainstay of the Navy's fleet, providing a replacement for the A-6 aircraft until the A/FX comes on line. It may also supersede some older F/A-18 models, as well as some portion of the F-14 fleet. According to Navy procurement estimates, the E/F version could cost almost \$60 million apiece, an increase of about 40 percent compared with the cost of the current F/A-18.

A/FX Medium-Attack Aircraft

The A/FX is an attack aircraft that is expected to have stealthy characteristics and to be capable of carrying large numbers of a variety of weapons over relatively long distances. Although primarily a medium-attack aircraft, the A/FX may also have some capability as a fighter. Last year, the Navy estimated that each A/FX would cost about \$115 million. The Navy has revised these numbers and now estimates that the A/FX will cost about \$90 million each.

Multirole Fighter

Two years ago, the Air Force announced plans to develop a new multirole fighter (MRF). According to the Air Force, no definite plans are available for this plane, which might not be deployed until 2012. At that time, the MRF will replace today's F-16 aircraft and will provide both attack and fighter capability. The Air Force is currently debating whether the plane should be an entirely new aircraft or a variation of an existing plane. According to statements last year, the Air Force hopes to hold down the cost of the MRF to no more than \$35 million apiece, which argues for altering the

existing plane, though the timing of this program is likely to make that difficult.

BASE-CASE ASSUMPTIONS ABOUT MODERNIZATION AND FORCE SIZE

The Clinton Administration's detailed plans for tactical aircraft and other defense forces will not be available until later this year or early next year. In the meantime, the Congress must begin to act on the 1994 defense budget request. That request includes about \$4 billion in funding to develop the four new or modified aircraft described above, two of which may not enter production for more than 10 years. To assess the long-term affordability of these planes, CBO made base-case assumptions about the size of future forces and plans for modernization. Where possible, the assumptions represent statements by the services about their possible plans.

So far, neither DoD nor the services have indicated that they will terminate any of the four programs. Indeed, the 1994 budget provides funding for developing all four, though funding for the most speculative of the programs--the MRF--is quite modest. In its base case, therefore, CBO assumes that the services will eventually buy them all.

The base case also assumes that the planes are purchased at rates similar to those planned last year. For example, procurement rates reach as high as 48 aircraft per year for the F-22, 72 for the F/A-18 E/F, and 18 for the A/FX (see Table A-1 in Appendix A for details).

In contrast to last year's plan, the base case does assume significant delays in some programs. For example, the A/FX aircraft would enter production later (2007 compared with 2001 in last year's plan) as would the MRF aircraft (2010 compared with 2002). Table 1 and Table A-1 show CBO's assumptions about timing.

This testimony focuses on procurement costs, but numbers of units are relevant in assessing both capability and the ability of procurement plans in the base case to meet numerical requirements for aircraft. Although no specifics have been proposed, the new Administration has stated that it will reduce the overall size of the U.S. military below the level proposed by the Bush Administration.

Under the base case, therefore, CBO assumes that the Air Force maintains only 21 wings of tactical aircraft compared with the 26 wings envisioned by the Bush Administration. A reduction below the Bush Administration's plan is consistent with service proposals in the 1994 budget

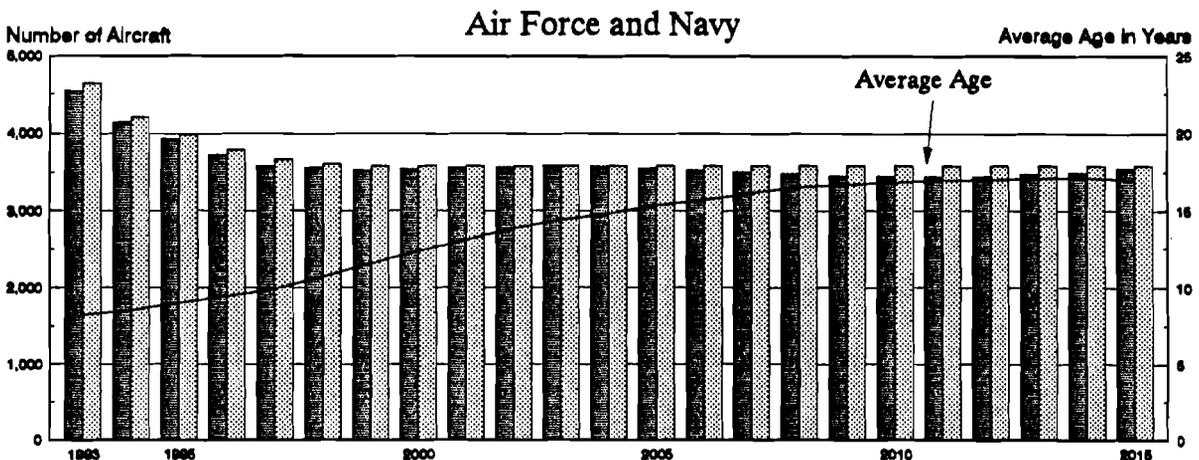
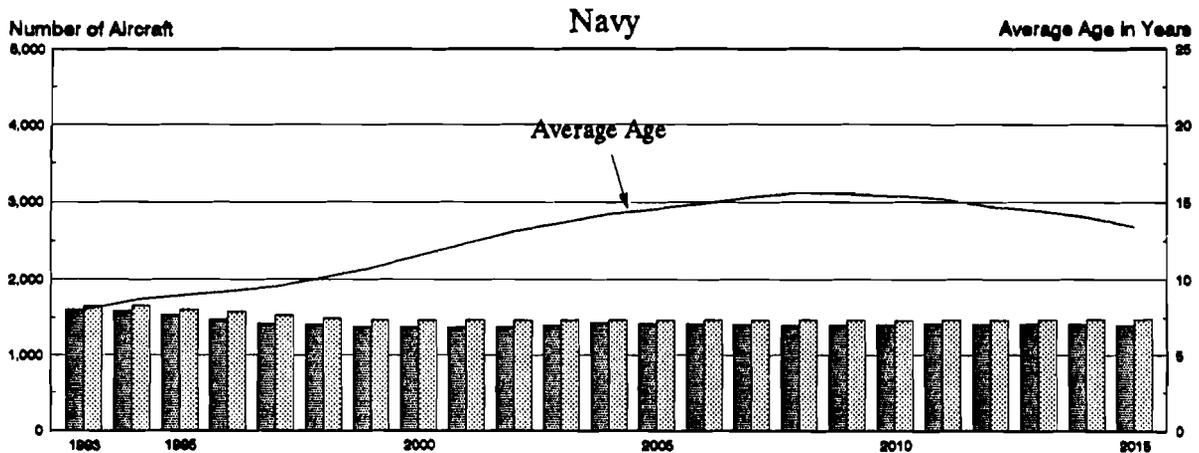
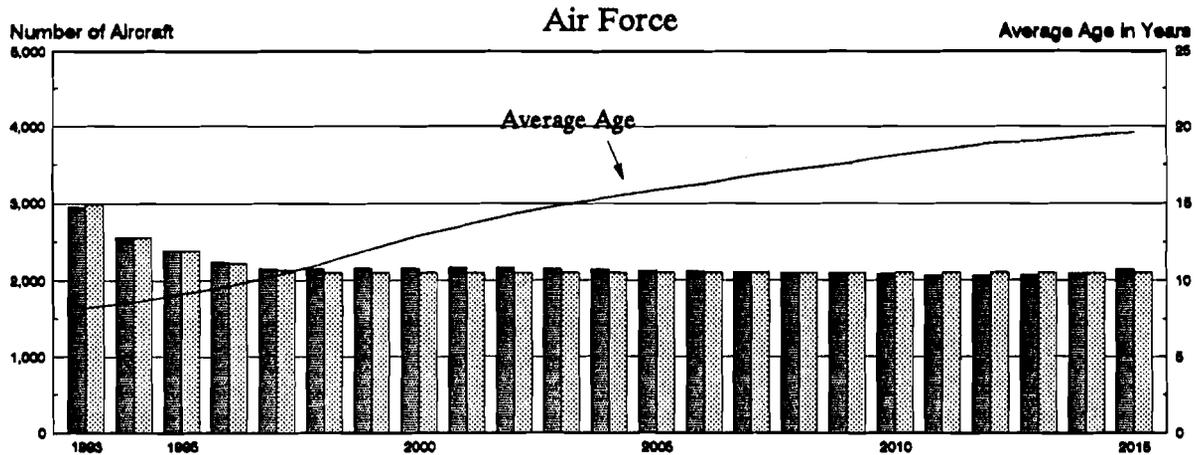
request, which reduced the number of wings below the Bush level. Air wings in the Department of the Navy, which were not reduced in the 1994 request, are assumed to remain at 13, the same level planned by the Bush Administration. To be consistent with possible Navy plans, however, CBO does assume that the number of aircraft in each Navy wing will be reduced. (Tables A-2 and A-3 in Appendix A provide more detailed assumptions about the numbers and composition of forces.)

