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# COMBAT AIR POWER

## Joint Mission Assessments Needed Before Making Program and Budget Decisions







United States  
General Accounting Office  
Washington, D.C. 20548

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**Comptroller General  
of the United States**

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Congressional Committees

The Department of Defense plans to spend over \$300 billion on programs already in progress to modernize its combat air power capabilities over the next 15 to 20 years. Hundreds of billions of dollars more will likely be required for programs, such as the Joint Strike Fighter, that are still being defined or that can be expected to be started over the next several years. The Department will face difficult decisions as it attempts to cover the high cost of these and other defense acquisitions when the nation is moving toward a balanced budget.

This comprehensive report on U.S. air power examines whether the Secretary of Defense has sufficient information from a joint perspective to prioritize programs, objectively weigh the merits of new program investments, and decide whether current programs should receive continued funding. To provide context for this assessment, we summarize major changes in U.S. air power capabilities since 1991 and the broad capabilities of potential adversaries. We build on and synthesize the findings of six individual air power reviews that we conducted over the past 2 years and draw from other GAO reports on air power weapons programs.

We believe that our recommendations to the Secretary of Defense, if implemented, would improve the information available to assist in making key decisions on air power plans, programs, and budgets. We are addressing this report to you because of your oversight responsibility for defense issues and budgets and your interest in this important subject.

This report was prepared under the direction of Richard Davis, Director, National Security Analysis, who may be reached on (202) 512-8412 if you or your staff have any questions. Major contributors to this report are listed in appendix V.

A handwritten signature in cursive script that reads 'Charles A. Bowsler'.

Charles A. Bowsler  
Comptroller General  
of the United States

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List of Congressional Committees

The Honorable Strom Thurmond  
Chairman  
The Honorable Sam Nunn  
Ranking Minority Member  
Committee on Armed Services  
United States Senate

The Honorable Ted Stevens  
Chairman  
The Honorable Daniel K. Inouye  
Ranking Minority Member  
Subcommittee on Defense  
Committee on Appropriations  
United States Senate

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House of Representatives

The Honorable C.W. Bill Young  
Chairman  
The Honorable John P. Murtha  
Ranking Minority Member  
Subcommittee on National Security  
Committee on Appropriations  
House of Representatives

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B-272206

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# Executive Summary

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## Purpose

No other nation relies as heavily on combat air power for its military strength or has invested as much in it as the United States. The Department of Defense (DOD) has initiated major acquisition programs estimated to cost over \$300 billion to modernize its combat air power forces over the next 15 to 20 years. These forces include about 5,900 fighter and attack aircraft, including long-range bombers equipped for conventional missions and attack helicopters; specialized combat support aircraft; advanced weapons for the combat aircraft; long-range missiles; theater air defense forces; and other key air power assets.

Because difficult tradeoff decisions will likely be needed among competing air power programs as the nation moves toward balancing the budget, GAO conducted detailed assessments of six key air power missions<sup>1</sup> to provide information useful to the debate. This culminating report builds on and synthesizes the findings of these six reviews and other GAO reviews of air power programs. GAO's overall objective was to assess whether the Secretary of Defense has sufficient information from a joint perspective to help him decide whether new investments should be made, whether programmed investments should continue to be funded, and what priority should be given to competing air power programs. To gain a broad perspective on the context in which these decisions are made, GAO sought to determine (1) how U.S. air power capabilities have changed since the end of fiscal year 1991, the year the Persian Gulf War ended; (2) what potential threat adversary forces pose to U.S. air power; (3) what contribution combat air power modernization programs will make to aggregate U.S. capabilities; and (4) how joint warfighting assessments are used to support the Secretary in making air power decisions.

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## Background

Title 10 of the U.S. Code and DOD's functions directive authorize each of the military services to acquire air power assets to meet its responsibilities. DOD's current air power assets, many of which perform multiple missions, were largely developed through the military services' investments of hundreds of billions of dollars primarily to acquire autonomous combat air power capabilities in preparation for a global war with the Soviet Union. The Air Force acquired bombers to deliver nuclear strikes and fighter and attack aircraft for conventional and theater-nuclear missions in the major land theaters, principally Europe. The Navy built an extensive carrier-based aviation force to control the seas and project power into the Soviet Union's maritime flanks. The Army developed attack

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<sup>1</sup>These include interdiction, air superiority, close support, air refueling, suppression of enemy air defenses, and surveillance and reconnaissance.

helicopters to provide air support to its ground troops. The Marine Corps acquired fighter and attack aircraft and attack helicopters to support its ground forces in their areas of operation. While each service had many similar capabilities, each also largely operated within its own spheres.

Today, the geographic areas of operations for combat air power that characterized much of the Cold War no longer apply. The air power components of the four services are now focused on joint operations with a strategy of preparing to fight two major regional conflicts versus a global war. Most of the likely theaters of operation are small enough that, with available refueling support, all types of aircraft can reach most targets.

The individual services have always been the primary players in the acquisition process based on their broad responsibilities to organize, train, and equip their forces under title 10 of the U.S. Code. However, to achieve a stronger joint orientation in DOD, Congress enacted the Goldwater-Nichols Department of Defense Reorganization Act of 1986. This act gave the Chairman of the Joint Chiefs of Staff and the commanders in chief (CINC) of the combatant commands stronger roles in Department matters, including the acquisition process. As principal military adviser to the Secretary of Defense, the Chairman is now expected to advise the Secretary on the priority of requirements identified by the CINCS and the extent to which program recommendations and budget proposals of the military departments conform with these priorities. The Chairman is also expected to submit to the Secretary alternative program recommendations and budget proposals to achieve greater conformance with CINC priorities. Subsequent legislation has given the Chairman additional responsibilities to examine ways DOD can eliminate or reduce duplicative capabilities and to assess military requirements for defense acquisition programs from a joint warfighting military perspective.

According to the 1995 National Military Strategy, major modernization programs involving significant investments are to be undertaken “only where there is clearly a substantial payoff.” To evaluate the merits of the services’ weapon investment proposals, programs, and budgets, various entities within the Office of the Secretary of Defense, such as the Director of Program Analysis and Evaluation, provide the Secretary independent analyses as needed. The Joint Requirements Oversight Council assists the Chairman of the Joint Chiefs of Staff in carrying out the Chairman’s responsibilities. This assistance includes identifying and assessing the priority of joint military requirements (including existing systems and equipment), ensuring that the assignment of program priorities reflects

projected resource levels, and considering alternatives to any acquisition program identified to meet military needs. A key goal of the Council is to achieve cross-service resource allocations that yield an overall defense capability that is more than the sum of the separate service capabilities. To support the Council and the Chairman, a joint warfighting capabilities assessment process was set up in 1994 to examine key relationships and interactions among warfighting capabilities of the services, including providing insights into joint requirements.

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## Results in Brief

Sufficient information is not being developed from a joint perspective to enable the Secretary of Defense to prioritize programs, objectively weigh the merits of new air power investments, and decide whether current programs should continue to receive funding. DOD has not established joint mission area requirements and compared them to the services' aggregate capabilities. Therefore, it cannot be confident that force structure and modernization decisions will result in the most cost-effective mix of forces to fulfill the National Military Strategy.

Reductions in the U.S. inventory of combat aircraft have been largely offset by key enhancements to U.S. air power capabilities. These include performance improvements in combat aircraft—such as increases in night-fighting and targeting capabilities—and growing inventories of precision munitions for the aircraft and of advanced long-range missiles to attack ground targets. Conversely, the aircraft and air defense forces of potential adversaries have not been substantially improved and do not pose a serious threat to U.S. air power's successful execution of its missions. These nations have considerably smaller forces, and their equipment is generally older and less capable than the U.S. forces' advanced systems. These nations' efforts to modernize their forces will likely continue to be inhibited by declines in the post-Cold War arms market, national and international efforts to limit the proliferation of conventional arms, and the high cost of advanced weapons.

Because DOD does not routinely develop information on joint mission needs and aggregate capabilities, it has little assurance that decisions to buy, modify, or retire air power systems are sound. The urgent need for such information is underscored by the reality that hundreds of billions of dollars will be required to finance combat air power investment programs as currently planned. Serious concerns about the affordability of these plans within likely defense budgets have been raised. Based on its assessments of air power mission areas and other reviews, GAO concludes

that DOD is proceeding with some major investments without clear evidence the programs are justified. These assessments indicate that some modernization programs will add only marginally to already formidable capabilities, while the need for others has been lessened by the changed security environment. For some programs, there are viable, less costly alternatives.

GAO believes that the Chairman could better advise the Secretary of Defense on air power programs and budgets if he conducted more comprehensive assessments in key mission areas. Broader assessments that tackle the more controversial air power issues would enable the Chairman to better assist the Secretary of Defense to make the difficult trade-off decisions that will likely be required. However, certain long-standing obstacles must be overcome if the key challenges related to air power are to be met head on. The Chairman must be the strong advocate for the joint perspective that the Goldwater-Nichols legislation intended. The well-being of the U.S. military as a whole must be placed above the interests of the individual services. And if circumstances change and program adjustments are needed, the Secretary and the Chairman must be willing to challenge the strong constituencies that develop around major acquisition programs. If DOD is to shape its force smartly within the bounds of likely budgets, existing levels of redundancy in capability must be questioned, and no program, once begun, should be considered irrevocable.

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## Principal Findings

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### Despite Downsizing, U.S. Air Power Capabilities Remain Formidable

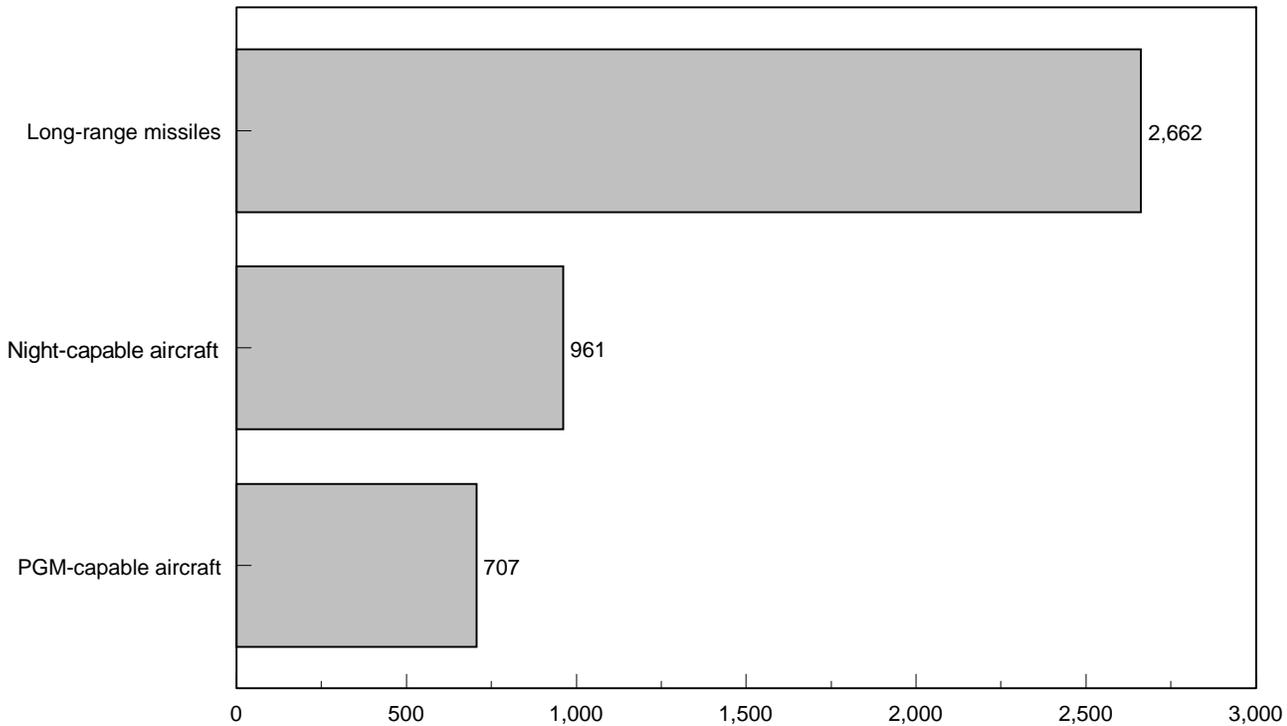
The United States has made many significant improvements to its combat air power capabilities in recent years. Although DOD has reduced its total combat aircraft about 28 percent since the end of the Persian Gulf War, the military services continue to retain about 5,900 advanced combat aircraft. These aircraft are increasingly being supplemented by other air power assets such as long-range cruise missiles, unmanned aerial vehicles, and theater air defense forces.

Many of the services' combat aircraft have multimission capabilities that allow combatant commanders greater flexibility in employing aviation assets. The aircraft are also more capable of autonomous navigation, night fighting, target acquisition, self-protection, and the use of advanced

munitions, vital attributes based on experiences in the Gulf War. The inventory of precision air-to-air and air-to-ground weapons carried by these aircraft is also being significantly expanded and improved.

Additionally, DOD has more than tripled its inventory of long-range missiles to attack ground targets and has improved the range and accuracy of many of them. Funds are also being spent to advance U.S. forces' ability to identify targets and communicate information quickly to combatant units. These advances are expected to further enhance the capabilities of current forces. Figure 1 highlights several significant advances in U.S. air power capabilities since fiscal year 1991.

Figure 1: Increases in Key U.S. Combat Air Power Capabilities Since the End of Fiscal Year 1991



Note: Long-range missiles include the Tomahawk cruise missile and the Army Tactical Missile System. Night-fighting aircraft include new and existing aircraft equipped with infrared detection devices or with cockpits that permit use of night-vision goggles. The precision-guided munition (PGM)-capable aircraft include new or existing aircraft equipped to autonomously employ PGMs using laser designators.

### Potential Adversaries' Capabilities Are Likely to Remain Limited

Although potential adversaries possess capabilities that threaten U.S. air power missions, the severity of these threats appears to be limited. Potential adversaries' air defense capabilities cannot currently prevent U.S. air power from achieving military objectives. Their conventional offensive air power capabilities are judged to be limited until at least early in the next century. Projections are that the countries in question are likely to improve their defensive and offensive capabilities only marginally over at least the next 10 years.

Because most potential adversaries lack the ability to develop and produce high technology weapons, they must import weapons to modernize their forces. However, they are likely to be inhibited from procuring advanced weapons due to changes in the post-Cold War arms market, national and international efforts to limit proliferation of conventional arms, and the high cost of advanced weapons. Shortfalls in training, maintenance, logistics, and doctrine further constrain potential adversaries' capabilities.

**Costly Modernization Programs Planned Without Sufficient Analysis of Needs and Capabilities**

The services are proceeding with costly acquisition programs to attain greater capabilities in mission areas where U.S. capabilities are already substantial. The long-range modernization of DOD's combat air power centers on four extremely expensive aircraft development programs—the Navy's \$81 billion, 1,000-plane F/A-18E/F fighter/attack aircraft; the Air Force's \$70 billion, 438-plane F-22 air superiority fighter; the Army's \$45 billion, 1,292-plane Comanche armed reconnaissance helicopter; and the Air Force/Navy 2,978-plane Joint Strike Fighter that is still being defined. Based on DOD's goals for the Joint Strike Fighter, the Congressional Budget Office estimates the program could cost \$165 billion, excluding inflation. Table 1 summarizes acquisition cost estimates for combat aircraft, weapons (including PGMS, theater air defense weapons, and close support artillery), and support systems such as surveillance and reconnaissance assets. (A more detailed list is in app. III.)

**Table 1: Estimated Costs of Major Air Power Modernization Programs**

| Then-year dollars in billions |                          |                                    |                            |
|-------------------------------|--------------------------|------------------------------------|----------------------------|
| Program                       | Through fiscal year 1996 | Fiscal year 1997 to end of program | Total                      |
| F/A-18 E/F                    | \$4.9                    | \$76.1                             | <b>\$81.0</b>              |
| F-22                          | 14.0                     | 56.1                               | <b>70.1</b>                |
| Comanche                      | 3.1                      | 41.7                               | <b>44.8</b>                |
| Longbow Apache                | 1.9                      | 6.4                                | <b>8.3</b>                 |
| B-1 bomber modifications      | 1.3                      | 2.5                                | <b>3.8</b>                 |
| AV-8B remanufacture           | 0.5                      | 1.8                                | <b>2.3</b>                 |
| Weapons                       | 30.5                     | 45.7                               | <b>76.2</b>                |
| Combat support                | 7.4                      | 9.2                                | <b>16.6</b>                |
| <b>Total</b>                  | <b>\$63.6</b>            | <b>\$239.5</b>                     | <b>\$303.1<sup>a</sup></b> |

<sup>a</sup>Joint Strike Fighter is not included in this table because DOD has not yet estimated its total program cost. The Congressional Budget Office estimates the program could cost about \$165 billion in 1997 dollars.

DOD faces a major challenge in attempting to pay for all of the programs as planned. While DOD believes these modernization plans are affordable, a 1996 Congressional Budget Office analysis of the F/A-18E/F, F-22, and Joint Strike Fighter costs and likely funding available for these programs raises serious doubts and indicates that about \$3 billion (1997 dollars) more will be required annually than may be available during the period 2002-2020.

DOD has not sufficiently assessed joint mission requirements and is therefore not well-positioned to determine the need for and priority of its planned investments. Major force structure and planning decisions have been made without completed analyses of the services' qualitative and quantitative requirements and capabilities to conduct combat air power missions.

A dearth of information on joint mission needs and aggregate capabilities to meet those needs prevents a definitive answer as to whether DOD's air power modernization programs are justified. However, based on past GAO reviews of individual air power systems and available information collected on its six mission reviews, GAO believes that DOD is proceeding with some major modernization programs without clear evidence that they are justified. Available information indicates that the current forces in some mission areas already provide combatant commanders with formidable capabilities. For example, the services already have at least 10 ways to hit 65 percent of the thousands of expected ground targets in two major regional conflicts. In addition, service interdiction assets can provide 140 to 160 percent coverage for many types of targets. Despite their numerous overlapping, often redundant, interdiction capabilities, the services plan to acquire aircraft and other weapons over the next 15 to 20 years that will further enhance their interdiction capabilities. This includes major modifications to the Air Force's fleet of 95 B-1B bombers to enable them to deliver conventional weapons.

The changed security environment appears to have lessened the need to proceed with some programs as planned. For example, despite the United States' unmatched air-to-air combat capabilities, the Air Force plans to begin production of its next generation fighter—the \$111 million F-22—in 1998, with rapid increases in the production rate to follow. The F-22 program was initiated to meet the projected Soviet threat of the mid-1990s. The severity of the threat in terms of quantities and capabilities has declined and potential adversaries have few fighters that could challenge the F-15, the current U.S. frontline fighter.

For some highly expensive modernization programs, viable, less costly alternatives are available. In these cases, the payoff in terms of added mission capability—considering the investment required—does not appear to be clearly substantial as mandated by the National Military Strategy. For example, the Navy F/A-18E/F's expected range, carrier recovery payload, and survivability will be only marginally improved over that of the less costly F/A-18C/D model.

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### Joint Warfighting Assessments Need to Be More Comprehensive

DOD has taken steps to improve the information the Secretary of Defense and the Chairman of the Joint Chiefs of Staff have to assess air power plans, programs, and budgets. To enhance the information available on combat requirements and capabilities, DOD has initiated major studies related to deep attack weapons, close support of ground forces, reconnaissance forces, and electronic warfare. It also expanded the role of the Joint Requirements Oversight Council and established 10 joint warfighting capability assessment teams to support the deliberations of the Council. These assessment teams have identified ways to improve the interoperability of forces in joint operations, and their assessments have contributed to some decisions that could help to avoid future levels of redundancy. However, the assessment teams thus far have had little impact in identifying unneeded overlaps and duplication in existing capabilities or in weighing the relative merits of alternative ways to recapitalize U.S. air power forces. GAO also found little evidence that the Council, with the support of the assessment teams, has developed specific proposals to shift resources among the services to enhance total force capability.

Certain obstacles must be overcome to improve the information flowing from a joint perspective. For example, DOD acknowledges that its current analytical tools, such as computer models and war games, need to be improved if they are to be effectively used in analyzing joint warfighting. Also, assessments that could threaten service plans and budgets are frequently avoided, and the potential effects of program reductions or cancellations on careers, jobs, and the industrial base inhibit serious consideration of program alternatives. Finally, the desire to gain the consensus of the services sometimes inhibits decisions that could better integrate service capabilities along mission lines. GAO acknowledges that more comprehensive assessments will not, by themselves, solve these long-standing problems. Major changes in outlook throughout the Department are also needed.