MEETING NUMERICAL REQUIREMENTS

Under these base-case assumptions, the Air Force and Navy can meet or exceed their numerical needs for aircraft if they are willing to keep aircraft in their fleets for many more years than in the past. CBO bases this conclusion on projections of requirements and inventories through 2015, a period long enough to reflect the effects of the planned purchases of the four aircraft (see Figure 1).

These projections are based on several assumptions about when planes are retired (see Appendix B for a discussion of assumptions about planned service lives and rates of use; Table A-4 contains the assumptions). If the

Figure 1. Inventory, Requirements, and Average Age Under Base Case



Inventory



Requirements

SOURCE: Congressional Budget Office projections based on Department of Defense, Air Force, and Navy data.

number of aircraft of a particular mission area exceeds requirements, then planes are assumed to be retired before their engineering service lives expire. But if retiring aircraft at the end of their service lives would leave a particular mission area short of its required aircraft, then planes are assumed to be kept in service longer. Shortfalls occur only when no planes are being bought for a particular mission area and peacetime accidents reduce inventories below requirements.

The Air Force fleet of fighter and attack aircraft would get much older in terms of chronological age based on these assumptions. The modest deliveries of new aircraft result in an average age that more than doubles, from about 9 years in 1994 to almost 20 in 2015, despite scheduling early retirement for large numbers of surplus aircraft.

Although chronological age may be useful as a measure of technological obsolescence, flight hours are a better gauge of wear and tear. By that measure, the Air Force is in pretty good shape through the end of the 1990s. During the first half of the decade, however, the Air Force would need to retain about 5 percent of its aircraft beyond their planned service lives measured in terms of flight hours. Percentages retained would rise rapidly

toward the end of the period of analysis; by 2015, about 23 percent of Air Force planes would exceed their service lives (see Figure A-1 in Appendix A).

The Navy would experience major problems sooner under the plan in the base case. Navy inventories just meet or fall slightly below requirements. In terms of chronological age, the Navy's fleet would actually age more modestly than that of the Air Force, reaching an average of more than 15 years in 2010, compared with about 9 years today. The age of the Navy's fleet would then decline; by 2015, it would average only about 13 years. However, by the start of the next decade, about 12 percent of the Navy's aircraft would exceed their planned service lives when measured by flight hours. That figure rises to almost 50 percent by 2010, though it declines to almost a third by 2015 as A/FXs and F/A-18s enter the fleet simultaneously.

Older Fleets Pose Problems

Are aging fleets a problem? The average ages in Figure 1 suggest that aircraft would be retained in the inventories well into their twenties and thirties under the base case. In the past, both the Air Force and Navy have expressed concerns about holding aircraft that long. They argue that accumulated stresses on wings and other parts might limit the utility of the

aircraft, maintenance costs might rise, and older planes might not be sufficiently capable in the face of enemy threats.

These ages are also outside the range of historical experience. Indeed, average ages under the base case are higher than the services have experienced during the entire history of tactical aviation using jet aircraft.

Older Fleets May Be Acceptable

However, older fleets may now be more acceptable for a number of reasons. After the breakup of the Soviet Union, other countries are unlikely to develop aircraft that have capability significantly better than today's U.S. planes.

Maintenance problems, which are more closely linked to the number of hours flown than to chronological age, might be avoided if reduced threats to U.S. security permit the services to fly their aircraft for fewer hours each year. For example, reducing annual flying hours for the Navy's fleet by one-third would reduce the number of aircraft that would need to be retained beyond normal retirement age to only about 13 percent of the fleet in 2015, compared with 30 percent at standard operating levels.

Unfortunately, reducing operating levels would shorten the time pilots have to practice, despite the advantages for aircraft inventories. Moreover, reducing pilots' training would also reduce their skills and might lower morale. Yet such reductions might be tolerable if there is sufficient warning time before a major war, and thus time to train, or if simulators can be used to reduce training needs.

The Air Force, which has many more planes than it needs in the near term, might also be able to store some of the excess planes and bring them out later when inventories are tight. Of course, storage expenses could add to operating costs. The changes might, however, make an older fleet acceptable and thus reduce procurement costs.

Finally, if the services attempt to hold down the age of their fleets, they will fall short of their requirements. For example, the Air Force could fall short of its aircraft requirements by about 25 percent in 2015 if it retires aircraft when they reach their planned service lives (see Figure A-2 in Appendix A). The Navy would have an even bigger problem. It might meet only two-thirds of its requirements in 2015 if it retired aircraft at the end of their planned service lives. Plus the Navy would begin experiencing large shortages around the middle of the next decade.