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## Recommendations

To ensure the future viability of U.S. air power, the Secretary of Defense will need to make decisions in at least two critical areas—how best to reduce duplications and overlaps in existing capabilities without unacceptable effects on force capabilities and how to recapitalize the force in the most cost-effective way. To make such decisions, the Secretary must have better information from a joint perspective. Accordingly, GAO recommends that the Secretary, along with the Chairman of the Joint Chiefs of Staff, develop an assessment process that yields more comprehensive information in key mission areas. This can be done by broadening the current joint warfare capabilities assessment process or developing an alternative mechanism.

To be of most value, such assessments should be done on a continuing basis and should, at a minimum, (1) assess total joint warfighting requirements in each mission area; (2) inventory aggregate service capabilities, including the full range of assets available to carry out each mission; (3) compare aggregate capabilities to joint requirements to identify shortages or excesses, taking into consideration existing and projected capabilities of potential adversaries and the sufficiency of existing capabilities to meet joint requirements; (4) determine the most cost-effective means to satisfy any shortages; and (5) where excesses exist, assess the relative merits of retiring alternative assets, reducing procurement quantities, or canceling acquisition programs.

The assessments also need to examine the projected impact of investments, retirements, and cancellations on other mission areas, since some assets contribute to multiple missions. Because the Chairman is to advise the Secretary on joint military requirements and provide programmatic advice on how best to provide joint warfighting capabilities within projected resource levels, the assessment process needs to help the Chairman determine program priorities across mission lines. To enhance the effectiveness of the assessments, GAO also recommends that the Secretary of Defense and the Chairman decide how best to provide analytical support to the assessment teams, ensure staff continuity, and allow the teams the latitude to examine the full range of air power issues.

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## Agency Comments and GAO's Evaluation

In written comments (see app. IV) on a draft of this report, DOD partially concurred with GAO's recommendations. While DOD said it disagreed with many of GAO's findings, most of that disagreement centered on two principal points: (1) the Secretary of Defense is not receiving adequate advice, particularly from a joint perspective, to support decision-making

on combat air power programs, and (2) ongoing major combat aircraft acquisition programs lack sufficient analysis of needs and capabilities.

DOD said it has taken many steps in recent years to improve the extent and quality of joint military advice and cited the joint warfighting capability assessment process as an example. It said the Secretary and Deputy Secretary receive comprehensive advice on combat air power programs through DOD's planning, programming, and budgeting system and systems acquisition process. The Department's response noted that both the Office of the Secretary of Defense and the Organization of the Joint Chiefs of Staff scrutinize major acquisition programs and that joint military force assessments and recommendations are provided. DOD acknowledged that the quality of analytical support can be improved but said that the extent of support available has not been insufficient for decision-making.

GAO acknowledges that steps have been taken to provide improved joint advice to the Secretary and that DOD decision support systems provide information for making decisions on major acquisition programs. GAO does not believe, however, the information is comprehensive enough to support resource allocation decisions across service and mission lines. Much of the information is developed by the individual services and is limited in scope. Only a very limited amount of information is available on joint requirements for performing missions, such as interdiction and close support, and on the aggregate capabilities available to meet those requirements. DOD's initiation of the deep attack weapons mix study and, more recently, a study to assess close support capabilities suggests that DOD is, in fact, beginning to seek more comprehensive information about cross-service needs and capabilities, as our recommendation suggests. While joint warfighting capability assessment teams have been established, DOD is not using these teams to identify unnecessary or overly redundant combat air power capabilities among the services. Moreover, DOD has not used the teams to help develop specific proposals or strategies to recapitalize U.S. air power forces, a major combat air power issue identified by the Chairman of the Joint Chiefs of Staff. Information on issues such as recapitalization alternatives and redundancies in capabilities, developed from a joint warfighting perspective, could be invaluable to decisionmakers who must allocate defense resources among competing needs to achieve maximum force effectiveness.

GAO believes that the services conduct considerable analyses to identify mission needs and justify new weapons program proposals. These needs analyses, however, are not based on assessments of the aggregate

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capabilities of the services to perform warfighting missions, and DOD does not routinely review service modernization proposals and programs from such a perspective. The Commission on Roles and Missions of the Armed Forces made similar observations. Typically, service analyses tend to justify specific modernization programs by showing the additional capabilities they could provide rather than assess the cost-effectiveness of alternative means of meeting an identified need. Additionally, under DOD's requirements generation process, only program proposals that meet DOD's major defense acquisition program criteria are reviewed and validated by the Joint Requirements Oversight Council. Many service modernization proposals and programs do not meet these criteria.

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**Abbreviations**

|         |                                                      |
|---------|------------------------------------------------------|
| ACDA    | Arms Control and Disarmament Agency                  |
| ATACMS  | Army Tactical Missile System                         |
| CBO     | Congressional Budget Office                          |
| CINC    | commanders in chief                                  |
| COCOM   | coordinating committee                               |
| DOD     | Department of Defense                                |
| GAO     | General Accounting Office                            |
| HARM    | High Speed Anti-radiation Missile                    |
| JDAM    | Joint Direct Attack Munition                         |
| JROC    | Joint Requirements Oversight Council                 |
| JSOW    | Joint Stand-off Weapon                               |
| JWCA    | Joint Warfighting Capability Assessment              |
| LANTIRN | low altitude navigation targeting infrared for night |
| NATO    | North Atlantic Treaty Organization                   |
| OSD     | Office of the Secretary of Defense                   |
| PGM     | precision-guided munition                            |
| SEAD    | suppression of enemy air defenses                    |

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# Introduction

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Air power has played a pivotal role in America's military force since World War I when aircraft were first used in combat. In World War II, it was indispensable to U.S. forces to achieve victory. After the war, the Department of the Navy invested in longer-range aircraft and larger aircraft carriers to provide worldwide coverage from the sea. With the proven success of air power and development of the intercontinental-range bomber, the Department of the Air Force was established in 1947, with the Air Force taking its place alongside the other three services. During the Cold War, America's air power was a critical element of both its nuclear deterrent forces and its conventional combat forces. A massive U.S. aerospace industry developed, giving the United States a research, development, and production base that has dramatically advanced airframes, propulsion, avionics, weapons, and communications, and helped shape and broaden the role of air power in U.S. military strategy.

Today the Department of Defense (DOD) has what some refer to as the "four air forces," with each of the services possessing large numbers of aircraft. Air power includes not only fixed-wing aircraft but also attack helicopters, long-range missiles, unmanned aerial vehicles, and other assets that give the United States the ability to maintain air superiority and to project power worldwide through the air. During the Persian Gulf War, the unparalleled capabilities of these forces were demonstrated as U.S. and coalition forces dominated the conflict.

Sweeping changes in the global threat environment, sizable reductions in resources devoted to defense, technological advancements in combat systems, and other factors have significantly affected DOD's combat air power. Ensuring that the most cost-effective mix of combat air power capabilities is identified, developed, and fielded in such an environment to meet the needs of the combatant commanders is a major challenge.

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## U.S. Combat Air Power

In October 1993, DOD reported on its bottom-up review of defense needs in the post-Cold War security environment. The review outlined specific dangers to U.S. interests, strategies to deal with the dangers, an overall defense strategy for the new era, and force structure requirements. The strategy called on the military to be prepared to fight and win two nearly simultaneous major regional conflicts, engage in smaller-scale operations, meet overseas presence requirements, and deter attacks by weapons of mass destruction. Table 1.1 shows the overall size and structure of the general purpose forces DOD determined are needed to execute the strategy

and the approximate number of associated combat aircraft. DOD currently has about 5,900 such aircraft as it continues drawing down its forces.

**Table 1.1: Major General Purpose Forces Specified by the Bottom-Up Review and the Approximate Number of Associated Combat Aircraft**

| Service      | Major combat forces                                                                                  | Number of aircraft                                |
|--------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------|
| Army         | 10 Active divisions<br>15 Reserve enhanced readiness brigades                                        | 1,800 Attack and armed reconnaissance helicopters |
| Navy         | 11 Active carriers<br>1 Reserve carrier<br>10 Active carrier air wings<br>1 Reserve carrier air wing | 800 Fighter and attack aircraft                   |
| Marine Corps | 3 Marine expeditionary forces                                                                        | 550 Attack aircraft and helicopters               |
| Air Force    | 13 Active fighter wings<br>7 Reserve fighter wings<br>Long-range bombers                             | 2,200 Fighter and attack aircraft<br>184 Bombers  |

In addition to these fighter and attack aircraft, DOD has other important combat aviation elements, including over 1,500 specialized support aircraft, such as those used for refueling, command and control, reconnaissance, and suppressing enemy air defenses, and about 250 aircraft in its special operations forces. Appendix I identifies the principal aircraft, long-range missiles, and other weapons and assets that were covered by our review.

## Key Guidance Affecting Combat Air Power Forces

Two key DOD documents that provide guidance concerning the planning for and use of combat air power are the Secretary of Defense’s Defense Planning Guidance and the Chairman of the Joint Chiefs of Staff’s current National Military Strategy dated 1995. These documents build on the strategy, plans, and programs identified in the Bottom-Up Review.

According to the Defense Planning Guidance and the National Military Strategy, U.S. forces, in concert with regional allies, are to be of sufficient size and capabilities to credibly deter and, if necessary, decisively defeat aggression by projecting and sustaining U.S. power during two nearly simultaneous major regional conflicts. The services’ forces are also expected to be prepared to fight as a joint team, with each service providing trained and ready forces to support the commanders in chief (CINC) of the combatant commands. U.S. air power is to be able to seize and control the skies, hold vital enemy capabilities at risk throughout the theater, and help destroy the enemy’s ability to wage war. Air power is also expected to provide sustained, precision firepower; reconnaissance

and surveillance; refueling; and global lift. The ability of combat aircraft to respond quickly to regional contingencies makes them particularly important in the post-Cold War era.

Both documents discuss the criticality of enhancements to existing systems and the selected modernization of forces to DOD's ability to carry out the military strategy. Each expresses concerns about upgrading and replacing weapon systems and equipment under constrained budgets. In recognition of the costly recapitalization planned and the projected budgetary resources to support it, the Chairman's strategy states that major modernization programs involving significant investment are to be undertaken "only where there is clearly a substantial payoff."

A new document—Joint Vision 2010—provides the military services a common direction in developing their capabilities within a joint framework. Like the guidance and strategy documents, the vision document cites the need for more efficient use of defense resources. It stresses the imperativeness of jointness—of integrating service capabilities with less redundancy in and among the services—if the United States is to retain effectiveness when faced with flat budgets and increasingly more costly readiness and modernization.

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## DOD Roles and Responsibilities

The authority of the military departments to acquire air power and other assets stems from their broad legislative responsibilities to prepare forces for the effective prosecution of war (Title 10 U.S. Code). DOD Directive 5100.1, which identifies the functions of the DOD and its major components, authorizes the military departments to develop and procure weapons, equipment, and supplies essential to fulfilling their assigned functions. Under the directive, the Army's primary functions include the preparation of forces to defeat enemy land forces and seize, occupy, and defend land areas; the Navy's and/or Marine Corps' functions include the preparation of forces to gain and maintain general naval supremacy and prosecute a naval campaign; and the Air Force, the preparation of forces to gain and maintain air supremacy and air interdiction of enemy land forces and communications. The Marine Corps is also expected to conduct amphibious operations. All services are authorized to develop capabilities to attack land targets through the air to accomplish their primary missions.<sup>1</sup> The directive also states that the military departments are to fulfill the current and future operational requirements of the combatant

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<sup>1</sup>For a more detailed discussion of service roles, missions and functions, see *Roles and Functions of U.S. Combat Forces: Past, Present, and Prospects*, Congressional Research Service, Report No. 93-72S, Jan. 21, 1993.

commands to the maximum extent practical; present and justify their respective positions on DOD plans, programs, and policies; cooperate effectively with one another; provide for more effective, efficient, and economical administration; and eliminate duplication.

The individual services have always had the primary role in weapons acquisition. In an attempt to strengthen the joint orientation of the Department, Congress enacted the Goldwater-Nichols Department of Defense Reorganization Act of 1986. This act, which amended title 10, gave the Chairman of the Joint Chiefs of Staff and the combatant commanders stronger roles in Department matters, including weapons acquisition. It designated the Chairman as principal military adviser to the President, the National Security Council, and the Secretary of Defense and gave him several broad authorities. For example, the Chairman is expected to provide for strategic direction of the armed forces, prepare strategic plans, perform net assessments of the capabilities of U.S. and allied armed forces compared with those of potential adversaries, and advise the Secretary on the requirements, programs, and budgets of the military departments in terms of the joint perspective.

Regarding this latter responsibility, the Chairman is expected to (1) provide advice on the priorities of requirements identified by the commanders of the combatant commands, (2) determine the extent to which program recommendations and budget proposals conform with the combatant commands' priorities, (3) submit alternative program recommendations and budget proposals within projected resource levels to achieve greater conformance with these priorities, and (4) assess military requirements for major defense acquisition programs. In addition to these responsibilities, the National Defense Authorization Act for fiscal year 1993 directed the Chairman to examine what DOD can do to eliminate or reduce duplicative capabilities.

Assisting the Chairman in providing the Secretary advice on military requirements and the programs and budgets of the military departments is the Joint Requirements Oversight Council (JROC) and the Joint Staff, which are subject to the authority, direction, and control of the Chairman. Within the Office of the Secretary of Defense (OSD), the Office of the Director of Program Analysis and Evaluation provides, in part, analytical support to the Secretary in the management and oversight of service programs and budgets.

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## Objectives, Scope, and Methodology

The overall objective of this review was to assess whether the Secretary of Defense has sufficient information from a joint perspective to help him decide whether new investments in combat air power should be made, whether programmed investments should continue to be funded, and what priority should be given to competing programs. To gain a broad perspective on the context in which these decisions are made, we sought to determine (1) how U.S. air power capabilities have changed since the end of fiscal year 1991; (2) what potential threat adversary forces pose to U.S. air power; (3) what contribution combat air power modernization programs will make to aggregate U.S. capabilities; and (4) how joint warfighting assessments are used to support the Secretary in making air power decisions.

The scope of our review included (1) fighter and attack aircraft, including attack helicopters and long-range bombers equipped for conventional missions; (2) key specialized support aircraft that enhance the capability of combat aircraft; (3) munitions employed by combat aircraft; and (4) other major systems—particularly long-range missiles, theater air defense systems, and unmanned aerial vehicles—that perform missions traditionally assigned to combat aircraft. Our scope did not encompass assets dedicated primarily to airlift, such as the C-17 and V-22 aircraft, and U.S. special operations forces. Also, the potential contribution of allied forces was not considered.

We reviewed in detail six key mission areas in which combat air power plays a prominent role:

- performing offensive and defensive operations to achieve and maintain air superiority in areas of combat operations,
- interdicting enemy forces before they can be used against friendly forces,
- providing close support for ground forces by attacking hostile forces in close proximity to friendly forces,
- suppressing enemy air defenses by jamming or destroying enemy air defense forces,
- refueling combat aircraft in the air to sustain combat operations, and
- performing surveillance and reconnaissance to obtain intelligence data for combat operations.

In conducting these reviews, we reviewed numerous reports, studies, and other documents containing information on these missions and the primary platforms and weapons used. We discussed capabilities, requirements, force structure, and modernization issues with officials and

representatives of various offices within OSD, the Organization of the Joint Chiefs of Staff, the military services, and the operational commands. We compared and contrasted performance data on current and planned weapon systems by mission area to acquire a good understanding of the joint capabilities of the military forces to perform the missions and to identify overlaps and gaps in capabilities. Separate reports on the interdiction, close support, suppression of enemy air defenses, and air refueling reviews have already been issued, while our reports on air superiority and surveillance and reconnaissance are still being prepared. A listing of the four issued reports and of other GAO reports related to this body of work is included at the end of this report.

We supplemented the six mission reviews with more detailed assessments of (1) recent and planned changes in the capabilities of U.S. forces and of the current and projected capabilities of potential adversaries to counter U.S. air power and (2) the military advice on joint requirements and capabilities being developed through the Chairman of the Joint Chiefs of Staff for the Secretary of Defense. For information on changes in U.S. capabilities, we drew upon information gathered on the six mission reviews. We also used examples from our other published reports on major DOD modernization programs to illustrate our findings. For information on current and projected capabilities of potential adversaries, we reviewed reports of the Central Intelligence Agency, Defense Intelligence Agency, and Arms Control and Disarmament Agency and discussed threat information with intelligence agency personnel.

To assess information being developed for the Secretary of Defense on joint air power requirements and aggregate capabilities of the services to meet those requirements, we evaluated the JROC and its supporting joint warfighting capabilities assessment (JWCA) process, which assist the Chairman in carrying out his responsibilities. We discussed the functioning of this process and air power issues being examined with Joint Staff officials who oversee the process as well as assessment team representatives from the Joint Staff and OSD. We reviewed the May 1995 report by the independent Commission on Roles and Missions of the Armed Forces.<sup>2</sup> We also discussed the report with Commission staff and reviewed documents the Commission developed or acquired. We conducted this review from May 1994 through June 1996 in accordance with generally accepted government auditing standards.

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<sup>2</sup>Directions for Defense (Report of the Commission on Roles and Missions of the Armed Forces, May 24, 1995).

# U.S. Air Power Is Formidable and Improving

While force downsizing may give the appearance of a loss in capability, the United States continues to retain in its conventional inventory about 5,900 modern fighter and attack aircraft, including 178 long-range bombers and 1,732 attack helicopters, and over 1,500 specialized support aircraft. It also has growing inventories of advanced precision air-to-air and air-to-ground weapons for its combat aircraft to carry and an expanding arsenal of accurate long-range surface-to-surface missiles to strike ground targets. Inventory levels for the aircraft included in our review are shown in appendix II.

DOD has spent billions of dollars in recent years to make its current frontline combat aircraft and helicopters more efficient and effective. These enhancements include improved navigation, night fighting, target acquisition, and self-protection capabilities as well as more aircraft capable of using advanced munitions. Specialized support aircraft used for air refueling and surveillance and reconnaissance, which are vital to the effectiveness of combat aircraft, have also been improved, while forces for suppressing enemy air defenses are being restructured. Additionally, advances in the ability of U.S. forces to identify targets and communicate that information quickly to combatant units should further enhance the capabilities of current forces.

## Combat Air Power Force Structure Has Been Changing

The size and composition of the U.S. combat air power force structure have changed considerably since fiscal year 1991, the year the Persian Gulf War ended. Cutbacks in the number of combat aircraft adopted by the Bush administration and further cutbacks by the Clinton administration in its 1993 Bottom-Up Review are scheduled to be completed in 1997. While the number of fighter and attack aircraft, including B-1B bombers and attack helicopters, is being reduced about 28 percent from 1991 levels, other new and emerging elements of combat air power, such as long-range missiles and theater air defense forces, have grown in number and capability. Specialized support aircraft have experienced varying levels of change in their inventory.

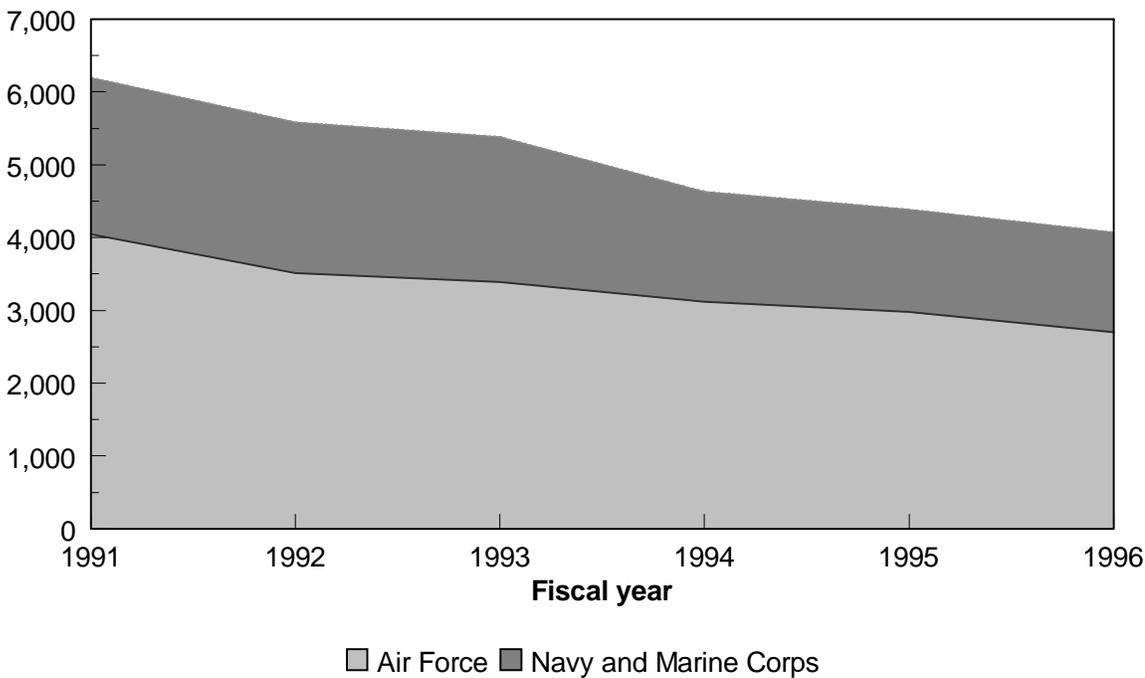
## Fighter and Attack Aircraft Inventories Are Smaller

Changes in aviation needs since the end of the Cold War, coupled with cuts in defense spending, have led DOD to reduce its combat aircraft inventory. These changes have been most pronounced for Air Force, Navy, and Marine Corps fixed-wing fighter and attack aircraft and Air Force bombers—from about 6,400 in 1991 to about 4,160 in 1996. DOD considers about 65 percent of these aircraft as authorized to combat units to perform

basic combat missions and 35 percent of them as backup aircraft maintained for training, testing, maintenance, and attrition replacement reserves. Figure 2.1 shows the change in the total inventories of these types of aircraft from 1991 to 1996.