CAPABILITY OF TACTICAL AIRCRAFT

Even as forces get older and smaller, the capability of U.S. tactical aircraft is likely to be overwhelmingly superior to that of some selected regional powers for some time. For example, by the year 2000, U.S. forces would have been reduced to the levels assumed in the base-case plan. Even so, U.S. tactical aircraft would still have about 5 times the capability of the current Chinese forces, more than 20 times the capability of the forces of North Korea and post-war Iraq, and almost 60 times Cuban forces (see Figure A-3 in Appendix A).

U.S. tactical aircraft are also superior, though by much smaller margins, to the forces of the Russian Republic. U.S. forces exceed the capability of the Russian Republic's by about 80 percent. These estimates assume that Russia has all the forces it is allowed under the limits of the Conventional Forces in Europe (CFE) Treaty now in effect. The estimates do not lower the capability of Russian forces to account for any damage done to them now, despite press reports indicating that Russia may not be paying to maintain many of its weapons stocks. Thus, from the U.S. perspective, these estimates represent a worst-case assessment.

The comparisons are based on a scoring method (called the TASCFORM method) that was developed for the Department of Defense by The Analytic Sciences Corporation. The method takes into account both the quantity and quality of weapons. U.S. scores reflect contributions of both Air Force and Navy aircraft but do not assume any contributions from allies. The version of the TASCFORM method used in this testimony does not address important factors that could affect the outcome of a war, including training and logistics support. All such scoring methods ignore specific wartime scenarios, tactics, terrain, and luck. Some of these factors, particularly training, could add to the U.S. advantage.

The overwhelming superiority U.S. forces enjoy does not necessarily mean that the forces in the base-case plan would be too large or too modern. The United States may want overwhelming superiority in order to minimize casualties in a future war. It may also want the capability to fight in one major regional contingency, such as an Operation Desert Storm, while maintaining a reserve of forces to deter war or to fight in other regions.

Moreover, the comparisons in this testimony are based on the current capability of selected regional powers. If those nations modernize their tactical air forces by buying foreign-made planes, this country may need to respond with a modernization plan of its own to maintain its superiority.

The comparisons do suggest, however, that the United States possesses a substantial margin of superiority in tactical air capability. If it chooses, the country can take time to assess carefully its plan for modernizing tactical air forces.

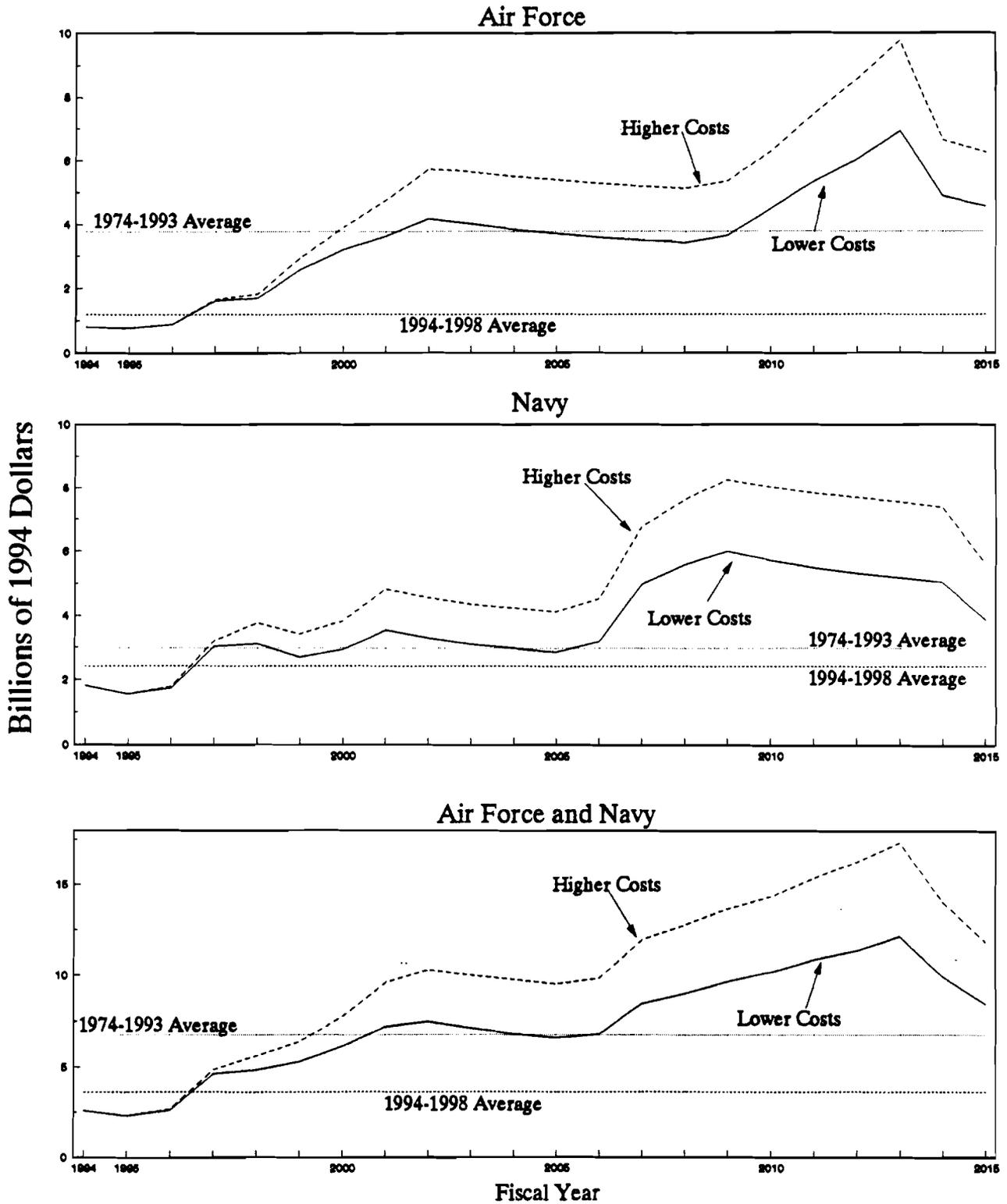
HOW AFFORDABLE IS THE PLAN?

The affordability of the procurement costs associated with the illustrative plan is one factor that must enter that assessment.