Figure 2.1: Changes in DOD Fighter and Attack Aircraft Inventory, Fiscal Years 1991 Through 1996

Aircraft inventory



Note: Figures are as of the end of the fiscal year. Figures for 1996 are projections.

This smaller combat force structure has been accomplished primarily by retiring older aircraft that are often expensive to operate and maintain, such as the Navy and Marine Corps A-6 medium bomber and A-7 light attack plane and the Air Force A-7, F-4 fighter, and F-111 strike aircraft. At the same time, many newer model aircraft have entered the fleet since the

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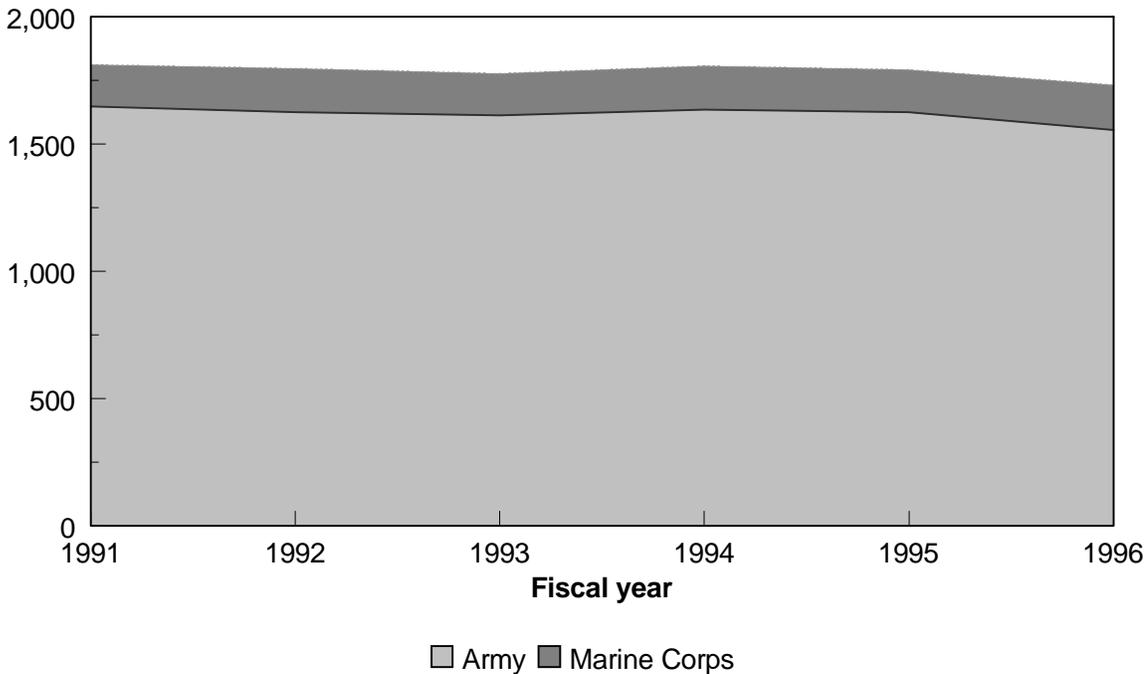
Persian Gulf War, including about 70 F-15E strike fighters, about 250 F-16 multimission fighters, and 200 F/A-18 fighter and attack aircraft. Changes in inventory levels by aircraft model are shown in appendix II.

Some important capabilities are being retired as these older aircraft are removed from the inventory. For example, the Navy will lose the payload, range, and all-weather capability of the A-6, and the Air Force will lose the speed and nighttime-precision bombing capability of the F-111. DOD believes, however, that it can do without these assets, given the dangers it expects to face and the high costs of upgrades, operations, and support that it can avoid by retiring these aircraft.

Attack helicopter inventories have fallen only 4 percent—1,811 to 1,732. Many of the older helicopters in the 1991 inventory have been replaced by newer more capable ones. The Army has added about 150 AH-64A Apache attack helicopters and nearly 300 OH-58D Kiowa Warrior armed reconnaissance helicopters to its fleet, and the Marine Corps has added over 70 AH-1W Cobras to its fleet. At the same time, both services have retired nearly 600 older AH-1 Cobras. Figure 2.2 shows attack helicopter inventory changes.

Figure 2.2: Changes in Army and Marine Corps Attack Helicopter Inventory

Attack helicopter inventory



Long-Range Missile Inventories Increasing

From fiscal years 1991 through 1996, about \$4.5 billion was appropriated to acquire long-range missiles, and the combined inventories of these missiles more than tripled from 1,133 to over 3,750. (This does not include conventional air-launched cruise missiles as inventory data on those weapons is classified.) The Navy Tomahawk land-attack cruise missile and the Army tactical missile system (ATACMS) have been used to attack a variety of fixed targets, including air defense and communications sites, often in high-threat environments. The Gulf War and subsequent contingency operations, including, most recently, September 1996 attacks on Iraqi military installations, have demonstrated that long-range missiles can carry out some of the missions of strike aircraft while they reduce the risk of pilot losses and aircraft attrition.

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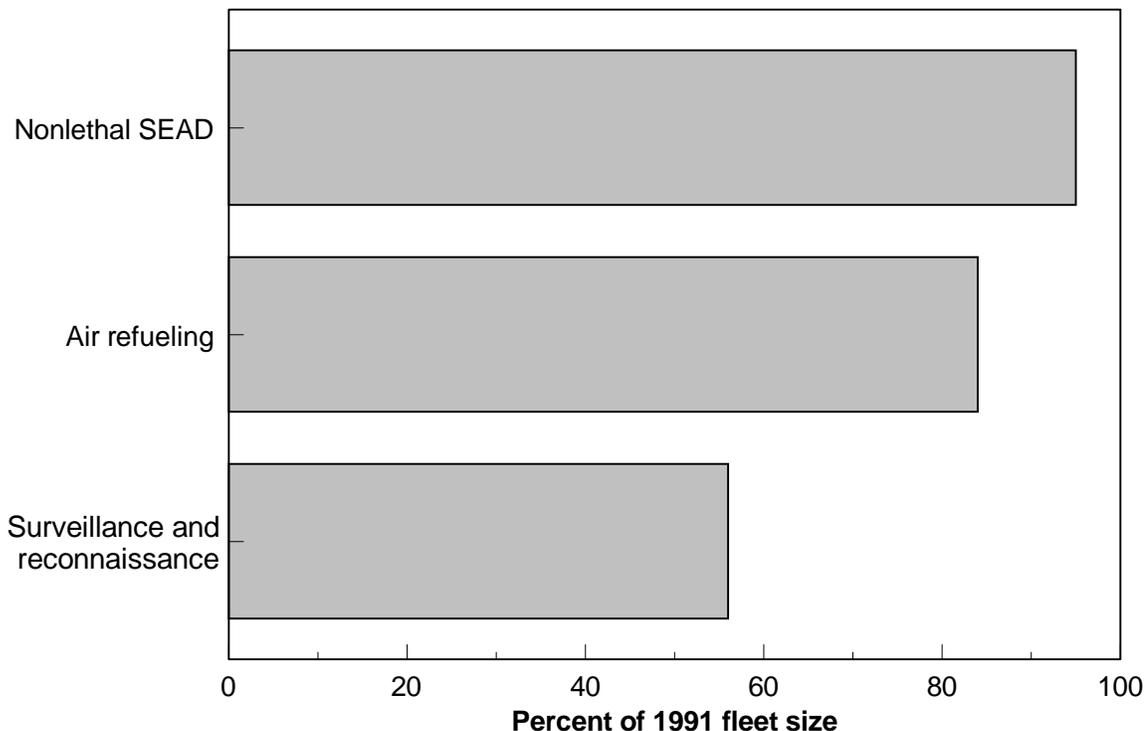
Although the number of ships (including attack submarines) capable of firing the Tomahawk grew only slightly—from 112 to 119—between 1991 and 1996, the Navy’s overall ability to fire these land-attack missiles has grown considerably. This is because a greater number of the ships capable of firing the missile are now surface ships and surface ships are able to carry more Tomahawks than submarines. The Navy has also demonstrated that the ATACMS can be fired successfully from surface ships. This offers the possibility of future enhancements to the Navy’s long-range missile capabilities.

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### Specialized Aircraft Inventories Have Experienced Varying Changes

DOD has not reduced its inventories of combat support aircraft used for nonlethal suppression of enemy air defenses (SEAD) and air refueling to the same extent as its fixed-wing combat forces. Inventory levels of specialized surveillance and reconnaissance aircraft have been reduced significantly but will be replaced by other reconnaissance assets. Figure 2.3 shows the changes in the inventory levels for these type of specialized aircraft.

Figure 2.3: Fiscal Year 1996 Specialized Aircraft Inventories as a Percent of Fiscal Year 1991 Inventories



The 5-percent reduction in specialized nonlethal SEAD aircraft reflects a decline of 10 aircraft (from 188 in fiscal year 1991 to 178 in fiscal year 1996); the 16-percent reduction in air refueling aircraft reflects a decline of 171 aircraft (from 1,046 to 875); and the 44-percent reduction in surveillance and reconnaissance aircraft reflects a decline of 415 aircraft (from 943 to 528). Most of the latter decline was due to the retirement of 184 Air Force RF-4C penetrating reconnaissance aircraft and 159 Navy P-3 antisubmarine warfare aircraft. The Air Force is making a transition to greater use of unmanned aerial vehicles to provide reconnaissance over enemy airspace and is equipping some F-16 fighters with sensors for such missions. The submarine threat to U.S. forces has diminished since the fall of the Soviet Union, reducing the need for antisubmarine warfare assets.

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## Combat Air Power Capabilities Continue to Be Improved

Though DOD's aviation force is smaller today, many of the combat aircraft are newer and more highly capable, allowing for greater flexibility in the employment of force across a broader range of operating environments. Acting on lessons learned from the Persian Gulf War and recommendations made by organizations such as the Defense Science Board, DOD has taken steps to make many of the remaining combat aircraft more capable, to include improvements such as autonomous navigation, night fighting, target acquisition, and self-protection and the employment of advanced munitions. Based on aircraft performance during the Gulf War, DOD has identified these capabilities as vital to the efficiency and effectiveness of attack aircraft. Advances in miniaturizing and modularizing subsystems have allowed DOD to enhance aircraft capabilities within existing airframes, overcoming concerns about space and weight limitations. Theater air defense systems are also being improved as concern increases about cruise and ballistic missiles armed with weapons of mass destruction. Similarly, DOD has enhanced the capabilities of specialized support aircraft and long-range missiles and plans further improvements to these systems.

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## Navigation, Night Fighting, and Targeting Capabilities of Combat Aircraft Continue to Be Enhanced

Congress has mandated that all DOD aircraft be able to use the global positioning system by the end of fiscal year 2000. This system allows for precise positioning and navigation across a broad range of missions, contributing to better situational awareness and more efficient use of forces. It also can be used to deliver munitions accurately in all weather conditions.

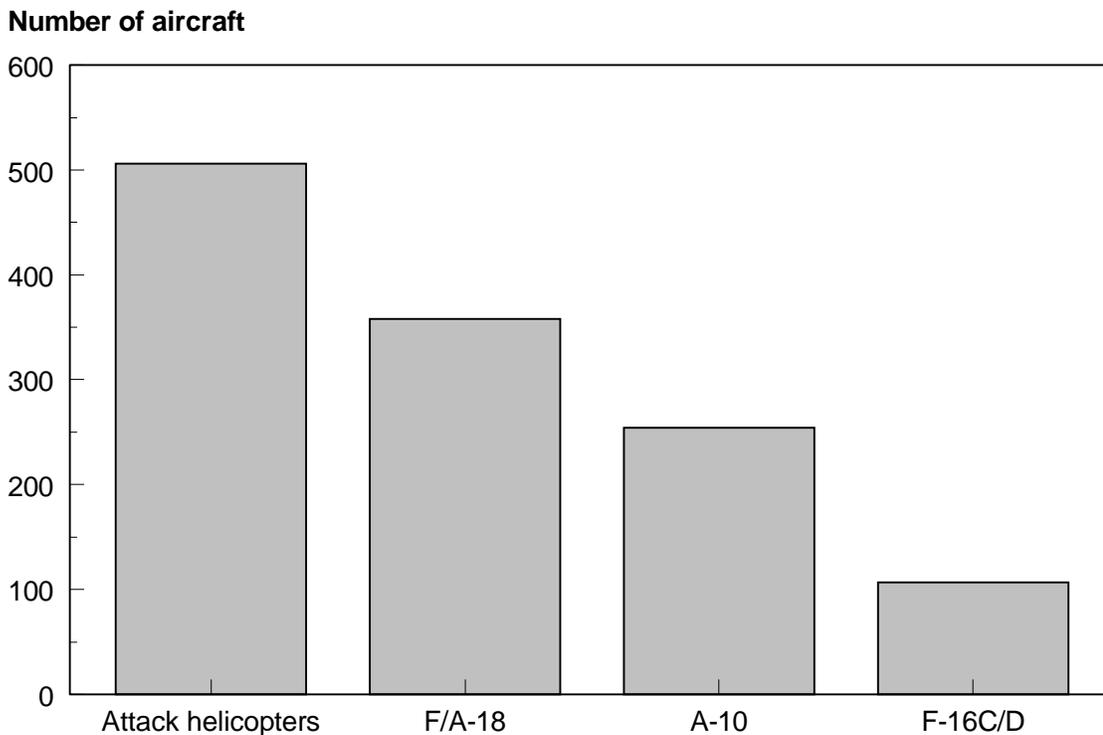
The number of aircraft with night fighting and target acquisition capabilities—both critical to the flexibility and effectiveness of combat aircraft—has increased significantly since fiscal year 1991. What constitutes a night fighting capability varies between platforms. During the Gulf War, night capability for the F-15E consisted of LANTIRN (low altitude navigation targeting infrared for night) targeting pods<sup>1</sup> only. These pods give pilots the ability to accurately target weapons day or night in adverse weather. Night-capable F-16s used during the Gulf War had LANTIRN navigation pods only. Today, F-15E and F-16 night capability consists of aircraft using both LANTIRN targeting and navigation pods. Gulf War night capability for the F/A-18 consisted of either a navigation or targeting forward-looking infrared pod and/or night vision goggles. No night-capable

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<sup>1</sup>Pods are detachable compartments that house electronic equipment used for such functions as targeting, navigation, and self-protection.

A-10 or AV-8B<sup>2</sup> Harrier aircraft were used during the Gulf War, but today A-10 pilots can use night vision goggles, and the night attack AV-8B is equipped with a navigation forward-looking infrared pod, and its pilots are equipped with night vision goggles. The number of night-capable helicopters has grown by more than 500 as more Apaches and Kiowa Warriors have entered the Army fleet and more AH-1W Cobra helicopters have entered the Marine Corps fleet. The change in night fighting capability since 1991 for selected aircraft types is shown in figure 2.4.

Figure 2.4: Increase in Night Fighting Capability Since Fiscal Year 1991



Today, more than 600 F-15Es and F-16s can use all or part of LANTIRN for night fighting. The Air Force plans to equip 250 F-16s with cockpit changes that will enable their pilots to use night vision goggles to complement the LANTIRN capability. Inventories of night-capable F/A-18 aircraft have grown

<sup>2</sup>Night-capable AV-8B aircraft were in the inventory at the time of the Gulf War. However, since pilots had not been trained in the use of the system, no night-capable AV-8Bs were used in the war.

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by more than 350 from 1991 to 1996, as DOD invested hundreds of millions of dollars in forward-looking infrared pods. More than 250 A-10 attack aircraft have been equipped for night operations. Although about 355 night-capable Navy A-6 and Air Force F-111F aircraft will be gone from the inventory by the end of fiscal year 1996, overall, DOD increased the number of night-capable combat aircraft by over 900. Beginning in 1996, many Navy F-14 aircraft started receiving LANTIRN and night vision cockpit modifications.

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### Self-Defense Capabilities of Combat Aircraft Are Being Improved

To enhance the survivability of attack aircraft, the services are equipping them with new self-protection jammers, upgraded radar warning receivers, and increased expendable countermeasures. In past work, we have noted performance problems with many of these systems. In addition, the Air Force is currently adding towed decoys to further enhance the survivability of its F-16s. Also, the Marine Corps plans to (1) add a missile warning system to its AV-8B and AH-1W aircraft to alert aircraft crews of a missile attack and (2) install the combined interrogator transponder on its F-18C/D aircraft to enable crews to identify other aircraft beyond visual range as either friendly or hostile. This identification capability is expected to reduce the incidence of fratricide. During the Gulf War, only the Air Force F-15 had this capability.

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### More Combat Aircraft Can Use Advanced Munitions

Equipping aircraft with the subsystems needed to employ advanced munitions is a critical force enhancement that DOD considers necessary to successfully execute its military strategy. DOD is making a sizable investment in such weapons. For example, it estimates it will spend over \$15 billion on five major precision-guided munitions (PGM) for its combat aircraft—the joint stand-off weapon (JSOW), the joint direct attack munition (JDAM), the Longbow Hellfire missile, the sensor fused weapon, and the joint air-to-surface standoff missile. Additionally, other PGMs for aircraft valued at nearly \$4 billion entered the inventory from 1992 through 1996.

More than nine times as many F-16s and, with the growth in F-15E inventory, one-and-a-half times as many F-15Es can employ PGMS in 1996 than could do so in 1991.<sup>3</sup> Overall, DOD estimates it has about twice as many aircraft capable of employing these types of weapons as it did during the Gulf War. The Hellfire missile has given more Army and Marine Corps helicopters a PGM capability. Future PGM development will concentrate on

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<sup>3</sup>For these purposes, a PGM capability is the autonomous ability to employ laser-guided munitions.

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developing standoff weapons. Although some PGM capability is being lost through retirement of the Air Force F-111F and Navy A-6E, DOD expects to retain roughly the current level of capability into the next century.

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### New Threats Force Growth in Air Defense

In response to the growing threat of theater ballistic missiles that are used in regional conflicts and can be armed with weapons of mass destruction, DOD is increasing funding to upgrade existing and planned air defense systems—a critical component of U.S. air superiority forces—and plans more advanced developments as the threat evolves. The Army's Patriot PAC-3 and upgrades to the Navy's area defense system will provide the near-term response to this threat. Upgrades to the Air Force E-3 and Navy E-2C surveillance and reconnaissance aircraft should also enhance capabilities to counter the long-range cruise missile threat through improved detection of cruise missiles en route to their targets. The Space-Based Infrared System is also being developed to aid in missile warning and missile defense. DOD plans to spend over \$6 billion during the next 5 years to develop future theater missile defense systems, including the theater high-altitude air defense system.

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### Long-Range Missiles Offer More Capability

Since the Gulf War, the Navy has improved its Tomahawk missile's operational responsiveness, target penetration, range, and accuracy. It has added global positioning system guidance and redesigned the warhead and engine in the missile's block III configuration that entered service in 1993. The Navy will upgrade or remanufacture existing Tomahawk missiles with (1) jam-resistant global positioning system receivers and an inertial navigation system to guide the missile throughout the mission and (2) a forward-looking terminal sensor to autonomously attack targets. These missiles are expected to enter service around 2000.

The ATACMS block IA, scheduled for delivery in fiscal year 1998, is an upgrade that will nearly double the range of the missile and increase its accuracy. More advanced versions of the ATACMS—block II and IIA—will use the brilliant anti-armor submunition, which is scheduled to enter service after the turn of the century. This submunition will give the missile the ability to acquire, track, and home on operating armored vehicles deep into enemy territory.

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## Specialized Aircraft Are Receiving Upgrades

The services are also selectively upgrading their specialized aviation assets for surveillance and reconnaissance, SEADS, and air refueling. Coupled with force restructuring, DOD expects these upgrades to enhance combat operations and expand opportunities to perform joint operations and provide cross-service support.

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## Surveillance and Reconnaissance Capabilities Are Being Improved

DOD has identified battlefield surveillance as a critical force enhancement needed to improve the capabilities, flexibility, and lethality of general purpose forces and ensure the successful execution of the National Military Strategy. The Air Force and Navy have improved existing sensors that enhance the capability of current surveillance and reconnaissance aircraft—the U-2R, RC-135V/W, and EP-3E—to provide intelligence support to combat forces. Heading the list of battlefield surveillance improvements, as shown in the Secretary of Defense’s annual report, is the E-8C Joint Surveillance Target Attack Radar System. With its synthetic aperture radar and moving target indicator, this system is designed to provide wide area, real-time information on the movement of enemy forces to air and ground units. Also, DOD has invested hundreds of millions of dollars, and plans to invest about \$1.5 billion more over the next 5 years, to develop and procure unmanned aerial vehicles. DOD expects that these vehicles will provide complementary battlefield reconnaissance and reduce the need for manned reconnaissance aircraft to penetrate enemy airspace.

The Air Force is improving its E-3 and the Navy its Hawkeye E-2C aerial surveillance and control aircraft in their roles as early warning and airborne command and control platforms. For the E-3, \$220 million was appropriated for fiscal year 1996 to improve the aircraft’s capabilities. Annual modification expenditures for the E-2C more than doubled in 1995 from those in 1991, despite a shrinking inventory. The Air Force RC-135 and Navy EP-3E signals intelligence aircraft are also being upgraded to improve the collection and dissemination of intelligence data.

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## DOD Is Restructuring Its Electronic Warfare Forces

SEAD—the synergistic use of radar and communications jamming and of destruction through the use of antiradiation missiles—is recognized to be a critical component of air operations, as it improves the survivability of other U.S. aircraft in combat areas. In establishing funding priorities, DOD has decided to retire certain Air Force SEAD aircraft—the F-4G and EF-111A jammer—and replace them with a new Air Force system, the high speed anti-radiation missile (HARM) targeting system on the F-16C, and an

existing Navy electronic warfare aircraft, the EA-6B. We expressed serious concerns about the prudence of these decisions in an April 1996 report, as the decisions were made without an assessment of how the cumulative changes in SEAD capabilities would affect overall warfighting capability.<sup>4</sup> Although DOD recognizes that it must adjust tactics and operations to account for performance differences between current and replacement systems, it believes that it can meet the Air Force's SEAD needs into the next century by selectively upgrading the EA-6B and the HARM targeting system.

When the Air Force completes the retirement of its most capable lethal SEAD aircraft, the F-4G, at the end of fiscal year 1996, it will primarily rely on 72 F-16C aircraft equipped with the HARM targeting system. However, the EA-6B, which will replace the EF-111 in the Air Force's nonlethal SEAD role, can also target and fire HARM missiles. It also has a communications-jamming capability that will allow it to supplement the Air Force's heavily burdened communications jammer, the EC-130H Compass Call. The Air Force has also decided to upgrade its EC-130H fleet to meet new threats.

Recognizing that too few EA-6B aircraft may be available to meet both Air Force and Navy needs, DOD plans to retain 12 EF-111s in the active inventory through the end of 1998, when additional upgraded EA-6Bs should be available. Though the performance of the two platforms is not the same, and the multiservice use of the same platform will entail some logistics support challenges, the Chairman of the Joint Chiefs of Staff believes that retiring the EF-111 represents a "prudent risk" that DOD can take to more fully fund higher priority needs. DOD believes the SEAD mission is important and will retain about 140 radar and communications jamming aircraft and over 800 aircraft able to fire antiradiation missiles in its force structure.

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## Cross-Service Air Refueling Capability Continues to Grow

From the end of 1991 through 1996, the Air Force will have replaced the engines on 126 KC-135 tankers at a cost of over \$20 million per aircraft. These reengined aircraft offer up to 50 percent greater fuel off-load capacity and quieter, cleaner, and more fuel-efficient performance with lower maintenance requirements. The Air Force is considering the same upgrades to about 140 more KC-135s.

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<sup>4</sup>Combat Air Power: Funding Priority for Suppression of Enemy Air Defenses May Be Too Low (GAO/NSIAD-96-128, April 10, 1996).

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Funding has been programmed to field a multi-point refueling capability that is expected to enhance cross-service operations. About \$100 million has been appropriated to modify 20 KC-10 and 45 KC-135R tankers to carry wing pods that will enable these Air Force aircraft to refuel Navy and Marine Corps aircraft. About \$160 million is needed to complete the KC-135 modifications. In 1991, no operational KC-10 or KC-135 tankers had this capability.

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## Integration and Interoperability Offer Enhancement Across Mission Areas

There has been debate as to whether the success of the coalition air forces during the Gulf War was an evolutionary or revolutionary advancement in the conduct of air warfare. While many combat technologies—stealth, night fighting, and PGMS—proved valuable, delays in the processing of intelligence and targeting information, and difficulty in communicating that information to the forces that could use it, minimized the full impact of advanced combat technologies. The Chairman of the Joint Chiefs of Staff has stated that the development of a “system of systems”—the integration of intelligence, surveillance, and reconnaissance with precision force through the more rapid processing and transfer of targeting and other information—offers the greatest enhancement in joint warfighting capability.

The Defense Science Board reported in 1993 that improvements in the effectiveness of combat aircraft would be fastest and most significant not through the purchase of new aircraft but through improvements to the interoperability and integration of existing assets.<sup>5</sup> DOD believes the ability of sensor platforms to transfer target information quickly to air, ground, and naval units armed with PGMS will act as a force multiplier, resulting in greater lethality and possibly a reduction in force structure and munitions requirements. The \$2 billion Joint Tactical Information Distribution System, for example, will net together command and control centers, sensor platforms, fighter aircraft, and surface air defense units to improve performance in the high density air combat environment, providing near real-time secure data and voice communications from sensor to shooter platforms. The Defense Airborne Reconnaissance Office is developing imagery processing standards to enable the processing of imagery from multiple sensors. Satellite communications systems being fielded provide secure communications for command authorities to command and control tactical and strategic forces of all services at all levels of conflict. The Navy’s cooperative engagement capability is being developed to integrate surface and air defenses, across service lines, over land and sea. The goal

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<sup>5</sup>Report of the Defense Science Board Task Force on Tactical Air Warfare, Nov. 30, 1993.

is to link all air defense forces to provide the faster transfer of targeting information.

Advanced munitions will also offer benefits across mission lines. By reducing sortie requirements and allowing for weapons delivery beyond the range of enemy air defenses, advanced munitions could possibly reduce the need for air refueling as well as dedicated SEAD. The Defense Science Board noted in its 1993 report that during the Gulf War, a ton of PGMS typically replaced 12 to 20 tons of unguided munitions for many types of targets on a tonnage-per-target-kill basis, thereby reducing tactical aircraft sorties and airlift requirements. Also, for each ton of PGMS, the Board estimated that as much as 35 to 40 tons of fuel could be saved due to the decrease in overall air operations.

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## Conclusions

The downsizing of U.S. forces in recent years has not necessarily translated into a loss of combat air power. While the number of combat aircraft has been reduced, these reductions have been largely offset by an expanded group of assets and capabilities available to the combatant commands. Capabilities have improved because (1) a larger percentage of the combat aircraft force is now able to perform multiple missions; (2) key performance capabilities of combat aircraft, such as night fighting, are being significantly enhanced; and (3) the growth in inventories of advanced long-range missiles and PGMS is adding to the arsenal of weapons and to the options available to attack targets. Moreover, the continuing integration of service capabilities in such areas as battlefield surveillance; command, control, and communications; and targeting should enable force commanders to further capitalize on the aggregate capabilities of the services and maintain extensive air power capabilities despite force-level reductions.

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# Capabilities of Potential Adversaries Are Limited and Will Likely Be Slowly Improved

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Potential adversaries<sup>1</sup> possess two types of capabilities that constitute a threat to U.S. air power accomplishing its objectives: a defensive (air defense) capability using aircraft and surface-based air defense forces and an offensive attack capability employing aircraft and cruise and ballistic missiles. The current air defense capabilities of potential adversaries, in terms of both aircraft and air defense systems, are unlikely to prevent U.S. air power from achieving its military objectives. The conventional offensive threat is judged to be low until at least early in the next century. Furthermore, efforts by potential adversaries to modernize their forces will likely continue to be inhibited by declines in the post-Cold War arms market, national and international efforts to limit proliferation of conventional arms, and the high cost of advanced weapons. These adversaries are also experiencing shortfalls in training, maintenance, and logistics, and many of them have weaknesses in their military doctrine.

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## Current Threats to U.S. Air Power Are Limited

Potential regional adversaries currently possess defensive and offensive weapons considered technologically inferior to U.S. forces. Improvements in these capabilities is dependent on the acquisition of weapons and technology from outside sources.

The current air defense capabilities of potential adversaries have limitations. Regarding aircraft, these nations have only small quantities of modern fighters for air defense. The bulk of their air forces are older and less capable, and their fleets are not expected to be bolstered by many modern aircraft. Similarly, for their surface-to-air defense forces, these nations tend to rely on older systems for high-altitude long-range defense and to use the more modern and effective systems, when available, at low altitudes and short ranges. The most prevalent threats are assessed to be overcome by U.S. aircraft with the use of tactics and countermeasures. Furthermore, the location of the most threatening assets tends to be known.

For offensive operations, like defense forces, the bulk of potential adversaries' aviation forces, which may comprise significant numbers, are older and less capable aircraft. The same assessment applies to long-range missile capabilities. Some potential adversaries possess significant quantities of ballistic missiles, but they tend to be of low technology and of limited military use. The potential land-attack cruise missile capabilities of these nations are low and are not expected to increase in sophistication

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<sup>1</sup>Potential adversaries were identified through discussions with DOD representatives. We have intentionally not identified these countries to keep this report unclassified.

until the middle of the next decade, if at all. Though the threat to military forces from conventionally armed missiles is low, the possibility that such weapons could be used for political purposes—and possibly armed with nuclear, biological, or chemical warheads—may affect the employment of U.S. forces.

Air defense is a high priority of potential adversaries, and it is believed most potential adversaries are trying to improve their effectiveness and survivability by upgrading existing systems, purchasing more modern weapons, and using camouflage and decoys. These improvements, if achieved, could delay U.S. combat air power from achieving air superiority quickly and cause higher U.S. and allied casualties. These nations would also like to improve their aviation and ballistic and cruise missile capabilities. However, they currently lack the capability to develop and produce the advanced systems that would allow them to significantly enhance air defense and long-range offensive capabilities. Therefore, advances will likely be confined to upgrades of existing equipment and the possible acquisition of advanced air defense systems from outside sources. Several factors, however, make that prospect less likely. Among these are (1) the modern arms market, which has changed since the end of the Cold War; (2) the high cost of modern weapons, given potential adversaries' economic capability; and (3) a growing global conventional arms control environment.

In technical comments on this report, DOD noted that important advances are being made in potential threats, in particular in advanced surface-to-air missile systems such as the SA-10. DOD said these threats, which are either in development by potential adversaries or available for sale on the international market, are expected to significantly affect U.S. capabilities to employ air power in the future. We do not discount these potential threats. However, DOD's projections of the ability of potential adversaries to employ such systems, known weaknesses of future threat systems, the acquisition of advanced standoff weapons for U.S. aircraft, and planned improvements to existing U.S. forces, when taken together, suggest that this threat is manageable. Furthermore, in subsequent discussions, DOD clarified that it did not intend for its comment to suggest that U.S. electronic warfare systems could not defeat future threats but that DOD prefers to continue to maintain a variety of capabilities, including additional stealth aircraft, to meet its objectives.

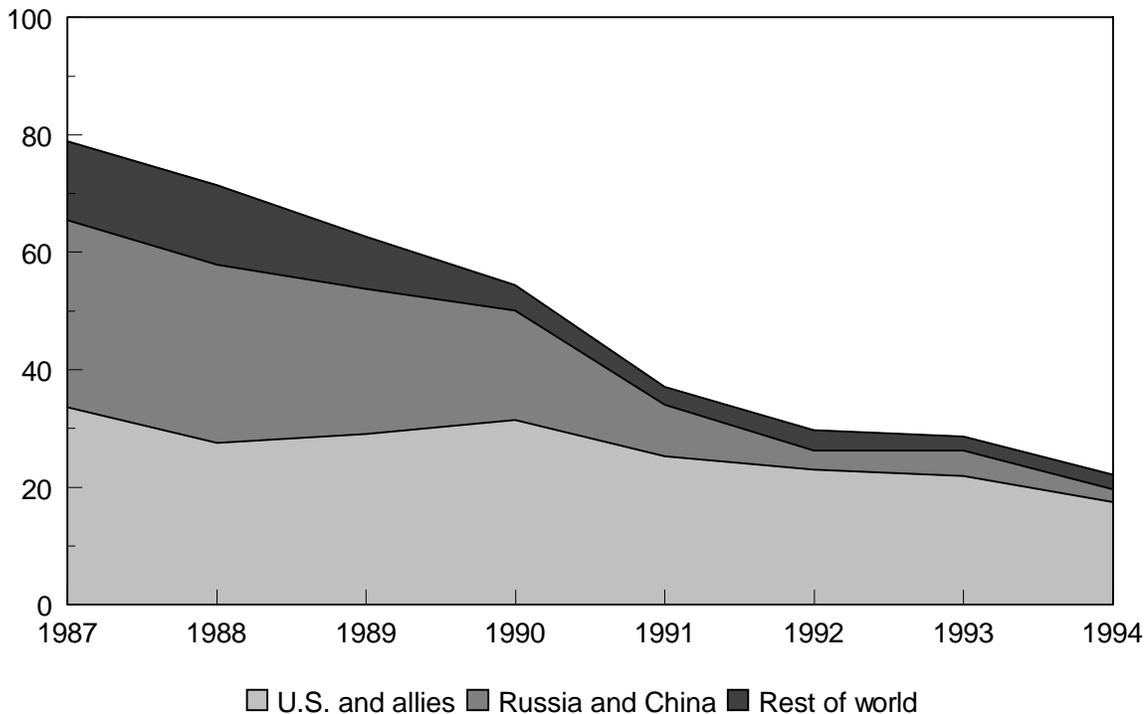
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## Arms Transfers Are Down in a Market Now Dominated by United States and Its Allies

The volume of arms transfers has fallen significantly in recent years and is not expected to reach its former levels any time soon. The principal nations selling and buying arms are the United States and its allies. Since potential adversaries depend on foreign technology to improve their capabilities, changes in the arms market could have a substantial effect on their ability to modernize their forces.

The value of the cross-border transfer of conventional arms fell by more than two-thirds from 1987 to 1994—from almost \$79 billion to \$22 billion in 1994 dollars worldwide, according to the latest available data from the U.S. Arms Control and Disarmament Agency (ACDA). The share of the international arms market held by the former Soviet Union, now shown as Russia, and China has fallen from a combined 40 percent to about 10 percent over the same period. At the same time, the share of the arms market held by the United States and several close allies has grown from 43 percent to 79 percent of all transfers (See fig. 3.1).

Figure 3.1: Trend in the Worldwide Transfer of Conventional Arms (Constant 1994 Dollars in Billions)



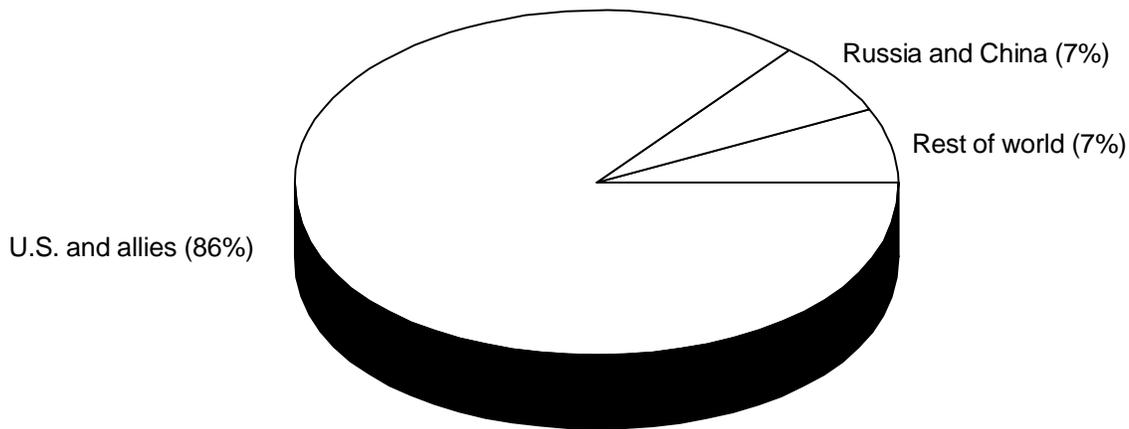
Source: *World Military Expenditures and Arms Transfers, 1995*, ACDA.

During the Cold War, the Soviet Union was a primary supplier of arms to the Third World, often providing weapons without charging for them. Now Russia generally requires payment, often in hard currency, for the weapons it transfers. The latest available ACDA data show worldwide Soviet Union/Russian transfers fell from \$23.1 billion in 1987 to \$1.3 billion in 1994. China also reduced its arms exports over that period.<sup>2</sup> Agreements for future deliveries also fell for Russia and China from the levels of the 1980s. However, Russia has increased the value of its agreements for future weapons deliveries since 1992.

<sup>2</sup>An August 15, 1996, Congressional Research Service report on conventional arms transfers shows an increase in transfers in 1995 over 1994. The percentage of the market held by Russia and China increased to 13 percent. The United States and its allies remained the dominant suppliers of arms and developing countries friendly to the United States were the principal recipients.

While overall arms transfers have fallen, those who have been buying have shown a preference for American and Western European equipment. Buyers prefer proven high quality weapons that are accompanied by good logistics support. For the most recent 3-year period available, 1992 to 1994, the arms market in terms of actual arms transfers has been dominated on the seller side by the United States and a few of its North Atlantic Treaty Organization (NATO) allies, and on the buyer side by allies of the United States in Europe, the Middle East, and East Asia. Transfers to the Middle East by supplier are shown in figure 3.2.

Figure 3.2: Arms Transfer Deliveries to the Middle East by Source (1992-94)



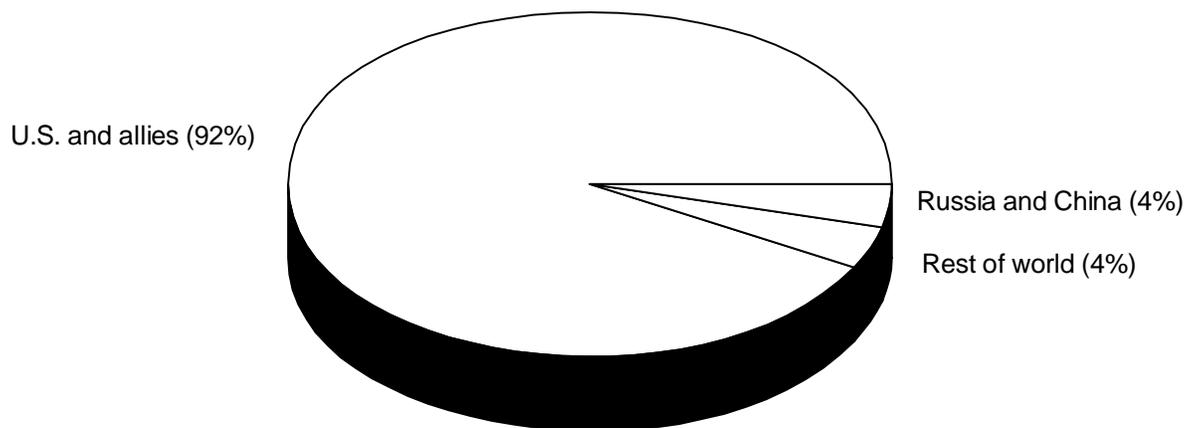
Source: *World Military Expenditures and Arms Transfers, 1995*, ACDA.

As figure 3.2 shows, 86 percent of the value of actual deliveries of conventional arms to the Middle East for the period shown originated from the United States and four close allies—the United Kingdom, France, Canada, and Germany—and were primarily to members of the Gulf War coalition. Only about 14 percent came from Russia, China, and other

sources, and some of that total also went to U.S. Gulf War allies in the Middle East.

The pattern for arms sales agreements for future deliveries is similar; that is, the United States and its NATO allies are the dominant suppliers (see fig. 3.3).

Figure 3.3: Agreements for Future Deliveries to the Middle East by Source (1992-94)



Source: *World Military Expenditures and Arms Transfers, 1995*, ACDA.

From 1992 to 1994, almost 92 percent of the value of sales agreements for future conventional arms deliveries to the Middle East were made by the United States, the United Kingdom, France, and Germany. Only 8 percent of agreements for future Middle East deliveries originated from Russia, China, or the rest of the world.