Sharp Increases in Procurement Funding

To assess affordability, CBO made two estimates of the procurement funding required to purchase the aircraft in the base-case plan. The lower estimate generally relies on the service's projections of the unit cost of new aircraft (see Table A-5 in Appendix A). Under this lower estimate, the Air Force and Navy together would require procurement budgets for tactical aircraft averaging \$8.6 billion a year during the 2000-2015 period, the years of CBO's projections (see Figure 2). Average required funding would be about four

Figure 2. Projected Procurement Funding for Fighter and Attack Aircraft Compared with Historical Levels



SOURCE: Congressional Budget Office projections based on Department of Defense, Air Force, and Navy data.

times the approved funding for 1993. (All costs in this testimony are in constant 1994 dollars and include only the cost for purchasing major aircraft.)

At the end of the next decade, procurement funding could balloon to as much as about \$12 billion a year under the lower estimate. This bulge in funding reflects plans to buy all four of these expensive aircraft (F/A-18 E/F, F-22, A/FX, and MRF) at the same time.

Moreover, procurement funding could be substantially higher than that under the lower estimate. In the past, unit costs of aircraft have risen from one generation to the next. For example, the first model of the F-15, the A/B model, cost three times more than its predecessor, the F-4. Applying this ratio to the cost of the F-15 suggests the F-22 could grow in cost to \$115 million, about 40 percent higher than the Air Force estimate. The higher estimate of costs in this testimony anticipates growth in costs at roughly this rate (see Table A-5 in Appendix A). Growth of this magnitude is also roughly consistent with estimates of historical cost growth from design to production.

Under the higher estimate, procurement funding between 2000 and 2015 would average \$12.1 billion a year, almost six times the 1993 level.

Funding in this estimate could rise to more than \$17 billion a year toward the end of the period.

Required Funds Exceed Historical Shares

Would enough money be available to procure these aircraft? The answer is no, if the total defense budget remains at planned levels and aircraft procurement receives its long-term share of that budget.

This analysis assumes that, through 2015, the total defense budget remains constant in real terms at the level now planned by the new Administration for 1998. It also assumes that procurement of tactical aircraft receives the same average share of the total budget as it received between 1974 and 1993. Available funds would then equal \$6.7 billion a year between 2000 and 2015. That amount would be \$1.9 billion a year short of the funding required under the lower estimate, and \$5.4 billion less than required funding under the higher estimate. Shortfalls would be larger in the Navy and smaller in the Air Force (see Figure 2).

Using budgetary shares may be a reasonable first step in assessing affordability. Under the base case, tactical aircraft would require high levels

of funding for a sustained period. Budgetary shares calculated over a long period should suggest the feasibility of such funding. Indeed, it may have been this type of analysis that led the Chairman of the Joint Chiefs of Staff to conclude, in his February 1993 report on roles and missions, that the "acquisition plan for major aviation programs would require more resources than might be available."

New Plans May Improve the Outlook for Affordability

The four aircraft programs would be affordable, however, if the share of funds devoted to the programs rose substantially above its average in the 1974-1993 period. For example, doubling that share would make enough funds available to finance all the base-case plans even under the higher estimate of costs in this testimony. Changes in defense plans now being considered may make such increases realistic, a departure from the situation just a year or so ago.

In December 1991, when CBO projected funding requirements for all the services, the share for tactical aircraft seemed unlikely to rise significantly. At that time, each of the services had long-term plans that, by the early part of the next decade, would have required increases in funding. Plans in 1991 also called for deploying an extensive system of missile defenses beginning

early in the next decade, a program funded outside the budgets of the services.

Defense plans may now be changing in significant ways. The Clinton Administration has indicated that it will scale back its deployment of missile defenses. Funding for that program was cut sharply in 1994 compared with the level proposed by the Bush Administration. Although CBO has not projected Army and Air Force funding requirements under likely plans, those services have also curtailed programs in ways that will reduce their budgetary needs.

Perhaps most important, press reports and service statements indicate that the Navy--which in 1991 had the largest requirement for funding increases among all the services--is considering substantial changes in its force and modernization plans. The Navy is contemplating a cut in its ship fleet of 27 percent, from 450 ships under the Bush Administration's plan of 1991 to about 330 ships. This cutback would delay the need to buy large numbers of expensive ships such as attack submarines and surface combatants until around 2010. In addition, the Navy has apparently canceled plans to modernize most of the other aircraft it operates, including P-3, S-3, E-2C, and EA-6B aircraft.

CBO is currently analyzing the effects of these changes on the long-term costs of the Navy. We will be releasing detailed results soon. Our analysis suggests that, if the Navy retains its planned share of the Clinton Administration's budget, substantial funds could be transferred from procurement of Navy ships and supporting aircraft to fighter and attack planes. In terms of funding, the year 2000 would mark the beginning of the "decade of tacair."

With these transfers, the Navy could finance the base-case plans for procuring its fighter and attack aircraft without a budget increase beyond the level expected in 1998. This finding holds through the middle of the next decade, even under the higher-cost case that assumes increases in the unit costs of ships and aircraft above planned levels. Since most of the growth in funding required to pay for the four planes in this testimony is for Navy aircraft, this result would make the whole package more affordable.

Problems of cost would also be eased if the overall defense budget grows in real terms above the Administration's planned level in 1998. It may be reasonable to assume some growth given the relatively long period of this assessment. CBO's long-term projections assume that U.S. gross domestic product (GDP) will grow by an average of 2 percent or so a year over long periods. If the defense budget maintains the share of GDP planned for 1998,

rather than experiencing the decline that would be associated with constant defense budgets, many problems of affordability would vanish or be eased.

Less Optimistic Assumptions Suggest Potential Problems

Unfortunately, it is too soon to conclude that affordability is a problem of the past.

Plans Remain Uncertain. The new defense plans that could ease concerns about affordability are still under discussion. Indeed, the Department of Defense is just beginning its "Bottom-Up Review" of military forces and weapon programs. The outcome of that review could be influenced by changes in security threats as well as a reluctance on the part of services to countenance large cuts in forces. If, for example, the Defense Department were to recommend maintaining naval forces near their current level, rather than sharply reducing the size of the fleet, concerns about affordability would remain. The Congress could also alter plans in ways that add to costs.

Changes in plans for weapon systems other than fighter and attack aircraft could also cause problems. For example, the Navy apparently plans not to replace many types of its supporting aircraft, at least not until after

2010. Some of those aircraft--for example, some P-3 and S-3 aircraft--could approach 40 or more years in age toward the end of the next decade. If the Navy decided that those venerable ages were not acceptable, and instituted expensive programs to replace or modernize the aircraft, funding problems would be more severe.

The Funding Bulge. Even without changes in plans that add to costs, CBO's analysis suggests that a bulge in defense funding needs might develop under the base case beyond 2005. By that time, all four aircraft in this testimony would be in procurement. Even if it reduces the size of its ship fleet, by then the Navy would need to begin buying substantial numbers of submarines and surface combatants, and needs for funds for the Army and Air Force could increase as well. The real levels of defense spending now planned for the late 1990s might not be adequate to fund all of these programs.