The decline in transfers has been accompanied by the contraction of the arms industries of many weapons exporters in terms of both production and development. Arms manufacturing nations have tended to reduce the size of their own armed forces and their arms production capabilities since

the Cold War ended. Development programs have been slowed in many cases, and major weapon production programs have been subject to delay, reduction, or cancellation. Although arms producers want to continue exports to protect domestic jobs and reduce the cost of modernizing their own forces, they are presently finding few large buyers. Arms deliveries to India have fallen substantially and transfers to Pakistan have fallen since 1990. The buying spree of America's Persian Gulf allies has also slowed. At the same time, potential adversaries that may desire advanced weapons have not been obtaining them or placing orders with producers, in part because of economic constraints and internationally imposed limits on arms transfers.

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### High Costs and Export Restrictions May Limit Advances in Capability

While the development of more capable weapons is likely to continue, the ability of potential adversaries to obtain these weapons in large numbers is not assured. The cost of modern high technology weapons continues to grow, while the ability of these countries to afford such systems is constrained. Additionally, international efforts to restrict arms and technology proliferation have been increasing in terms of both the types of technology targeted and the number of exporting nations agreeing to restrictions.

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### Weapons Prices Increase While Potential Adversaries' Economies Stagnate

The high technology weapons that could seriously threaten U.S. air power are expensive, no matter what the source. For example, each aircraft that is part of the original Eurofighter 2000 tactical aircraft contract is projected to cost about \$75 million. An advanced surface-to-air system like the Patriot PAC-3 costs over \$100 million per battery. Nations that depend on export sales of selected commodities to finance their militaries or that have closed economies could find it much harder to afford high technology systems. The more likely course for these nations is to upgrade their existing equipment, either by mixing new components with their old systems or through other upgrade programs from arms suppliers. Although such attempts could offer new challenges to the United States and its allies, they would be less threatening than more modern equipment.

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### International Agreements Could Inhibit Capability Enhancements

Part of the National Military Strategy entails increasing cooperation with regional allies while containing regional powers not friendly to the United States and its allies. Conventional arms control is part of this strategy. Some international agreements/collaborations and domestic weapons export policies are designed to limit the opportunities for regional powers

to acquire advanced weapons. For example, the United Nations imposed sanctions on more than one nation in the 1990s, prohibiting transfers of weapons or commercial technology to these nations that could be used for military purposes. ACDA data show no measurable arms transfers to nations under U.N. sanctions since sanctions were imposed.

A key collaboration, the Wassenaar Arrangement, took effect in December 1995. This arrangement—the goal of which is complete disclosure of arms transfers—has 28 member nations. This cooperative effort replaces the Coordinating Committee for Multilateral Export Controls (COCOM), the Cold War regime that limited arms and technology transfers to Soviet bloc nations. The Wassenaar Arrangement has identified several nations that are to be excluded from arms exports or exports of potential dual-use technology—that is, technology with military as well as commercial applications. It is hoped that this agreement will allow major weapons producers to target volatile regions for restraint in the transfer of arms. Although Wassenaar does not constitute a formal treaty, major arms manufacturing countries have agreed to its arms transfer restrictions as part of their country's domestic arms transfer policies.

A third major arms control agreement, the Missile Technology Control Regime, was created in 1987 and is designed to specifically limit the transfer of missiles—including cruise and ballistic—and missile-related and dual-use technology. Original members were major NATO partners and Japan, but the Regime has been expanded to include more than 20 nations.

The combination of U.N. sanctions, the Wassenaar Arrangement, and the Missile Technology Control Regime represent an obstacle to potential adversaries that seek to acquire highly capable weapons and advanced technology. Again, ACDA data indicate sharply reduced transfers to these nations in recent years, and there are no indications these agreements will be relaxed significantly in the near future. In fact, according to the State Department, the United States intends to strengthen the Wassenaar Arrangement. Given that Wassenaar members are the major arms producers and that potential adversaries generally lack an indigenous advanced weapon development and production capability, the potential for significantly inhibiting potential adversaries from improvements in capability is, to a great extent, in these member nations' hands.

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## A Capable Force Requires More Than Advanced Weapons

Potential adversaries have not demonstrated the commitment to logistics support and training that the U.S. military considers necessary to achieve the best performance possible from the equipment available. The advanced age of the equipment currently in the inventories of these nations increases support requirements, and chronic shortages of spare parts lower their expected effectiveness. Many of the more modern systems are likely to be highly complex and difficult to maintain. Generally, the sophistication and intensity of training that potential adversaries provide their operators is considered well below U.S. standards. Furthermore, most of these countries have no experience training against an opponent like the United States.

Another factor affecting the capabilities of potential adversaries is their military doctrine. No matter how effective their weapons may be, the centralized command and control that most potential adversaries exercise over the operations of their military forces further affects the effective and efficient use of the forces.

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## Conclusions

Although potential adversaries possess capabilities that constitute a threat to the ability of U.S. air power to accomplish its objectives, the severity of these threats, particularly in relation to the formidable capability of U.S. forces to counter them, appears to be limited. Efforts by these countries to modernize their forces will likely be inhibited by declines in the post-Cold War arms market, national and international efforts to limit the proliferation of conventional arms, and the high cost of advanced weapons. Additionally, shortfalls in training, maintenance, logistics, and military doctrine further constrain the capabilities of potential adversaries.

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# Air Power Modernization Programs Are Not Based on Joint Assessments

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DOD's plans for modernizing its air power forces call for spending several hundred billion dollars on new air power programs to further enhance U.S. capabilities that are already formidable. These programs, which are likely to be a significant challenge to pay for, are proceeding even though DOD has not sufficiently assessed joint mission requirements. Without such assessments, the Secretary of Defense does not have the information needed to accurately assess the need for and priority of planned modernization programs.

A definitive answer as to the necessity of planned investments is not possible without knowing how aggregate service capabilities meet joint war-fighting requirements. However, our past GAO work and information developed on our mission reviews suggest that some planned investments may not be worth the costs. For some programs, the payoff in added mission capability—considering the investment required and the limited needed capability added—is not clearly substantial, as required by the National Military Strategy. For others, the security environment and/or assumptions under which the programs were justified have changed. In other cases, there are viable and less costly alternatives to planned investments.

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## Planned Investments Pose a Financial Challenge

Each military service has major acquisition programs to modernize its combat air power forces. Many of them were initiated to counter a global Soviet threat. These programs include not only combat aircraft but also programs to acquire long-range missiles to strike land targets; advanced weapons combat aircraft can use; theater missile defense forces; surveillance and reconnaissance assets; and command, control, and communications systems. Appendix III summarizes the costs of DOD's major combat air power acquisition programs. If these programs proceed as planned, their total program costs, including allowances for inflation, are estimated to exceed \$300 billion, about \$60 billion of which has already been spent. Not included in these totals is the cost of the Joint Strike Fighter, the program that is likely to be the most costly of all. DOD has only published initial research, development, test and evaluation cost data on this program, which is projected to provide about 2,978 advanced joint strike-fighter aircraft for the Navy, Air Force, and Marine Corps beginning in the next decade. The Congressional Budget Office (CBO) estimates a total acquisition cost, based on DOD's goals for the program, of \$165 billion in 1997 dollars.

The largest segment of DOD's planned air power investments reflects the plan to replace aging fighter and attack aircraft. With the large defense buildup of the 1980s and the changed national security environment of the 1990s, in recent years DOD has significantly cut back on the procurement of such aircraft. These aircraft, which include the F-15s, F-16s, and F/A-18C/Ds for which production lines remain open, are highly capable aircraft. Nevertheless, DOD plans to replace them with more advanced and costly systems, but not necessarily on a one-for-one basis. The costs to replace the older model aircraft with new ones are projected to be quite substantial in the next decade. In fact, DOD estimates that it will spend about as much to procure combat aircraft in the next decade as it spent during the 1980s force buildup, even with the figures adjusted for inflation.

DOD's force modernization plans are based on several assumptions. First, DOD assumes that the defense budget top line will stop its decline in fiscal year 1997 and begin to rise and that funding for procurement will increase to \$60.1 billion in fiscal year 2001. Second, DOD assumes it will achieve significant savings through base closures and other infrastructure reductions and "outsourcing" many support activities. Additionally, DOD assumes that savings will be realized from overhauling the defense acquisition system. There are reasons to be skeptical about the practicality of modernizing U.S. air power under these assumptions. An annual \$60 billion procurement appropriation in fiscal year 2001 would be over 40 percent higher than that in the fiscal year 1997 budget. In each of its last three future years defense programs, DOD has postponed planned increases in its procurement budget request. As for infrastructure savings, our review of DOD's 1996-2001 Future Years Defense Program identified only negligible net savings accruing over the program's 6 years.<sup>1</sup> Acquisition reform savings may also prove to be elusive. For example, although DOD expects to accrue substantial savings by reforming contract management and oversight requirements, we reported in April 1996 that initial results of such reforms indicate such savings may be minimal.<sup>2</sup>

In testimony before Congress in June 1996, senior DOD officials reported that military service and OSD officials reviewed the affordability of the three largest combat aircraft programs—the F-18E/F, F-22, and Joint Strike Fighter. According to the testimony, these officials determined that the overall planned investment in these programs was within historical

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<sup>1</sup>Defense Infrastructure: Budget Estimates for 1996-2001 Offer Little Savings for Modernization (GAO/NSIAD-96-131, Apr. 1996).

<sup>2</sup>Acquisition Reform: Efforts to Reduce the Cost to Manage and Oversee DOD Contracts (GAO/NSIAD-96-106, Apr. 1996).

norms and affordable within service priorities. Neither the Chairman of the Joint Chiefs of Staff nor CBO is as optimistic. The Chairman, in October 1995, said DOD's tactical aircraft procurement plans call for much greater than expected resources in the out-years. CBO, in testimony before the Congress in June 1996, said its analysis of DOD's fighter procurement plans suggest that they may not be affordable and that the programs will probably need to be scaled back.<sup>3</sup> Using DOD goals for the three programs, CBO estimated that the Air Force and the Navy would need about \$9.6 billion annually over the 2002-2020 period to buy fighter and attack aircraft, but may only have about \$6.6 billion available to spend. The agency also described the aging of the fighter fleet as "worrisome," suggesting that future leaders could have less flexibility in dealing with funding cuts.

DOD makes decisions on the affordability of its modernization plans in an environment that encourages the "selling" of programs, along with undue optimism, parochialism, and other compromises of good judgment. Once DOD initiates major acquisition programs, such as the F-22, F/A-18E/F, and the Joint Strike Fighter, it has historically made a nearly irrevocable commitment to the program, unless the program experiences a catastrophe. Once begun, programs develop constituencies in the services, OSD, industry, the user community, and Congress—constituencies that give a momentum to programs and make their termination an option rarely considered by DOD.

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## **DOD Has Planned Major Investments Without Adequately Defined Requirements**

DOD has done little analysis to establish joint mission area requirements for some specific combat air power missions or to plan the aggregate capabilities needed by each of the services to meet those requirements. Studies that may provide such information on several key air power missions have been initiated but were not completed at the end of our review. Without such analyses, decisions on the need for new weapon systems, major modifications, and added capabilities evolve from a requirements generation process that encourages each service to maintain its own view of how its own capabilities should be enhanced to meet warfighting needs.

In its May 1995 report, the Commission on Roles and Missions of the Armed Forces substantiated what our reviews of defense programs have

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<sup>3</sup>Modernizing Tactical Aircraft, Statement of Cindy Williams, Assistant Director, National Security Division, Congressional Budget Office, before the Subcommittee on Military Research and Development and the Subcommittee on Military Procurement, Committee on National Security, House of Representatives, June 27, 1996.

found, that “each Service is fully engaged in trying to deliver to the CINCS what the Service views as the best possible set of its specific capabilities—without taking into account the similar capabilities provided by the other Services.” The analyses used to generate weapon system requirements for new acquisition programs are most often narrowly focused. They do not fully consider whether the capabilities of the other services to perform a given mission mitigate the need for a new acquisition or major modification.

Significant limitations in study methodologies and the use of questionable assumptions that can result in overstated requirements are apparent in three DOD studies examining requirements for bombers in conventional conflicts. None of the studies, for example, assessed whether fighters or long-range missiles could accomplish the mission more cost-effectively than bombers. One of the studies, done by the Air Force and used by it to estimate and justify bomber requirements, assumed that only bombers would be available to strike time-critical targets during the first 5 days of a major regional conflict. This assumption seems to conflict with DOD planning guidance, which assumes that Air Force and Navy combat aircraft would arrive early enough in theater to attack targets at the outset of a major regional conflict.

Under DOD’s requirements generation system, DOD components (principally the military services) are responsible for documenting deficiencies in current capabilities and opportunities to provide new capabilities in mission needs statements. If the potential material solution could result in a major defense acquisition program,<sup>4</sup> the JROC is responsible for review and validation of the need. Validated needs statements are to be reviewed by the Defense Acquisition Board, which is responsible for identifying possible material alternatives and authorizing concept studies, if necessary. OSD’s Director of Program Analysis and Evaluation is responsible for reviewing any analyses of alternatives for meeting the validated need.

While DOD has decision support systems, such as the requirements generation system and the planning, programming, and budgeting system, to assist the senior officials in making critical decisions, reviews like those done by the JROC and by OSD staff do not have the benefit of information on joint mission requirements and the aggregate capabilities of the services to

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<sup>4</sup>An acquisition program that is not a highly sensitive program and that is estimated to require research, development, test, and evaluation expenditures of more than \$355 million (in fiscal year 1996 constant dollars) or procurement expenditures of more than \$2.135 billion (in fiscal year 1996 constant dollars).

meet those requirements. Therefore, such reviews can provide little assurance that there is a valid mission need, that force capabilities are being properly sized to meet requirements, and that the more cost-effective alternative has been identified. Additionally, because many weapon system modernization programs fall outside the major defense acquisition program definition, many service modernization initiatives are not validated by the JROC.<sup>5</sup>

DOD has defended its requirements generation system, saying the services have valid complementary requirements in many of the mission areas. In its opinion, the overlapping capabilities acquired add to the options available to U.S. leadership in a crisis and allow combatant commanders to tailor a military response to any contingency. We acknowledge that flexibility is important to respond to contingencies and that a certain amount of overlapping capability is needed. The question is whether, in the post-Cold War era, the United States needs or can afford to sustain current levels of redundancy. Advanced combat systems are not only costly to acquire, they are also expensive to operate and maintain. For example, DOD data indicates that the annual direct cost to operate and support an F-14 in the active inventory is about \$2.2 million, an F-18 about \$1.7 million, an F-15 about \$3.2 million, and an F-16 about \$2.2 million. These figures include the cost of the aircrews.

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### **Some Investments Are Proceeding Without Clear Justification**

The lack of information on joint mission needs and aggregate capabilities to meet those needs prevents a definitive answer as to whether DOD's air power investment programs are justified. Based on our past reviews of individual air power systems and available information we collected on our six mission reviews, we believe that DOD is proceeding with some major investments without clear evidence that the programs are justified. When information is viewed more broadly, some programs appear to add only marginally to already formidable capabilities in some areas. Also, the changed security environment has lessened the need for some programs, and for others, viable, less costly alternatives appear to exist.

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### **Additional Capability May Not Be Needed in Some Mission Areas**

Whether DOD's planned investments represent the most cost-effective mix of air power assets to accomplish combat air power missions is unclear because past DOD assessments have largely skirted the question of sufficiency. However, available information suggests that existing

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<sup>5</sup>For example, only 3 of the 12 close support programs we reviewed were classified as major defense programs subject to JROC review. The other nine programs, with estimated costs totaling over \$5 billion for fiscal years 1996 through 2001, were not reviewed.

capabilities in mission areas like interdiction, air-to-air combat, and close support are quite substantial even without further enhancements.

In the interdiction mission area—the diverting, disrupting, delaying, or destroying of enemy forces before they can be used against U.S. forces—both current capabilities and those expected to be in place in 2002 are sufficient to hit all identified ground targets for the two major regional conflicts with considerable margin for error. Based on service data on current and planned interdiction capabilities and Defense Intelligence Agency and service threat assessments that identified enemy targets, the services already have at least 10 ways to hit 65 percent of the thousands of expected ground targets in two major regional conflicts. Some targets can be hit by 25 or more combinations of aircraft and weapons. In addition, service interdiction assets can provide 140 to 160 percent coverage for many types of targets.

Despite this level of capability, the services are modifying current platforms and developing new weapon systems that will provide new and enhanced interdiction capabilities over the next 15 to 20 years at a total estimated cost of over \$200 billion. These enhancements include the F/A-18E/F attack fighter, the ATACMS, major modifications to the B-1B bomber, more PGMS and improvements to aircraft and weapons, and acquisition of the Comanche armed reconnaissance helicopter. The Joint Strike Fighter, which is not included in the \$200 billion estimate, will also provide interdiction capabilities.

In the area of air-to-air combat—a critical mission to achieve and retain air superiority—over 600 combat-designated F-14 and F-15 fighter aircraft are dedicated to this mission. This number far exceeds the quantity and quality of fighter aircraft potential adversaries are projected to have. In addition, about 1,900 other combat designated multirole fighter aircraft, such as F-16s and F/A-18C/Ds, while not dedicated to air superiority missions, are very capable air superiority fighters. These aircraft could assist F-14s and F-15s to defeat enemy fighters before being used for other missions such as interdiction and close support. The capabilities of these fighter aircraft have also been enhanced extensively with the procurement of advanced weapons—particularly over 7,400 advanced medium range air-to-air missiles—and through continuing improvements to these weapons and to support platforms, such as airborne warning and control system aircraft, that help the fighters locate, identify, track, and attack enemy aircraft at great distances. Despite the unparalleled U.S. air-to-air capabilities, the Air Force plans to begin to replace its F-15s with 438 F-22 fighters in 2004, at

an estimated average unit procurement cost of about \$111 million. Release of long-lead production funding for the first lot of four F-22s is scheduled for fiscal year 1998. DOD expects that the F/A-18E/F and the Joint Strike Fighter will further add to U.S. air superiority capabilities.

In the area of close support, the military services collectively possess a substantial inventory of weapon systems. These assets include five types of artillery, four types of attack helicopters, five types of fixed-wing aircraft, and 5-inch naval guns on cruisers and destroyers. DOD data indicates that in the year 2001, the U.S. military will have about 3,680 artillery systems, 1,850 attack helicopters, and 2,380 multirole fixed-wing aircraft that can provide close support as well as an unspecified number of naval 5-inch guns. The services plan to spend over \$10.6 billion to further improve these capabilities between fiscal years 1996 and 2001, including major improvements to the Marine's AV-8B close support aircraft and the Army's Apache attack helicopter. Additional major acquisition programs that could further enhance close support capabilities include the F/A-18E/F strike fighter, the Joint Strike Fighter, and advanced munitions to attack ground targets.

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### **Changed Security Environment Appears to Lessen Need for Some Programs**

Given the current security environment, the extensive aggregate capabilities U.S. forces now possess may lessen the need to proceed with several key modernization programs as currently planned, since the capabilities being acquired are not urgently needed. The two most prominent examples are the planned production of F-22 air superiority fighters and modifications to the B-1 bombers.

The Air Force is proceeding with plans to begin to acquire F-22 air superiority fighter aircraft in fiscal year 1999 and rapidly accelerate the pace of production to 48 aircraft per year. This is being done despite the services' unmatched capabilities in air-to-air combat. The Air Force initiated the F-22 (advanced tactical fighter) program in 1981 to meet the projected threat of the mid-1990s. Since the F-22 entered engineering and manufacturing development, the severity of the projected threat in terms of quantities and capabilities has declined. Instead of confronting thousands of modern Soviet fighters, U.S. air forces now expect to confront potential adversaries that have few fighters with the capability to challenge the F-15, the current U.S. frontline fighter. Further, our analysis, reported in March 1994, indicated that the current inventory of F-15s can be economically maintained in a structurally sound condition until 2015 or later. Thus, the planned rapid increase in the rate of production to achieve

initial operational capability in 2004 may be premature.<sup>6</sup> Further, because F-22s are expected to be substantially more effective than F-15A-Ds, replacing the F-15A-Ds on a one-for-one basis, as currently planned, may be unnecessary. DOD estimates the average procurement cost of an F-22 will be about \$111 million.

In technical comments on a draft of this report, DOD said that several current or soon-to-be-fielded fighters are at parity with the F-15, but provided no further details. Although we recognize that several foreign aircraft being developed will be at rough parity with the F-15C, it is uncertain how quickly the aircraft will be produced. It is also unlikely that large quantities will be available and affordable by potential adversaries.

In the case of the B-1B bomber, DOD needs to reexamine the need to keep this aircraft in the inventory and make several billion dollars of modifications to it. With the Cold War over and a reduction in the requirement for a large fleet of manned penetrating bombers that can deliver nuclear warheads in a global nuclear war, the B-1B will no longer be part of the U.S. nuclear force. The Air Force plans to modify its fleet of 95 B-1Bs to increase their conventional capability and sustainability. The B1Bs can currently carry only the 500-pound unguided, general-purpose bomb and cluster munitions; but after the modification, the B-1Bs will be able to carry more types of conventional ordnance. Several factors make the continued need for B-1Bs questionable. First, DOD considers its current capability sufficient to meet its requirement to interdict enemy targets identified in two major regional conflicts. Second, our analysis of Air Force targeting data indicates the modified B-1B would strike a very small percentage of the Air Force's designated targets. Third, combatant command officials stated they would use far fewer B-1Bs than DOD cites as necessary. Fourth, other Air Force and Navy aircraft can launch the same munitions as the modified B-1B and others.

Retiring the B-1B would increase U.S. forces' dependence on other capabilities and the risk that some targets might not be hit as quickly. However, it is reasonable to expect that the targets assigned to the B-1 could be hit by other assets, including missiles such as ATACMS and Tomahawk. If DOD retired the Air Force's 95 B-1Bs immediately, it could save almost \$5.9 billion in budget authority over the next 5 years. These

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<sup>6</sup>Tactical Aircraft: F-15 Replacement Is Premature as Currently Planned (GAO/NSIAD-94-118, Mar. 1994) and Tactical Aircraft: Concurrency in Development and Production of F-22 Aircraft Should Be Reduced (GAO/NSIAD-95-59, Apr. 1995) discuss the issues of the F-15's capabilities and concurrency planned in the development and production of the F-22.

issues surrounding the B-1 are discussed in our report on the bomber force, which we expect to issue shortly.

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### Viability, Less Costly Program Alternatives May Be Available

Analysis suggests that viable, less costly program alternatives may be available for some mission areas. The Navy's planned purchase of 1,000 F/A-18E/F fighter aircraft at an estimated cost (as of Dec. 1995) of \$81 billion is a case in point. The F/A-18E/F is intended to replace F/A-18C/D aircraft and to perform Navy and Marine Corps fighter escort, interdiction, fleet air defense, and close support missions. The aircraft's origins are traceable to a 1988 study that identified upgrade options to the F/A-18C/D in performing these missions. However, the operational deficiencies in the F/A-18C/Ds that the Navy cited in justifying the F/A-18E/F either have not materialized as projected or can be corrected with nonstructural changes to the F/A-18C/D. Furthermore, the F/A-18E/F's operational capabilities will only be marginally improved over the F/A-18C/D. In addition, while the F/A-18E/F will have increased range over the F/A-18C/D, the F/A-18C/D range will exceed the range required by the F/A-18E/F's system specifications, and the F/A-18E/F's range increase is achieved at the expense of its combat performance. Also, modifications to increase the F/A-18E/F's payload have created a problem when weapons are released from the aircraft that may reduce the F/A-18E/F's potential payload capability.

Over the years, the Navy has improved the operational capabilities of the F/A-18C/D so that procuring more of them, rather than the new model F/A-18E/F aircraft, could be the most cost-effective approach to modernizing the Navy's combat aircraft fleet in the mid-term. In this regard, additional upgrades, should they be needed, could be made to the F/A-18C/D, which would further improve its capabilities. These upgrades include a larger fuel tank for more range and strengthened landing gear to increase carrier recovery payload. Then, for the long term, the Joint Strike Fighter could be an alternative to the F/A-18E/F. The Joint Strike Fighter's operational capabilities are projected by DOD to be equal or superior to the F/A-18E/F at a lower unit cost.

The Army's Comanche helicopter program provides a second example. In initiating the program, the Army sought a family of lightweight, multipurpose helicopters whose justification centered on practicality rather than the threat. The program was expected to inexpensively replace a fleet of Vietnam-era helicopters with new helicopters that would be up to 50 percent cheaper to operate and support. Within these economical

confines, the new helicopters were to offer as good a technical performance as possible. Subsequently, however, specific requirements were developed, and the program emerged as it is today—a threat-based program to yield the next generation high-performance helicopter armed with 14 Hellfire missiles at a cost significantly higher than that of the Apache, the Army's most advanced and costly helicopter.

At least three alternative helicopters are available that we believe could, if upgraded, perform many of the Comanche's missions. The Super Cobra, for example, is a twin-engine aircraft that the Marine Corps intends to equip with a four-blade rotor. It could perform armed reconnaissance and attack missions, and the new rotor will substantially improve its flight performance. A second alternative, the Longbow Apache, performs many of the missions that the Comanche is being developed to perform, and it was ranked higher for operational effectiveness than the basic Comanche in a 1990 DOD comparison of the aircraft. Finally, the Army's Kiowa Warrior is a much improved version of the early model Kiowa, which can perform armed reconnaissance missions. Many users believe the lethality, low observability, deployability, and speed of the Kiowa Warrior, when combined with certain upgrades or doctrinal changes, would resolve many of the deficiencies the Comanche is expected to resolve.

DOD continues to support both the F/A-18E/F and the Comanche programs. It said it is convinced that the fundamental reasons to develop the F/A-18E/F remain valid, but provided us no new data or information to support this. Regarding the Comanche, DOD believes it considered a wide range of alternatives before deciding on the Comanche. DOD's positions are discussed in our reports on the F/A-18E/F and Army aviation modernization.<sup>7</sup>

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## Conclusions

DOD faces considerable funding challenges in modernizing its forces for the next century under its current plans. This is particularly so with fighter and attack aircraft, where the replacement of many aircraft scheduled for retirement in the next decade with costly new aircraft would require substantial resources. To ensure a viable combat-ready force in the future, DOD needs to deliberately consider the need for and priority of major investments in relation to joint requirements and aggregate service capabilities. Each represents a major long-term commitment and therefore

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<sup>7</sup>Navy Aviation: F/A-18E/F Will Provide Marginal Operational Improvement at High Cost (GAO/NSIAD-96-98, June 18, 1996) and Army Aviation: Modernization Strategy Needs to Be Reassessed (GAO/NSIAD-95-9, Nov. 21, 1994).

requires close and continual examination to ensure a substantial payoff in added capability.

The absence of joint mission area analyses makes it difficult to assess whether planned investments in air power modernization are warranted. Without a full understanding of joint requirements and aggregate service capabilities in each mission area, the Secretary of Defense does not have the information needed to make decisions about whether existing capabilities are sufficient to meet anticipated challenges or whether additional investments are justified. The fact that DOD is proceeding with modernization programs whose justifications do not, on the surface, appear to be compelling illustrates the need for continuing comprehensive mission area assessments. No program—regardless of the investment already made—should be considered irrevocable—but should be continually examined as circumstances and capabilities change.

Although we have limited our illustrations in this chapter to major modernization programs, smaller programs would also benefit from mission area assessments. These assessments would help DOD determine the validity of the need for all types of new weapons investments as well as procurement quantities and also decide whether to reduce or retire existing assets.

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# Decisions on Air Power Programs and Priorities Require Comprehensive Joint Assessments

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Through key legislation, Congress has sought to better integrate the capabilities of the military forces, provide for improved military advice to the Secretary of Defense apart from that provided by the military services, and strengthen the joint orientation of DOD. Although DOD has improved its joint orientation in many respects, the individual services continue to heavily influence defense decisions, particularly those related to investments in weapons. Stronger military advice from a joint perspective is needed if the Secretary is to objectively weigh the merits not only of combat air power but also of other defense programs.

Although DOD has begun to assess selected warfighting capabilities from a joint perspective, this process is still evolving and has not yet led to any identifiable reductions in overlap and duplication among deployed air power forces. Nor has it led to specific platform proposals to deal with the high cost of recapitalizing DOD's combat air power or specific proposals to transfer resources among services to meet higher priority needs. Better analytical tools and data are needed to improve joint warfighting assessments, and certain other obstacles must be overcome to reduce overlaps and achieve a stronger joint orientation.

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## Key Defense Legislation Has Sought to Better Integrate the Military Forces

Collectively, the National Security Act of 1947 and the Goldwater-Nichols Department of Defense Reorganization Act of 1986 sought to better integrate the military forces, provide a channel for military advice to the Secretary of Defense apart from that of the individual services, and strengthen the joint orientation of the Department. Although DOD officials believe that the Department has improved its joint orientation in many respects, some of the underlying conditions that led to this legislation continue to surface.

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## National Security Act of 1947 Sought Integration of Military Capabilities

In many respects, the circumstances leading Congress to enact the National Security Act of 1947 parallel those surrounding the current debate over defense spending and modernization priorities. The military services' lack of unified policy and planning during World War II, when the Army and Navy existed as separate military organizations reporting to the President, led to this major piece of defense legislation. This act created a National Military Establishment (later renamed the Department of Defense) to provide policy direction over the individual services and formally established the Joint Chiefs of Staff. In enacting this legislation, Congress sought to better integrate the distinct military capabilities of the services. The services subsequently agreed in 1948 on their respective

functions. This agreement—termed the Key West Agreement—delineated services functions and was aimed at preventing unnecessary duplication.

During this period, intense interservice competition for drastically shrinking defense resources erupted. The primary debate centered on whether both the newly created Air Force and the Navy should have roles in strategic bombing. Although the Air Force was assigned this role in 1948, the Navy soon initiated a major effort to build a super aircraft carrier to launch strategic bombers from its decks. Service control over combat aviation, airlift, guided missiles, and air defense weapons also generated much debate. The question of whether the nation needed or could afford all of the weapons the services proposed when defense resources were declining was central to these debates.

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## **Goldwater-Nichols Legislation Attempted to Strengthen DOD's Joint Orientation**

Almost 40 years after the National Security Act sought to better integrate military capabilities, concerns over the need for a stronger joint orientation in the Department of Defense arose. Concerns about a perceived imbalance between service and joint advice ultimately led to the Goldwater-Nichols Department of Defense Reorganization Act of 1986 (Goldwater-Nichols). A major Senate Armed Services Committee report leading to the legislation pointed out that (1) the military services were not articulating DOD's strategic goals or establishing priorities; (2) the military services dominated the force planning, programming, and budgeting process; (3) the Joint Chiefs of Staff system was not yielding meaningful recommendations on issues affecting more than one service, and the services retained an effective veto over nearly every Joint Chiefs action; and (4) DOD's excessive functional orientation was inhibiting the integration of service capabilities along missions lines. This report concluded that inadequate integration could lead to unwarranted duplication, gaps in warfighting capability, and unrealistic plans.

Various provisions of the Goldwater-Nichols legislation were directed at correcting these lingering problems. For example, it designated the Chairman of the Joint Chiefs of Staff as principal military adviser to the President, National Security Council, and Secretary of Defense. This provided a channel for military advice apart from the military services. The Chairman was also given new responsibilities designed to improve resource decision-making, including advising the Secretary on program recommendations and budget proposals developed by the military departments and other DOD components.

Although DOD officials believe that progress has been made toward a stronger joint orientation within DOD, some of the key provisions of Goldwater-Nichols aimed at preventing unnecessary overlap and duplication have not had the intended effect. For example, to ensure reexamination of opportunities to reduce overlap and duplication, Goldwater-Nichols directed the Chairman, Joint Chiefs of Staff, to periodically report to the Secretary of Defense his recommendations on how the assigned functions of the armed services should be changed to avoid undue redundancy. The Defense Authorization Act for Fiscal Year 1993 added additional matters for the Chairman to consider in his report, including the extent to which the armed forces' efficiency would be enhanced by the elimination or reduction of duplication in capabilities of DOD components. The Chairman completed two reviews—the most recent in 1993—but neither has led to significant changes in service roles, missions, and functions involving combat air power.

Congressional dissatisfaction with the results of the Chairman's reviews was one factor leading it to direct DOD to establish an independent commission to review the allocation of roles, missions, and functions among the armed forces and to recommend how they should be changed. The ensuing Commission on Roles and Missions of the Armed Forces reported its findings in May 1995. Once again, some of the same problems that had led to the Goldwater-Nichols legislation nearly 10 years before surfaced. For example, the Commission observed that the primary problems in weapon system acquisitions were traceable to inadequacies in the early phase of the requirements determination process. In the Commission's view, the lack of a unified concept and analysis of warfighting needs was the critical underlying problem.

The Commission concluded in its report that joint thought and action needed to become a compelling reality throughout DOD if the objectives of Goldwater-Nichols were to be realized. It recommended various actions to improve the management structures and decision support processes related to DOD's requirements development and budgeting. A key conclusion in this regard was that the JROC and OSD staff needed to have a greater ability and willingness to address DOD needs in the aggregate. Accordingly, the Commission recommended that the JROC's charter over joint requirements formulation be strengthened. It also recommended that DOD increase the technical and analytic capacity of the Joint Staff to better assist the Chairman and Vice Chairman. The Secretary of Defense requested more study of several key Commission proposals. Many of these

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studies were still underway or the results were under consideration within DOD at the completion of our review.

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## New Oversight Process Has Had a Limited Impact

Since the spring of 1994, the Chairman and Vice Chairman of the Joint Chiefs of Staff have taken steps to implement a process to assess U.S. warfighting needs and capabilities from a joint perspective. This process, which has centered around the JROC, is intended to provide the Chairman, and ultimately the Secretary of Defense and the Congress, with a joint view on program and budget issues. Both the Chairman and Vice Chairman recognized that the requirements generation and resource allocation processes depended heavily on each service's assessment of its individual needs and priorities and that requirements had not been sufficiently reviewed from a joint perspective.

In response to these concerns, the JROC's role was expanded and a new process to assess warfighting capabilities from a joint mission perspective was established to support the JROC's deliberations. While this process has contributed to changes that should improve joint warfighting, its role is still evolving, and its impact on air power programs and budgets has been limited.

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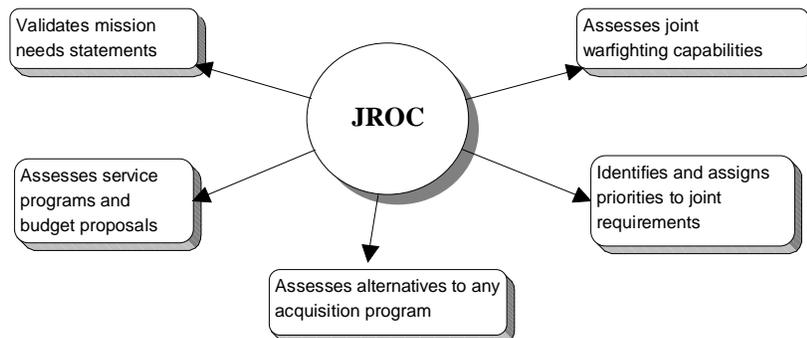
## JROC's Role Has Expanded

Between 1986 and 1994, the JROC served as the principal forum for senior military leaders to review and validate mission need statements for major defense acquisition programs. Approved mission statements are reviewed by the Defense Acquisition Board, which decides whether concept studies of solutions should be performed.

In early 1994, the Chairman of the Joint Chiefs of Staff directed the Vice Chairman to expand the JROC charter to more fully support the Chairman in executing his statutory responsibilities. In addition to validating mission needs statements for major defense acquisition programs, Council responsibilities now include assisting the Chairman in (1) assessing joint warfighting capabilities, (2) assigning a joint priority among major weapons meeting valid requirements, and (3) assessing the extent to which the military departments' program recommendations and budget proposals conform with established priorities. Under the Fiscal Year 1996 Defense Authorization Act, title 10 of U.S. Code was amended to include the JROC and its functions. The function of assigning priorities was revised and expanded through this legislation to include assisting the Chairman in identifying and assessing the priority of joint military requirements

(including existing systems and equipment), ensuring that the assignment of priorities conforms to and reflects resource levels projected by the Secretary of Defense. Additionally, the JROC's responsibilities were further expanded to include assisting the Chairman in considering the relative costs and benefits of alternatives to acquisition programs aimed at meeting identified military requirements. Figure 5.1 shows the JROC's expanded responsibilities.

**Figure 5.1: How the JROC Assists the Chairman**

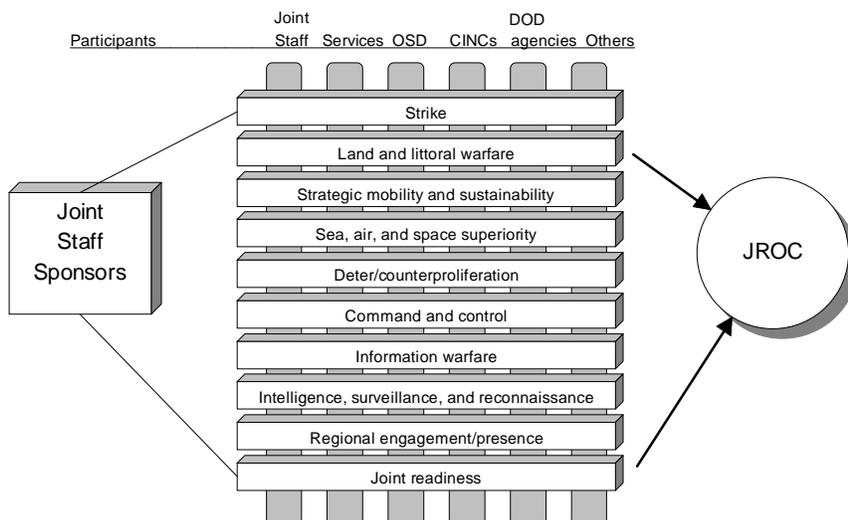


The Fiscal Year 1996 Defense Authorization Act also designated the Chairman of the Joint Chiefs of Staff as the Chairman of the JROC. Other Council members include an Army, Air Force, and Marine Corps officer in the grade of general and a Navy admiral. The Chairman can delegate his functions only to the Vice Chairman of the Joint Chiefs of Staff, who for years has chaired the Council. In executing its responsibilities, JROC does not vote, but rather develops a consensus, or unanimity, in the positions it takes.

**New Assessment Process**  
**Established to Improve**  
**Joint Perspective**

To assist the JROC in advising the Chairman on joint warfighting capabilities, the joint warfighting capability assessment (JWCA) process was established in April 1994. Under this process, 10 assessment teams have been established in selected mission areas (see fig. 5.2).

**Figure 5.2: Joint Warfighting Capability Assessment Areas**



As sponsors of the JWCA teams, Joint Staff directorates coordinate the assessments with representatives from the Joint Staff, services, OSD, combatant commands (CINCs), and others as necessary. The teams are organized separate and apart from the Joint Staff and report to the JROC, which decides which issues they will assess. The intent is for the JWCA teams to continuously assess available information on their respective joint capability areas to identify opportunities to improve warfighting effectiveness. A key word is “assess.” The teams do not conduct analytical studies to develop new information to support the JROC. Rather, they assess available information and then develop and present briefings to the JROC. The JWCA teams produce only briefings, not reports or papers that lay out in detail the pros and cons of any options identified to address the issue(s) at hand.

The Chairman uses the information from the JWCA team assessments to develop two key documents—the Chairman’s Program Recommendations, which contains his recommendations to the Secretary of Defense for consideration in developing the Defense Planning Guidance, and the Chairman’s Program Assessment, which contains alternative program recommendations and budget proposals for the Secretary’s consideration in refining the defense program and budget.

In expanding the JROC process, including the establishment of the JWCA teams, it was envisioned that the JROC would be more than simply another military committee on which members participate strictly as representatives of their services. Recommendations coming from the JROC would not simply reflect the sum of each service's requirements. Rather, the JROC, with the support of the JWCA process, would produce joint information the Chairman needs to meet his program review and assessment responsibilities and to resolve cross-service requirements issues, eliminate duplicative programs, and pursue opportunities to enhance the interoperability of weapon systems.

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**JWCA Process Has  
Improved Dialogue on  
Joint Issues**

The JWCA process has been in existence over 2 years and is still evolving. Representatives of both the Joint Staff and OSD believe that the process has led to more systematic and extensive discussions of joint issues among the top military leadership. They also believe that JWCA briefings have led to more informed and extensive discussions of joint issues within the JROC. Progress has been made on some interoperability issues as a result of the process. For example, in response to a JROC tasking, a JWCA team combined with Joint Staff elements to assess the interoperability of intelligence sensors and processors, fusion, and communication systems. According to the Chairman of the Joint Chiefs of Staff, the team's recommendations will improve the interoperability among the individual services' platforms so that data can be provided in a more timely manner to the battlefield.

JWCA teams have also, on at least one occasion, been used in conjunction with other DOD elements to study key issues for the Secretary of Defense. In 1994, in response to a request of the Deputy Secretary of Defense, the JROC chairman formed a study group using representatives of three JWCA teams and several offices within OSD to examine issues related to precision strikes on targets and required intelligence support. The study group briefed the JROC on its findings and recommendations concerning databases, battlespace coverage, joint targeting doctrine, battle damage assessment, and other areas. A key recommendation was that intelligence, surveillance, and reconnaissance and command, control, and communications considerations be fully integrated early into the weapon system acquisition process. To implement this recommendation, the group devised revisions to DOD acquisition regulations that have been adopted.