The year 2005 is, of course, a long way off. Between now and then, growth in GDP may allow more money to be devoted to defense. Further reductions in security threats may also permit the United States to maintain smaller forces than those now planned.

However, this funding bulge, though far in the future, is largely a result of the four aircraft programs that you will debate in 1994--programs that will

consume \$4 billion in 1994 development funds. It may therefore be reasonable to keep this bulge in mind, even though it would not occur for many years.

An Earlier Funding Bulge. Moreover, this funding bulge could arrive sooner if, for example, procurement of the A/FX started earlier. Under base-case plans, the A/FX aircraft would enter procurement in 2007. Measured from the beginning of development of the A-12 aircraft (the A/FX's canceled predecessor), the A/FX development period would span about 20 years, an unprecedented length for a fighter. A/FX procurement might be accelerated if the requirement for a stealthy, medium-attack aircraft were deemed critical. If so, earlier procurement could move up the funding bulge. For example, if the A/FX entered production in 2003 and production reached 18 aircraft per year by 2005, funding would increase by \$3 billion in 2005 under the higher-cost case.

The funding bulge would be larger still if the Navy decided to increase the planned purchases of F/A-18 E/F aircraft in order to offset aging in its forces. Expensive modification programs could also increase costs during the early part of the next decade. The Navy currently plans to modify and extend the life of the Marine Corps' short-range bomber, the AV-8B, at a potential unit cost of about \$35 million. (This figure represents the funding requested

in 1994, the first year of procurement for the modification program. As a result of increasing efficiencies related to learning during the production process, average costs of later models may be lower.) Funds for this modification program are not included in the costs of major aircraft procurement, but they might add to that funding.

Additional Budget Cuts. Problems of affordability could reappear quickly if the defense budget undergoes cuts beyond those already announced by the Clinton Administration. The fiscal program recommended by the new Administration would make a substantial contribution toward reducing the U.S. deficit, but it is not sufficient to solve the long-run deficit problem. An additional package of policy changes aimed at reducing the deficit would be necessary to eliminate the problem. Such a package might include a substantial additional cut in defense spending. Unless such a cut was fully accommodated by additional reductions in forces, the problems of affordability for tactical aircraft and other defense procurement programs could again become severe.

ALTERNATIVE APPROACHES TO MODERNIZING TACTICAL AIRCRAFT

If problems with affordability remain, the Congress might want to examine alternative strategies that reduce the cost of the aviation programs discussed in this testimony. Even if changes in overall defense plans make all four aircraft programs more affordable, the Administration and the Congress must be sure that all four are needed to meet U.S. security needs. CBO has not analyzed specific alternatives in detail, but the following approaches illustrate the range of choices.

Silver Bullet Strategy

Costs could be reduced by buying only a few of the more costly and sophisticated aircraft. In wartime, these aircraft would be used to attack the most important and heavily defended targets. The majority of the force would be equipped with less sophisticated, cheaper planes. DoD pursued this so-called "silver bullet" strategy when it purchased the stealthy F-117. The strategy is inefficient in terms of unit costs. Small purchases of the sophisticated aircraft usually result in low rates of annual procurement. Overhead is spread over fewer aircraft and the benefits from learning are dampened, raising unit costs.

A silver bullet strategy, however, would reduce total costs. It may also be appropriate if reduced threats to U.S. security require buying fewer highly modern aircraft than was previously planned. The silver bullet approach also preserves an industrial capability to design and produce sophisticated weapons, including aircraft with the new stealth technology.

The disadvantages of a silver bullet strategy in terms of unit costs might also be minimized if the strategy is selected during the planning phase. Rather than responding to unanticipated cuts in annual purchases, companies could tailor their production to the smaller quantities, minimizing (one hopes) the inefficiencies associated with low-rate production.

The Navy could carry out the silver bullet strategy by purchasing only a small number of the A/FX aircraft. To equip the remainder of the fleet with a relatively inexpensive plane, the Navy could terminate the E/F program and buy C/D versions of the F/A-18. The funds freed up by ending the E/F program might also allow the Navy to speed development of the A/FX, thereby benefiting earlier from the capability of a stealthy attack aircraft.

The Air Force could apply the silver bullet approach by buying a small number of F-22s. Indeed, unofficial reports suggest that the service may be

considering a reduction in the number of F-22s bought annually, and perhaps in total procurement as well. The silver bullet strategy would also require that the Air Force equip the remainder of the fleet with an inexpensive multirole fighter, one that does not cost much more than today's F-16.

Unfortunately, history is not reassuring on this issue. Over the last several decades, successive generations of aircraft have, without exception, been more expensive than their predecessors. Developing an inexpensive multirole fighter will therefore require an unprecedented effort on the part of the Air Force.

Cancel Programs

If the production inefficiencies associated with the silver bullet approach are of concern, one or more of the planned aircraft programs might simply be canceled. Canceling programs would allow the remaining aircraft to be bought at more efficient rates. In addition, some programs that were begun years ago may not be needed in today's world, one in which defense budgets and security threats have both declined.

Cancel the F-22. Some analysts have argued that the F-22 program, which was developed to counter the highly capable air forces of the former Soviet Union, should be canceled. According to critics, the added capabilities it provides are both unnecessary and too expensive for the sorts of regional conflicts the United States is likely to confront. Indeed, the analysis of capabilities I discussed earlier suggests that the capability of U.S. fighter forces will exceed those of other nations for many years to come. The results of that analysis are supported by the speed with which U.S. fighter forces prevailed over Iraq in the Persian Gulf War.

Critics of the F-22 fighter have also argued that aircraft that perform attack missions, such as the A/FX, would be more useful in future conflicts than fighters. Finally, even if F-22s end up costing only \$80 million each, which may be optimistic, the plane is likely to lead to "sticker shock" among many taxpayers.

The Air Force counters that advanced fighters are needed to secure the skies above enemy territory to make attack missions feasible. The current generation of U.S. fighters, which do not have the stealthy characteristics that would be a key part of the F-22 design, are vulnerable to attack by surface-to-air missiles (SAMs). SAMs, which are relatively inexpensive, can be bought by regional powers in large numbers and may become even more lethal in the

years to come. Since fighters must fly over enemy territory to engage enemy aircraft, more numerous and lethal SAMs place fighters at risk unless they are stealthy.

The Air Force also believes that a number of other countries may procure aircraft that are as capable as those in today's U.S. fleet. Although these enemy planes would be deployed in small quantities, the United States may need a more capable fighter to maintain superiority in one-on-one encounters.