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**JWCA Process Has Not  
Tackled Controversial Air  
Power Issues**

While the new JWCA process has raised the level of attention and sensitivity to joint issues, we found little evidence that the process is identifying unnecessary or overly redundant air power capabilities, confronting the

challenge of modernizing the military's air power, or helping establish priorities among competing programs.

According to representatives from several JWCA teams, the teams have not been identifying tradeoffs among combat air power forces or programs to reduce redundancies. We were told that, unless specifically directed by the JROC, the JWCA teams are not empowered to develop such proposals. The primary example cited to us of an impact the JWCA teams had on reducing overlap among the services was DOD's decision to retire the Air Force's EF-111 radar jamming aircraft and consolidate the services' airborne radar jamming capabilities into one platform—the Navy's EA-6B. Documentation provided us, however, only indicates that the JWCA process became involved subsequent to the approval of the consolidation, when the Deputy Secretary of Defense asked the Vice Chairman of the Joint Chiefs of Staff to study the associated operational issues. The air superiority JWCA team performed the study, which included evaluating the performance of the EA-6B, developing an integrated operational concept for the consolidation, proposing a transition schedule, and assessing the requirement for upgrades to the EA-6B.

Joint Staff officials told us JWCA teams have not examined the affordability of individual weapon systems in their assessments. Moreover, according to one Joint Staff official, attempts to raise these larger, more controversial issues have not led to specific JWCA assessment mandates from the JROC. For example, the JWCA teams elevated recapitalization and affordability issues to the JROC in December 1995. At these meetings, the issue of the affordability of acquiring high-priced aircraft, particularly after the turn of the century under projected budgets, was raised. According to Joint Staff officials, the top 20 most expensive acquisition programs—half of them aircraft—were presented to the JROC during these meetings. Although the JROC and the services conceptually agreed on the need to scrutinize the cost of tactical aircraft, the JROC has not taken any concrete actions or directed the JWCA teams to further study the affordability issue.

Additionally, we found little evidence that the JROC, with the support of the JWCA process, has developed specific proposals to transfer resources from one service to another to meet higher priority needs. A review of Future Years Defense Program data also indicates no notable shifts in acquisition funding among the services between fiscal years 1994 and 2001. A key goal of the JROC, according to the Office of the Vice Chairman of the Joint Chiefs of Staff, is to enhance force capability by assisting the Chairman in proposing cross-service transfers of resources. Additionally, Joint Staff

officials told us the JWCA teams have not developed proposals to shift funding among programs to reflect higher priorities from a joint perspective.

In assessing the impact of the JROC and the JWCA process on combat air power, we examined two important ultimate outputs of the process—the Chairman’s Program Assessment and Program Recommendations to the Secretary of Defense. Under its broadened mandate, the JROC has been made a focal point for addressing joint warfighting needs. It is expected to support the Chairman in advising the Secretary by making specific programmatic recommendations that will, among other things, lead to increased joint warfighting capability and reduce unnecessary redundancies and marginally effective systems, within existing budget levels. However, in reviewing the Chairman’s 1994 and 1995 program assessments and 1995 program recommendations, we found little to suggest that this type of advice is being provided. The documents did not offer specific substantive proposals to reduce or eliminate duplication among existing service systems or otherwise aid in addressing the problem of funding recapitalization. In fact, the Chairman’s 1995 Program Assessment indicates an inability on the Chairman’s part, at least at that point, to propose changes in service programs and budgets. While the Chairman expressed serious concerns in his assessment about the need for and cost of recapitalizing warfighting capabilities and said that the power of joint operations allows for the identification of programs to be canceled or reduced, his advice was to defer to the services to make such choices.

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## **DOD Must Overcome Certain Obstacles to Achieve a Stronger Joint Orientation**

DOD must overcome several obstacles that have inhibited JWCA teams and others that try to assess joint mission requirements and the services’ aggregate capabilities to fulfill combat missions. In addition to scarce information on joint mission requirements and aggregate service capabilities discussed in chapter 4, impediments include (1) weak analytical tools and databases to assist in-depth joint mission area analyses, (2) weaknesses in DOD’s decision making support processes, and (3) the services’ resistance to changes affecting their programs.

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## **Better Analytical Tools and Data Are Needed to Improve Joint Assessments**

DOD officials acknowledge that current analytical tools, such as computer models and war games used in warfighting analyses, should be improved if they are to be effectively used to analyze joint warfighting. They told us these tools often do not accurately represent all aspects of a truly joint

force, frequently focus on either land or naval aspects, and often do not consider the contribution of surveillance and reconnaissance and command and control assets to the warfighter. Some models are grounded in Cold War theory and must be augmented with other evaluations to minimize their inherent deficiencies.

DOD representatives and analysts from the military operations research community also observe that there are serious limitations in the data to support analyses of joint capabilities and requirements. Presently, anytime DOD wants to study joint requirements, a database must be developed. Concerns then arise over whether the databases developed and used are consistent, valid, and accurate. Efforts have been made in the past to collect joint data and develop appropriate models for analyzing joint warfare. These efforts, however, fell short, as there was not a consistent, compelling need across enough of the analytic community to do the job adequately.

A current major initiative aimed at improving analytical support is the design and development of a new model—JWARS—that will simulate joint warfare. JWARS will seek to overcome past shortcomings and will include the contributions of surveillance and reconnaissance and command, control, and communication assets to the warfighter. This initiative was developed as part of DOD's joint analytic model improvement program because of the Secretary of Defense's concern that current models used for warfare analysis are no longer adequate to deal with the complex issues confronting senior decisionmakers. Under this program, DOD will upgrade and refine current warfighting models to keep them usable until a new generation of models to address joint warfare issues can be developed. The new models are intended to help decisionmakers assess the value of various force structure mixes. As part of this broad initiative, DOD also intends to develop a central database for use in mission area studies and analyses.

In addition to problems with models and data, the Roles and Missions Commission identified a need to improve analytical capabilities in both the Office of the Secretary of Defense and the Joint Staff. Commission staff said that there has been too much reliance on the services for analytical support and that the Joint Staff should improve its abilities to look broadly across systems and services in conducting analyses. Recognizing the need for more information and analytical support, the Joint Staff has contracted for studies to support the JWCA assessments. According to Joint Staff data,

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by the end of fiscal year 1996, DOD will have awarded about \$24 million in contracts to support the teams.

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### **Decision-making Support Process Limitations Create Problems**

In its May 1995 report, the Roles and Missions Commission faulted the decision support processes DOD uses to develop requirements and make resource allocation decisions. It cited a need for the JROC and OSD staff to have a greater ability to address DOD needs in the aggregate. The Commission also presented ideas and recommendations to improve DOD's decision-making processes to enable management to better develop requirements from a joint perspective. These included (1) changes to the information support network that would enable DOD to assess forces and capabilities by mission area and (2) changes to the weapons acquisition process that would enable joint warfighting concerns to be considered when requirements for new weapons are first being established. These and many other Commission proposals were still under assessment within DOD at the completion of our review.

DOD, in its comments on a draft of our report, indicated that it believes the OSD and Organization of the Joint Chiefs of Staff oversight of service programs and budgets is quite rigorous. Several OSD program analysts we interviewed did not share this view. They described the oversight as very limited and the JWCA process as contributing very little to programming and budgeting decisions. Roles and Missions Commission staff also stressed to us that, based on their years of experience in OSD, the Secretary needs stronger independent advisory support from the OSD staff.

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### **Desire to Have Consensus Can Inhibit Needed Changes**

DOD has reduced its force structure and terminated some weapon programs to reflect changes in the National Military Strategy and reduced defense budgets. But further attempts to cancel weapon programs and reduce unnecessary overlaps and duplications among forces are likely to generate considerable debate and resistance within DOD. Because such initiatives can threaten service plans and budgets, the tendency has been to avoid debates involving tradeoffs among the services' systems. The potential effects of program reductions or cancellations on careers, the distribution of funds to localities, jobs, and the industrial base also serve as disincentives for comprehensive assessments and dialogue on program alternatives.

The Chairman's 1995 Program Assessment indicates the difficulty the Chairman has had in identifying programs and capabilities to cancel or

reduce. While the Chairman recognized that the increasing jointness of military operations should permit additional program cancellations or reductions, he noted that the Joint Chiefs—despite the added support of the JROC and the JWCA process—had been unable to define with sufficient detail what should not be funded. The Chairman recommended that the Secretary of Defense look to the military services to identify programs that can be slowed or terminated. He said for this to happen, however, the services would have to be provided incentives. The Chairman recommended that the Secretary return to the services any savings they identify for application toward priority recapitalization or readiness and personnel programs.

Joint Staff officials indicated that the Chairman's reluctance to propose changes to major service programs may be attributable to the need for the Chairman to be a team builder and not be at odds with the service chiefs over their modernization programs. Adoption of the Chairman's proposal could lead the services to reduce or eliminate programs and otherwise more efficiently operate their agencies, including reducing infrastructure costs. However, it is difficult to appreciate how these unilateral decisions by the services will provide for the most efficient and effective use of defense resources to meet the needs of the combatant commanders. It should be remembered that studies and hearings leading up to the Goldwater-Nichols legislation observed that the need for the Joint Chiefs of Staff to reach consensus before making decisions clearly inhibited decisions that could integrate service capabilities along mission lines. The need to address this problem was one of the primary motivations behind Goldwater-Nichols.

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## Conclusions

While DOD acknowledges the need to consider joint requirements and the services' aggregate capabilities in defense planning, programming, and budgeting, its decision support systems have not yielded the information needed from a joint perspective to help the Secretary make some very difficult decisions. Measures intended to improve the advice provided by the Chairman of the Joint Chiefs of Staff have met with limited success. The Secretary does not have enough comprehensive information on joint mission requirements and aggregate capabilities to help him establish recapitalization priorities and reduce duplications and overlaps in existing capabilities without unacceptable effects on force capabilities. The Chairman would be in a better position to provide such advice if joint warfighting assessments examined such issues.

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**Chapter 5**  
**Decisions on Air Power Programs and**  
**Priorities Require Comprehensive Joint**  
**Assessments**

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Efforts are underway that could provide the Secretary of Defense, the Chairman of the Joint Chiefs of Staff, and other decisionmakers with improved information to make the difficult force structure and modernization choices needed. However, the desire to reach consensus with the service chiefs—or in the case of the JROC the practice of reaching consensus among its members—could present a formidable obstacle to efforts by DOD officials to make significant changes to major modernization programs and to identify and eliminate unnecessary or overly redundant capabilities. The Secretary of Defense and the Chairman of the Joint Chiefs of Staff need to be more willing to take decisive actions on modernization programs that do not provide a clearly substantial payoff in force capability.

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# Conclusions, Recommendations, and Agency Comments and Our Evaluation

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During the Cold War, the military services invested hundreds of billions of dollars to develop largely autonomous combat air power capabilities, primarily to prepare for a global war with the Soviet Union. The Air Force acquired bombers to deliver massive nuclear strikes against the Soviets and fighter and attack aircraft for conventional and theater-nuclear missions in the major land theaters, principally Europe. The Navy built an extensive carrier-based aviation force focused on controlling the seas and projecting power into the maritime flanks of the Soviet Union. The Army developed attack helicopters to provide air support to its ground troops. The Marine Corps acquired fighter and attack aircraft and attack helicopters to support its ground forces in their areas of operation. While the United States ended up with four essentially autonomous air forces with many similar capabilities, each also largely operated within its own warfighting domains.

Today, there is no longer a clear division of labor among aviation forces based on where they operate or what functions they carry out. Although many of the long-range bombers can still be used to deliver nuclear weapons, the air power components of the four services are now focused on joint conventional operations in regional conflicts and contingency operations. Most of the likely theaters of operation are small enough that, with available refueling support, all types of aircraft can reach most targets. And while the number of combat aircraft has been reduced, the reductions have been largely offset by an expansion in the types of assets and capabilities available to the combatant commanders. For example, (1) a larger percentage of the combat aircraft force can now perform multiple missions; (2) key performance capabilities of combat aircraft, such as night fighting, are being significantly enhanced; and (3) the inventories of advanced long-range missiles and PGMS are growing and improving, adding to the arsenal of weapons and options available to attack targets. Moreover, the continuing integration of service capabilities in such areas as battlefield surveillance; command, control, and communications; and targeting should enable force commanders to further capitalize on the aggregate capabilities of the services.

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## Conclusions

DOD has not been adequately examining its combat air power force structure and its modernization plans and programs from a joint perspective. The forces of the services are increasingly operating jointly and in concert with allies in a regional versus a global environment. However, DOD's decision support systems do not provide sufficient information from a joint perspective to enable the Secretary of Defense,

the Chairman of the Joint Chiefs of Staff, and other decisionmakers to prioritize programs, objectively weigh the merits of new air power investments, and decide whether current programs should continue to receive funding.

It is true that the overlapping and often redundant air power capabilities of the current force structure provide combatant commanders with operational flexibility to respond to any circumstance. The question is whether, in the post-Cold War era, the United States needs, or can afford, the current levels of overlap and redundancy. This is not easily answered because DOD has not fully examined the joint requirements for key warfighting missions areas or the aggregate capabilities of the services to meet those requirements. From our reviews of interdiction, air-to-air combat, and close support of ground forces, it is evident that U.S. capabilities are quite substantial even without further enhancement. For the interdiction mission, our analysis and the analysis of others showed that the services have more than enough capability to hit identified ground targets for the two major regional conflicts used in force planning. Planned investments in some cases may be adding little needed military capability at a very high cost.

While it may be desirable for DOD to scale back its air power modernization plans and reduce overlapping capabilities, the challenging question is, how. Such courses of action require tough choices, particularly when the military strategy is to win quickly and decisively in two nearly simultaneous major regional conflicts. Even with a more comprehensive understanding of joint requirements and the capabilities of the services to meet those requirements, the Secretary will likely continue to find it difficult to make decisions that could increase warfighting risks and affect programs, careers, jobs, and the industrial base. But without such an understanding, there may be little hope that these tough decisions will be made.

The need for improved joint warfighting information is recognized in DOD and provided much of the stimulus for the establishment of the joint warfighting capability assessment teams. A critical underlying need of these teams, or any assessment process, is objective comprehensive cross-service and cross-mission studies and analyses of joint requirements for doing key warfighting missions and the aggregate capabilities of the services to meet those requirements. Such analyses are very demanding and may require a considerable amount of military judgment. Nonetheless, they are vital input for better understanding how much capability is

needed to fulfill air power missions and what is the most cost-effective mix of air power assets to meet the needs of the combatant commanders within DOD's budgets. DOD has initiated several broad studies that should provide added information. These include a deep attack/weapons mix study that includes interdiction and close support operations, a reconnaissance force mix study, and an electronic warfare mission area analysis.

DOD has not routinely reviewed the justification for weapon modernization programs based on their contribution to the aggregate capabilities of the military to meet mission requirements. In our May 1996 report on DOD interdiction capabilities and modernization plans, we recommended that the Secretary of Defense do such reviews. DOD agreed with our recommendation. Based on our review of other missions, such reviews are needed for other key mission areas as well. Because many assets contribute to more than one mission area, cross-mission analyses will need to be part of the process.

The urgent need for such assessments is underscored by the reality that significant outlays will be required in the next decade to finance DOD's combat air power modernization programs as currently planned. Over the past few years, we have reviewed the Department's major air power modernization programs—the F/A-18E/F, the F-22, the Comanche, and the B-1B bomber modification programs—within the context of the post-Cold War security environment. Our work leading to this culminating report has served to reinforce the theme of these earlier assessments—namely, that DOD should revisit the program justifications for these programs because the circumstances and assumptions upon which they were based have changed. Although extensive resources have already been invested in these programs, past investment decisions should not be considered irreversible but rather should be considered in the light of new information. The extensive long-term financial commitment needed to fund all of these programs makes it imperative that these key programs—and possibly others—be reconsidered since the future viability of U.S. combat air power could be at risk if it is not smartly modernized within likely budgets.

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## Recommendations

To ensure a viable, combat ready force in the future, the Secretary of Defense will need to make decisions in at least two critical areas—how best to reduce unneeded duplication and overlap in existing capabilities and how to recapitalize the force in the most cost-effective manner. To

make such decisions, the Secretary must have better information coming from a joint perspective. Accordingly, we recommend that the Secretary of Defense, along with the Chairman of the Joint Chiefs of Staff, develop an assessment process that yields more comprehensive information in key mission areas. This can be done by broadening the current joint warfare capabilities assessment process or developing an alternative mechanism.

To be of most value, such assessments should be done on a continuing basis and should, at a minimum, (1) assess total joint war-fighting requirements in each mission area; (2) inventory aggregate service capabilities, including the full range of assets available to carry out each mission; (3) compare aggregate capabilities to joint requirements to identify shortages or excesses, taking into consideration existing and projected capabilities of potential adversaries and the adequacy of existing capabilities to meet joint requirements; (4) determine the most cost-effective means to satisfy any shortages; and (5) where excesses exist, assess the relative merits of retiring alternative assets, reducing procurement quantities, or canceling acquisition programs.

The assessments also need to examine the projected impact of investments, retirements, and cancellations on other mission areas since some assets contribute to multiple mission areas. Because the Chairman is to advise the Secretary on joint military requirements and provide programmatic advice on how best to provide joint warfighting capabilities within projected resource levels, the assessment process needs to help the Chairman determine program priorities across mission lines. To enhance the effectiveness of the assessments, we also recommend that the Secretary of Defense and the Chairman decide how best to provide analytical support to the assessment teams, ensure staff continuity, and allow the teams latitude to examine the full range of air power issues.

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## Agency Comments and Our Evaluation

DOD partially concurred with our recommendations, and while it said it disagreed with many of our findings, most of that disagreement centered on two principal points: (1) the Secretary of Defense is not receiving adequate advice, particularly from a joint perspective, to support decision-making on combat air power programs, and (2) ongoing major combat aircraft acquisition programs lack sufficient analysis of needs and capabilities.

DOD said many steps had been taken in recent years to improve the extent and quality of joint military advice and cited the JWCA process as an

example. It said the Secretary and Deputy Secretary receive comprehensive advice on combat air power programs through DOD's planning, programming, and budgeting system and systems acquisition process. The Department's response noted that both OSD and the Organization of the Joint Chiefs of Staff carefully scrutinize major acquisition programs and that joint military force assessments and recommendations are provided. DOD acknowledged that the quality of analytical support can be improved but believes that the extent of support available has not been insufficient for decision-making.

We agree that steps have been taken to provide improved joint advice to the Secretary. We also recognize that DOD decision support systems provide information for making planning, programming, and budgeting decisions on major acquisition programs. We do not, however, believe the information is sufficiently comprehensive to support resource allocation decisions across service and mission lines. Much of the information is developed by the individual services and limited in scope. Only a very limited amount of information is available on joint requirements for performing missions, such as interdiction and close support, and on the aggregate capabilities available to meet those requirements. DOD's initiation of the deep attack weapons mix study and, more recently, a study to assess close support capabilities, suggest that it is, in fact, seeking more comprehensive information about cross-service needs and capabilities as our recommendation suggests. While joint warfighting capability assessment teams have been established, DOD has not been using these teams to identify unnecessary or overly redundant combat air power capabilities among the services; nor has the Department used the teams to help develop specific proposals or strategies for recapitalizing U.S. air power forces, a major combat air power issue identified by the Chairman of the Joint Chiefs of Staff. Information on issues such as redundancies in capabilities and on recapitalization alternatives, developed from a joint warfighting perspective, would be invaluable to decisionmakers in allocating defense resources among competing needs to achieve maximum force effectiveness.

With regard to the analyses of needs and capabilities behind combat air power weapons acquisition programs, we recognize that the services conduct considerable analyses to identify mission needs and justify new weapons program proposals. These analyses, however, are not based on assessments of the aggregate capabilities of the services to perform warfighting missions, nor does DOD routinely review service modernization proposals and programs from such a perspective. The Commission on

Roles and Missions of the Armed Forces made similar observations. More typically service analyses tend to justify specific modernization programs by showing the additional capabilities they could provide rather than assess the cost-effectiveness of alternative means of meeting an identified need. A 1995 study done at the request of the Chairman of the JROC, also identified this as a problem. The study team found that analyses done to support JROC decisions frequently concentrate only on the capability of the DOD component's proposed system to fill stated gaps in warfighter needs. Potential alternatives are given little consideration. Additionally, as pointed out in Chapter 4 of this report, under DOD's requirements generation process, only program proposals that meet DOD's major defense acquisition program criteria are reviewed and validated by the JROC. Many service modernization proposals and programs are not reviewed as they do not meet this criteria.