Cancel the A/FX. Alternatively, the A/FX--which is being designed for the medium-attack mission--could be canceled. That decision would eventually leave the Navy without a medium-attack aircraft. As a result, the mission would have to be handled by the Air Force using its F-111 and F-15E attack aircraft and, in some cases, B-1, B-2, and B-52 bombers.

This shift in roles and missions may be consistent with current Navy decisions. The Navy has placed increased emphasis on assisting the Marine Corps in amphibious operations, which generally take place close to shore. Moreover, by 1999, the Navy intends to retire all of its A-6 aircraft, the plane that currently carries out the medium-attack mission for the Navy. Procuring the A/FX as a replacement for the A-6 will apparently not begin until 2007,

which means that the Navy will be without a medium-range bomber for most of the next decade. If the United States can rely on the Air Force to carry out the medium-attack mission for a decade, it may be able to rely on that service permanently.

Nonetheless, canceling the A/FX poses several disadvantages. The carriers on which the A/FX would be based may still need to stay well out to sea in order to remain out of range of shore-based missiles. Consequently, the longer range of the A/FX may be important even if the Navy focuses on attacking targets closer to shore.

Perhaps more important, if the A/FX is canceled, the United States would not be developing any new aircraft that is stealthy and dedicated primarily to the attack mission. Yet virtually all attack missions take place over enemy territory. The growing threats from enemy surface-to-air missiles, which the Air Force believes require the development of a stealthy new fighter, may argue even more strongly for developing a stealthy attack aircraft, regardless of which service deploys it.

Accept Smaller Forces

If tactical air forces were reduced in size, modernizing the remaining forces might be more affordable. The base-case plan in this testimony already assumes a reduction in Air Force units from the level of 26 wings proposed by the Bush Administration to 21 wings. But the number might be further reduced to, say, 18 wings--the level Secretary of Defense Les Aspin recommended last year when he was the Chairman of this Committee.

The Navy, though it may be considering sharp reductions in the size of its ship fleet, is apparently not planning similar reductions in its air wings. The base case in this testimony therefore assumes that the number of Navy wings remains at 13, the same level proposed by the Bush Administration. During the campaign, however, the President recommended reducing the number of carriers to 10, and the Chairman of the Senate Armed Services Committee recommended deploying between 10 and 12 carriers. If carriers are reduced by two, then the number of air wings could reasonably be cut by the same number.

If forces are reduced in size, requirements for procurement could be scaled back and costs would be held down. Also, operating costs would be reduced. A cut to 18 wings in the Air Force and 11 wings in the Navy would

save \$1.5 billion in annual operating costs compared with the levels in the base-case plan in this testimony. If these operating funds were devoted to procurement, rather than to reducing the defense budget, they would ease any problems of affordability that develop in the procurement accounts.

CONCLUSION

In conclusion, the force plans apparently being considered by the military services--and particularly by the Navy--make it more likely that the four tactical aircraft programs discussed in this testimony can be afforded within planned defense budgets. The Congress, and certainly this Committee, can take considerable credit for prodding the services to consider plans that are more financially realistic.

However, it is too soon to declare that budget problems have been fully resolved. Those problems may remain if the services falter in their steps toward scaling back their forces or if additional cuts are imposed on the defense budget.

APPENDIX A. TABLES AND FIGURES

TABLE A-1.

AIRCRAFT PURCHASED UNDER BASE-CASE ASSUMPTIONS

Procurement Assumed for Future Years Defense Program (FYDP)							1994-1998			
Aircraft	1993	1994	1995	1996	1997	1998	Total	Average		
Air Force										
F-22	0	0	0	0	4	4	8	2		
Multirole Fighter	0	0	0	0	0	0	0	0		
F-16	24	24	24	24	24	24	120	24		
A/FX	<u>0</u>	<u>0</u>								
Subtotal	24	24	24	24	28	28	128	26		
Navy										
F/A-18C/D	36	36	36	36	24	0	132	26		
F/A-18E/F	0	0	0	0	12	24	36	7		
A/FX	<u>0</u>	<u>0</u>								
Subtotal	<u>36</u>	<u>36</u>	<u>36</u>	<u>36</u>	<u>36</u>	<u>24</u>	<u>168</u>	<u>34</u>		
Total	60	60	60	60	64	52	296	59		
Procurement Assumed Beyond FYDP Period, 1999-2008										
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Air Force										
F-22	12	24	36	48	48	48	48	48	48	48
Multirole Fighter	0	0	0	0	0	0	0	0	0	0
F-16	24	12	0	0	0	0	0	0	0	0
A/FX	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>						
Subtotal	36	36	36	48	48	48	48	48	48	48
Navy										
F/A-18C/D	0	0	0	0	0	0	0	0	0	0
F/A-18E/F	24	30	48	48	48	48	48	48	72	72
A/FX	<u>0</u>	<u>0</u>	<u>6</u>	<u>12</u>						
Subtotal	<u>24</u>	<u>30</u>	<u>48</u>	<u>48</u>	<u>48</u>	<u>48</u>	<u>48</u>	<u>48</u>	<u>78</u>	<u>84</u>
Total	60	66	84	96	96	96	96	96	126	132
Procurement Assumed Beyond FYDP Period, 2009-2015										
	2009	2010	2011	2012	2013	2014	2015	1999-2015		
								Total	Average	
Air Force										
F-22	48	48	48	48	40	0	0	640	38	
Multirole Fighter	0	12	24	36	48	48	48	216	13	
F-16	0	0	0	0	0	0	0	36	2	
A/FX	<u>0</u>	<u>0</u>	<u>0</u>	<u>6</u>	<u>18</u>	<u>24</u>	<u>24</u>	<u>72</u>	<u>4</u>	
Subtotal	48	60	72	90	106	72	72	964	57	
Navy										
F/A-18C/D	0	0	0	0	0	0	0	0	0	
F/A-18E/F	72	72	72	72	72	72	46	964	57	
A/FX	<u>18</u>	<u>144</u>	<u>8</u>							
Subtotal	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>90</u>	<u>64</u>	<u>1,108</u>	<u>65</u>	
Total	138	150	162	180	196	162	136	2,072	122	

SOURCE: Congressional Budget Office.

NOTE: Numbers may not add to totals because of rounding.

TABLE A-2. WINGS AND AIRCRAFT REQUIREMENTS (ACTIVE AND RESERVE) UNDER BASE CASE

	Clinton Plan (1994)	Bush Plan (1997)	Base-Case Assumptions (Late 1990s and Beyond)	Other Assumptions in Base Case
Air Force				
Wings	24 1/3	26	21	No fighter interceptor squadrons
Required aircraft	n.a.	2,800	2,100	100 aircraft per wing
Navy				
Wings	13	13	13	
Required aircraft	n.a.	1,700	1,500	Does not include 3 U.S. Marine Corps F/A-18 squadrons retained by the Navy for support of carrier air wings

SOURCE: Congressional Budget Office.

NOTE: n.a. = not available.

TABLE A-3. COMPOSITION OF CARRIER WINGS

Type of Plane	Current	Near Term	Long Term
F-14	20	14	0
F/A-18	20	36	36
A-6 or A/FX	<u>16</u>	<u>0</u>	<u>16</u>
Total Fighter or Attack	56	50	52

SOURCE: Congressional Budget Office.

NOTE: Excludes a number of other aircraft that are part of the Navy's carrier air wings.

TABLE A-4. ASSUMPTIONS ABOUT AIRCRAFT SERVICE LIVES AND RATES OF USE (Expressed in flight hours)

Service	Service Life		Rate of Use	
	Current	2015	Current	2015
Air Force	7,100	8,000	300	325
Navy	6,800	6,700	330	350

SOURCE: Congressional Budget Office.

NOTES: Numbers reflect specific assumptions provided by the Air Force and Navy for each plane in the fleet, weighted by the number of aircraft. Assumptions about service life may, especially for the Navy, assume the existence of modifications that have not yet occurred.

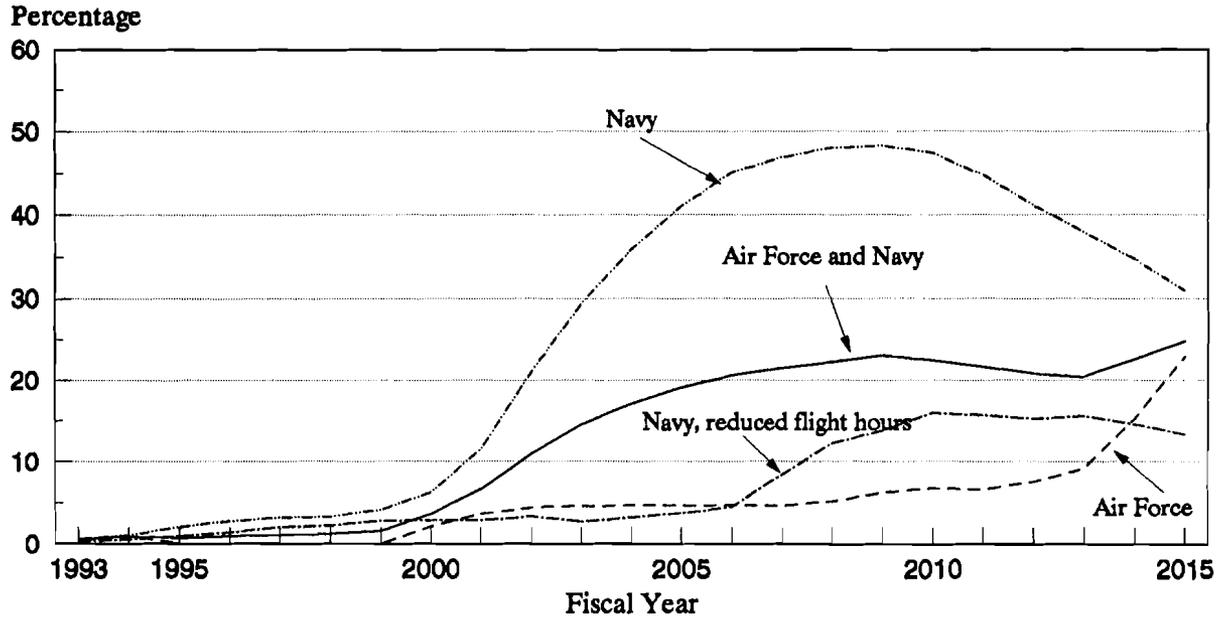
TABLE A-5. ASSUMPTIONS ABOUT THE PRICES OF AIRCRAFT

Service	Procurement per Plane (Millions of dollars)		Total RDT&E for Program (Billions of dollars)
	Lower Cost	Higher Cost	
Air Force			
F-22	80	115	18
MRF	35	50	n.a.
Navy			
A/FX	90	130	20
F/A-18E/F	60	80	6

SOURCE: Congressional Budget Office.

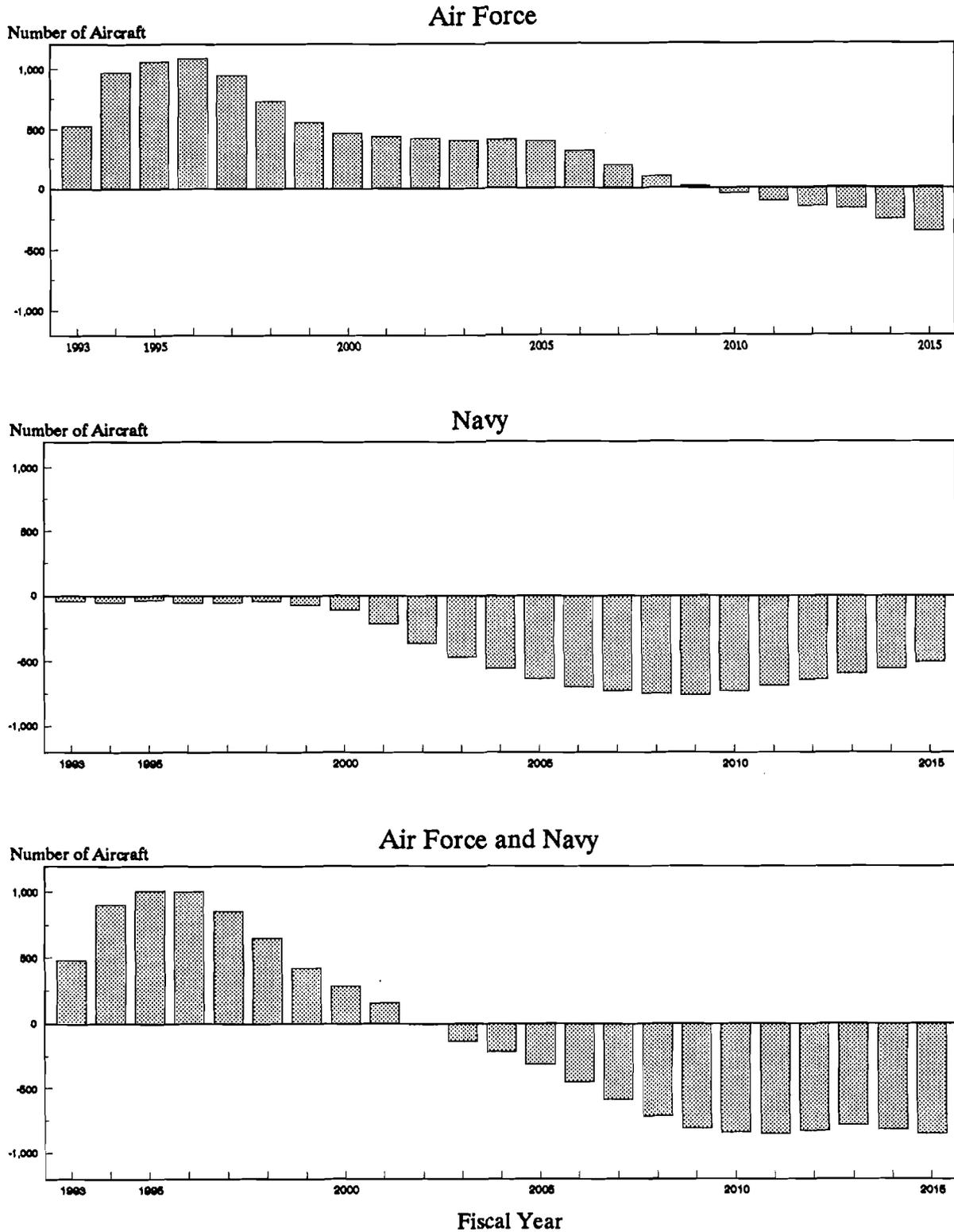
NOTES: n.a. = not available; RDT&E = research, development, test, and evaluation.

Figure A-1. Percentage of Fleet Retained Beyond Retirement Age to Meet Requirements



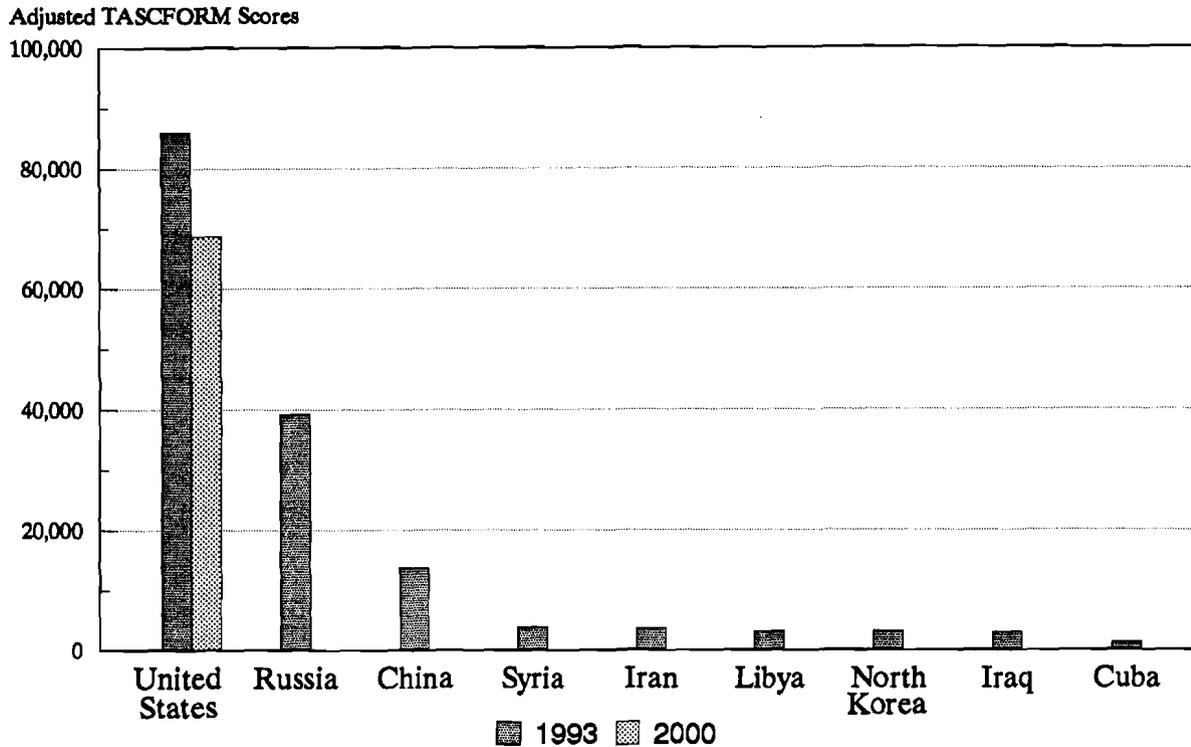
SOURCE: Congressional Budget Office projections based on Department of Defense, Air Force, and Navy data.

Figure A-2. Projected Overages and Shortfalls for the Air Force and the Navy



SOURCE: Congressional Budget Office projections based on Department of Defense, Air Force, and Navy data.

Figure A-3. U.S. Scores Compared with Selected Regional Powers



SOURCES: Congressional Budget Office estimates based on data from *The Military Balance* (London: International Institute for Strategic Studies, 1992-1993); The Analytic Sciences Corporation; U.S. Air Force; and U.S. Department of Defense.

NOTE: TASCFORM = Technique for Assessing Comparative Force Modernization.

APPENDIX B. SERVICE LIVES AND RATES OF USE

The Congressional Budget Office calculated the shortfalls and overages of aircraft based on assumptions about service lives and rates of use measured in terms of flight hours. For the most part, the data were taken from estimates in the Department of Defense's "Report to the Congress on Fixed Wing Tactical Aviation Modernization" or were provided by the services.

Applying the service-life estimates from this publication to CBO's projections of aircraft inventories suggests that Air Force fighter and attack aircraft would be able to fly an average of about 8,000 hours before retiring, modestly longer than today's average of 7,100 hours. Navy planes would be expected to have shorter service lives, about 6,700 hours in the future compared with 6,800 hours on average today. The Air Force and Navy also provided estimates of service life. Those estimates are predicated on completion of aircraft modification programs that are not yet complete or even fully funded. Therefore, CBO used the smaller numbers for the case that retires planes when they reach the end of their service lives.

Annual rates of use are roughly the number of hours that an aircraft flies each year. Planned rates of use are somewhat higher in the Navy (a fleetwide average of 350 hours per year per aircraft) than in the Air Force (an

average of 320 hours per year per aircraft). Rates of use vary somewhat based on the type of aircraft, and the Air Force's average rate of use would increase modestly to 325 in the future based on a change in the composition of the fleet. The Navy's rates of use are assumed to increase to about 350 hours through 2015.

These planned service lives and rates of use can be translated into chronological retirement ages. The figures suggest that Air Force aircraft would be retired when they are about 25 years old, on average. Navy planes would be retired at about 19 years old, on average.