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# Combat Air Power Systems

| System                   | Air superiority | Interdiction | Close support | Reconnaissance | Refueling | Other mission |
|--------------------------|-----------------|--------------|---------------|----------------|-----------|---------------|
| <b>Aircraft</b>          |                 |              |               |                |           |               |
| <b>Army</b>              |                 |              |               |                |           |               |
| AH-64                    |                 | X            | X             |                |           |               |
| AH-1                     |                 | X            | X             |                |           |               |
| RC-12                    |                 |              |               | X              |           |               |
| OH-58D                   |                 | X            | X             | X              |           |               |
| <b>Navy/Marine Corps</b> |                 |              |               |                |           |               |
| A-6                      |                 | X            | X             |                | X         |               |
| AH-1W                    |                 | X            | X             |                |           |               |
| AV-8B                    |                 | X            | X             |                |           |               |
| E/A-6B                   | X               |              |               |                |           |               |
| ES-3                     |                 |              |               | X              | X         |               |
| F-14                     | X               | X            | X             | X              |           |               |
| F/A-18                   | X               | X            | X             | X              |           |               |
| KC-130                   |                 |              |               |                | X         | X             |
| P-3C                     |                 |              |               |                |           | X             |
| S-3                      |                 |              |               |                | X         | X             |
| <b>Air Force</b>         |                 |              |               |                |           |               |
| A-10/OA10                |                 | X            | X             | X              |           |               |
| E-3                      |                 |              |               | X              |           |               |
| B-1B                     |                 | X            |               |                |           |               |
| B-2                      |                 | X            |               |                |           |               |
| B-52                     |                 | X            |               |                |           |               |
| EF-111                   | X               |              |               |                |           |               |
| F-4G                     | X               |              |               |                |           |               |
| F-15                     | X               |              |               |                |           |               |
| F-15E                    | X               | X            | X             |                |           |               |
| F-16                     | X               | X            | X             |                | X         |               |
| F-117                    |                 | X            |               |                |           |               |
| E-8                      |                 |              |               | X              |           |               |
| KC-10                    |                 |              |               |                | X         | X             |
| H/MC-130                 |                 |              |               |                | X         | X             |
| KC-135                   |                 |              |               |                | X         | X             |
| U-2                      |                 |              |               | X              |           |               |
| <b>DOD</b>               |                 |              |               |                |           |               |
| Unmanned aerial vehicles |                 |              |               | X              |           |               |

(continued)

**Appendix I  
Combat Air Power Systems**

| <b>System</b>           | <b>Air superiority</b> | <b>Interdiction</b> | <b>Close support</b> | <b>Reconnaissance</b> | <b>Refueling</b> | <b>Other mission</b> |
|-------------------------|------------------------|---------------------|----------------------|-----------------------|------------------|----------------------|
| <b>Weapons</b>          |                        |                     |                      |                       |                  |                      |
| Long-range missiles     | X                      | X                   |                      |                       |                  |                      |
| Air-to-air missiles     | X                      |                     |                      |                       |                  |                      |
| Air-to-surface missiles | X                      | X                   |                      | X                     |                  |                      |
| Gravity bombs           |                        | X                   |                      | X                     |                  |                      |
| JDAM/ JSOW              | X                      | X                   |                      | X                     |                  |                      |
| Laser-guided bombs      | X                      | X                   |                      | X                     |                  |                      |
| Patriot PAC-3           | X                      |                     |                      |                       |                  |                      |

# Aircraft Inventory Levels (1991 and 1996)

| <b>System</b>                       | <b>1991</b>  | <b>1996</b>  |
|-------------------------------------|--------------|--------------|
| <b>Fighter/attack aircraft</b>      |              |              |
| <b>Army</b>                         |              |              |
| AH-1 Cobra                          | 995          | 470          |
| AH-64A Apache                       | 645          | 798          |
| OH-58D Kiowa Warrior                | 9            | 288          |
| <b>Navy &amp; Marine Corps</b>      |              |              |
| A-4 Skyhawk                         | 166          | 0            |
| A-6 Intruder                        | 336          | 63           |
| A-7 Corsair                         | 65           | 0            |
| AV-8 Harrier                        | 171          | 184          |
| F-4 Phantom                         | 241          | 0            |
| F-14 Tomcat                         | 492          | 323          |
| F/A-18 Hornet                       | 681          | 806          |
| AH-1J Cobra                         | 51           | 0            |
| AH-1T Cobra                         | 7            | 0            |
| AH-1W Cobra                         | 104          | 176          |
| <b>Air Force</b>                    |              |              |
| A-7 Corsair                         | 248          | 0            |
| A/OA-10 Thunderbolt II              | 626          | 369          |
| B-1B Lancer                         | 96           | 95           |
| B-2 Stealth Bomber                  | 3            | 17           |
| B-52 Stratofortress                 | 191          | 66           |
| F-4E Phantom                        | 65           | 14           |
| F-4G Wild Weasel                    | 96           | 0            |
| F-15A/B Eagle                       | 349          | 107          |
| F-15C/D Eagle                       | 419          | 408          |
| F-15E Strike Eagle                  | 134          | 203          |
| F-16A/B Fighting Falcon             | 686          | 146          |
| F-16C/D Fighting Falcon             | 1,055        | 1,304        |
| F-111D/E/F Raven                    | 220          | 0            |
| F-117A Stealth Fighter              | 55           | 54           |
| <b>Total fighter and attack</b>     | <b>8,206</b> | <b>5,891</b> |
| <b>Specialized support aircraft</b> |              |              |
| <b>Army</b>                         |              |              |
| OV-1D Mohawk                        | 102          | 21           |
| RC-7                                | 0            | 6            |
| RC-12 Guardrail                     | 31           | 57           |

(continued)

**Appendix II**  
**Aircraft Inventory Levels (1991 and 1996)**

| <b>System</b>                             | <b>1991</b>   | <b>1996</b>  |
|-------------------------------------------|---------------|--------------|
| <b>Navy</b>                               |               |              |
| E-2 Hawkeye                               | 113           | 80           |
| EA-6B Prowler                             | 132           | 126          |
| EP-3E Orion                               | 17            | 7            |
| ES-3 Viking                               | 3             | 16           |
| KA-6D Intruder                            | 59            | 0            |
| KC-130 Hercules                           | 72            | 78           |
| P-3B/C Orion                              | 355           | 196          |
| S-3A Viking                               | 74            | 0            |
| S-3B Viking                               | 84            | 119          |
| <b>Air Force</b>                          |               |              |
| C-130 Pacer Coin/Senior Scout             | 8             | 6            |
| E-3 AWACS                                 | 34            | 33           |
| EC-130H Compass Call                      | 16            | 12           |
| EF-111A Raven                             | 40            | 40           |
| HC-130 Hercules                           | 55            | 56           |
| KC-10 Extender                            | 59            | 59           |
| KC-135 Stratotanker                       | 629           | 549          |
| MC-130 Combat Talon                       | 14            | 14           |
| RC-135V/W Rivet Joint                     | 14            | 14           |
| RF-4C Phantom                             | 184           | 0            |
| TR-1/U-2R/S                               | 37            | 32           |
| <b>DOD</b>                                |               |              |
| Unmanned aerial vehicles                  | 45            | 60           |
| <b>Total specialized support aircraft</b> | <b>2,177</b>  | <b>1,581</b> |
| <b>Total aircraft</b>                     | <b>10,383</b> | <b>7,472</b> |

Note: This table only includes aircraft which were in the scope of our review.

# Major Combat Air Power Program Funding Status

Then-year dollars in millions

| <b>Weapon system</b>                                                | <b>Cost through fiscal year 1996</b> | <b>Fiscal year 1997 and balance to complete</b> | <b>Total program cost</b> |
|---------------------------------------------------------------------|--------------------------------------|-------------------------------------------------|---------------------------|
| <b>Combat aircraft</b>                                              |                                      |                                                 |                           |
| F/A-18 E/F fighter/attack                                           | \$4,895.1                            | \$76,063.6                                      | <b>\$80,958.7</b>         |
| F-22 fighter                                                        | 14,029.2                             | 56,063.9                                        | <b>70,093.1</b>           |
| Comanche helicopter                                                 | 3,111.9                              | 41,670.5                                        | <b>44,782.4</b>           |
| Longbow Apache helicopter                                           | 1,884.0                              | 6,391.2                                         | <b>8,275.2</b>            |
| B-1 bomber mods                                                     | 1,283.9                              | 2,494.0                                         | <b>3,777.9</b>            |
| AV-8B remanufacture                                                 | 528.3                                | 1,790.0                                         | <b>2,318.3</b>            |
| <b>Weapon</b>                                                       |                                      |                                                 |                           |
| Tomahawk cruise missile                                             | 10,911.3                             | 2,935.8                                         | <b>13,847.1</b>           |
| Advanced medium range air-to-air missile                            | 8,032.8                              | 3,355.2                                         | <b>11,388.0</b>           |
| JSOW                                                                | 546.6                                | 4,512.4                                         | <b>5,059.0</b>            |
| Army tactical missile system - brilliant antitank                   | 946.7                                | 4,046.2                                         | <b>4,992.9</b>            |
| Joint air-to-surface standoff missile                               | 25.0                                 | 3,272.2                                         | <b>3,297.2</b>            |
| Longbow Hellfire missile                                            | 616.1                                | 1,990.8                                         | <b>2,606.9</b>            |
| JDAM                                                                | 316.9                                | 2,153.7                                         | <b>2,470.6</b>            |
| Army tactical missile system—antipersonnel/ antimaterial            | 1,808.6                              | 649.7                                           | <b>2,458.3</b>            |
| Sensor fused weapon                                                 | 728.1                                | 1,219.5                                         | <b>1,947.6</b>            |
| <b>Combat Support</b>                                               |                                      |                                                 |                           |
| Joint surveillance target attack radar system aircraft              | 5,330.2                              | 4,021.4                                         | <b>9,351.6</b>            |
| E2C airborne early warning aircraft                                 | 658.5                                | 2,672.6                                         | <b>3,331.1</b>            |
| Cooperative engagement capability                                   | 622.8                                | 1,965.0                                         | <b>2,587.8</b>            |
| Joint surveillance target attack radar system ground station module | 827.8                                | 559.3                                           | <b>1,387.1</b>            |
| <b>Other</b>                                                        |                                      |                                                 |                           |
| Patriot PAC-3 surface- to-air missile                               | 3,194.4                              | 4,058.1                                         | <b>7,252.5</b>            |
| Navys sea-based area (lower tier) theater ballistic missile defense | 669.0                                | 4,898.3                                         | <b>5,567.3</b>            |
| Theater high altitude air defense system                            | 2,439.0                              | 10,225.0                                        | <b>12,664.0</b>           |
| Crusader (advanced field artillery system) <sup>a</sup>             | 255.1                                | 2,386.0                                         | <b>2,641.1</b>            |

Note: Total program cost data on the Joint Strike Fighter program is not yet available from DOD. CBO has estimated that the program could cost \$165 billion in 1997 dollars.

<sup>a</sup>Data on the Crusader includes only research, development, test, and evaluation costs.

Source: DOD's Selected Acquisition Report (SAR) Summary Tables, December 31, 1995, except for the Comanche, joint air-to-surface standoff missile, Patriot, Navy (lower tier) theater ballistic missile defense, and theater high altitude air defense programs. The figures for these programs are based on data we acquired during our reviews of the programs.

# Comments From the Department of Defense



PROGRAM ANALYSIS  
AND EVALUATION

Mr. Richard Davis  
Director, National Security Analysis  
National Security and International  
Affairs Division  
U.S. General Accounting Office  
Washington D.C. 20548

OFFICE OF THE SECRETARY OF DEFENSE  
1800 DEFENSE PENTAGON  
WASHINGTON, D.C. 20301-1800

July 31, 1996



Dear Mr. Davis,

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) draft report, "Combat Air Power: Joint Mission Assessments Needed Before Making Program and Budget Decisions", dated June 20, 1996 (GAO Code 701040), OSD Case 1175. The Department disagrees with many of the draft report's findings and partially concurs with the draft's recommendations; thus, overall, the Department partially concurs with the draft report. The Department disagrees in particular with the draft report's finding that ongoing major combat aircraft acquisition programs lack "sufficient analysis of needs and capabilities" (see p. 9 of the report). The Department also disagrees that the Secretary and Deputy Secretary of Defense are receiving inadequate advice, in particular inadequate joint military advice, to support decision-making on combat air power programs.

The draft report stresses the need to improve the process by which joint military advice is provided to the Secretary of Defense on combat air power programs. The Department notes that existing processes have been adapted to incorporate a substantial amount of joint military advice and that many steps have been taken in the past few years to improve the extent and quality of joint military advice provided to the Secretary and Deputy Secretary. For example, the present Joint Warfighting Capabilities Assessment (JWCA) process carried out under the leadership of the Joint Staff is a major addition to the quality and quantity of analytical and military advice presented to senior departmental leadership. Several examples exist of sophisticated analytical efforts in the JWCA process to integrate different warfare areas and combat functions; these are cited in the more detailed comments attached to this letter. Thus, the Department concurs that the Joint Staff needs robust analytical capabilities and has taken action in recent years to strengthen those capabilities.

The Department agrees that analytical support for overall decision-making can be improved and has included funding for such improvements in the FY 1997 President's Budget now being considered by the Congress. The Department is continually seeking ways to improve its decision-making processes to deal with the greater uncertainties in long-term defense planning that have followed the end of the Cold War. These improvements are being made to an existing set of processes that the Department considers to be robust; they do not reflect a judgment that the current basis for decision-making is inadequate.



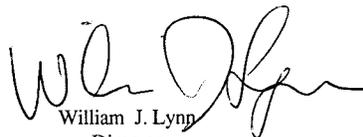
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**Appendix IV**  
**Comments From the Department of Defense**

All three of the Department's major combat aircraft acquisition programs will face careful scrutiny before they proceed past the next acquisition milestone. A review of F/A-18E/F capabilities and quantities will be carried out early next year when the Low Rate Initial Production (LRIP) decision is considered by the Defense Acquisition Board (DAB). A DAB review of the F-22 will be held prior to commitment to production. A comprehensive Analysis of Alternatives (AOA) is being designed now for the Milestone II review of the Joint Strike Fighter (JSF).

Overall, the GAO draft report does not adequately recognize the level of scrutiny provided by the Office of the Secretary of Defense and Organization of the Joint Chiefs of Staff to major acquisition programs. The Department's partial concurrence with the draft report's recommendations reflects this concern. The decision-making processes used to make major changes to several combat air power programs over the past several years demonstrate the rigor that DoD applies in structuring its programs. Examples are discussed in the detailed comments attached to this letter.

The Department appreciates the opportunity to comment on the draft report.



William J. Lynn  
Director  
Program Analysis & Evaluation

GAO DRAFT REPORT-DATED JUNE 20, 1996  
(GAO CODE 701040) OSD CASE 1175

“COMBAT AIR POWER: JOINT MISSION ASSESSMENTS NEEDED BEFORE  
MAKING PROGRAM AND BUDGET DECISIONS”

DoD COMMENTS TO THE GAO RECOMMENDATIONS

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o RECOMMENDATION 1: The GAO asserted that the future viability of U.S. air power requires that the Secretary of Defense make informed decisions in at least two critical areas--how best to reduce unneeded duplication and overlap in existing capabilities and how the force can be recapitalized in the most cost-effective manner. To make such decisions, the GAO concluded that the Secretary must have better information coming from a joint perspective. Accordingly, the GAO recommended that the Secretary, along with the Chairman of the Joint Chiefs of Staff, develop an assessment process that yields more comprehensive information in key mission areas. The GAO indicated that this can be done by broadening the current joint warfare capabilities assessment process or developing an alternative mechanism. (p.13, p.90/GAO Draft Report)

DoD RESPONSE: Partially concur. The DoD considers that adequate information is available to the Secretary of Defense to make decisions on U.S. combat air force programs. The Secretary and Deputy Secretary of Defense receive comprehensive advice on combat air power programs through two parallel processes: the Planning-Programming-and-Budgeting System (PPBS) and the systems acquisition process. Joint military force assessments and recommendations are provided in both processes. The quality of analytical support could be improved, but the extent of support available has not been insufficient for decision-making.

The Chairman of the Joint Chiefs of Staff provides advice to the Secretary and Deputy Secretary of Defense in the Chairman's Program Recommendations at the outset of each year's PPBS process. Later in the year, when final decisions are being made on priorities for that year's update of the Future Years Defense Program (FYDP), he provides the Chairman's Program Assessment to the Secretary and Deputy Secretary. These documents draw from the work of the Joint Warfighting Capabilities Assessment (JWCA) analyses as well as from consultations with the Commanders-in-Chief of the Unified and Specified Commands (CINCs) and their staffs. The JWCA process is very broad in scope and incorporates both quantitative analyses and integrating military judgment concerning capabilities, limitations, and risks.

The PPBS process was expanded significantly during the 1980s to offer full participation by the Joint Staff and CINC staffs in all phases of FYDP development. The major program review issue process that takes place each summer includes full Joint Staff representation on issue teams. Further, CINC representatives in the Pentagon can participate as they choose and copies of draft issue presentations have been made available to CINC staffs electronically on a timely basis since the 1980s for their participation as

Now on pp. 13, 75-76.

well. A general officer from the Joint Staff is a member of the Program Review Group (PRG) that screens prospective issues before they are forwarded to the Defense Resources Board (DRB) for decision. The Chairman, Joint Chiefs of Staff, is a member of the DRB and senior members of his staff routinely attend DRB deliberations. These Joint Chiefs of Staff representatives have been active, and occasionally decisive participants in DRB deliberations on combat air power issues.

Military advice from a joint services perspective similarly is provided regularly and comprehensively during the systems acquisition process led by the Under Secretary of Defense (Acquisition & Technology). Joint Staff analysts are members of system Integrated Product Teams (IPTs) that prepare evaluations and documentation on systems progress. Joint Staff representatives are present at all meetings of the Overarching Integrated Product Teams (OIPTs) that evaluate the readiness of systems to be presented to the Defense Acquisition Board (DAB) for approval for advancement to the next acquisition milestone. Similarly, the Vice Chairman, Joint Chiefs of Staff, is the vice chairman of the DAB. The Vice Chairman also is chairman of the Joint Requirements Oversight Council (JROC), which reviews in detail the joint requirements for all major acquisition programs prior to a DAB review.

o RECOMMENDATION 2: To be of most value, the GAO also recommended that such assessments should be done on a continuing basis and should, at a minimum, (1) assess total joint warfighting requirements in each mission area; (2) inventory aggregate Service capabilities, including the full range of assets available to carry out each mission; (3) compare aggregate capabilities to joint requirements to identify shortages or excesses, taking into consideration existing and projected capabilities of potential adversaries and whether existing capabilities may be sufficient to meet joint requirements; (4) determine the most cost-effective means to satisfy any shortages; and (5) where excesses exist, assess the relative merits of retiring alternative assets, reducing procurement quantities, or canceling acquisition programs. (p.14, p.90/GAO Draft Report)

DoD RESPONSE: Partially concur. The Department agrees that mission area assessments can improve understanding of military capabilities and limitations, but disagrees that an insufficient understanding of mission area needs has been available to support decision-making. The DoD conducts an annual update of the FYDP and carries out a thorough Program Review as part of its program development. The Program Review issue teams carry out the tasks indicated by the GAO to be needed to evaluate program adequacy. The Service Program Objectives Memoranda (POMs) provide a great deal of descriptive information on program content, future plans, and assessed capabilities. The issue teams, which are led by either Office of the Secretary of Defense (OSD) or Joint Staff personnel, assess the ability of Service programs to meet the national military strategy within available resources. They consider all available resources to meet critical needs and develop alternative means to satisfy these needs with varying levels of capability, cost, and risk. These alternatives provide the basis for decision by the Secretary and Deputy Secretary of Defense on the best overall DoD program.

Examples of how the PPBS has worked recently to adjust Service programs to best meet overall DoD within resource constraints include the decision in 1993 to delay retirement of the Air Force F-111F force pending further development of advanced

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weapons and targeting systems for other aircraft; the decision in 1994 to delay Joint Primary Aircraft Training System (JPATS) acquisition and use existing aircraft more fully; the decision in 1994 to create a DoD joint Tactical Airborne Electronic Warfare (JTAEW) force based on the Navy Department EA-6B, retiring the Air Force EF-111A; and decisions during 1995-96 to reshape the Joint Advanced Strike Technology (JAST) program as it evolved into the Joint Strike Fighter (JSF) program. The Joint Staff was centrally involved in the F-111, JTAEW and JAST issues; Joint Staff personnel led the detailed study of worldwide force needs, capabilities and goals that led to the final JTAEW consolidation decision. Joint Staff personnel conducted warfighting capabilities analyses in 1993 and 1994 that assessed the role of the F-111F, drawing on CINC and CINC staff inputs, and provided advice to the DRB in their deliberations on air power needs.

o **RECOMMENDATION 3:** The GAO further recommended that the assessments need to examine the projected impact of investments, retirements, and cancellations on other mission areas since some assets contribute to multiple mission areas. Where investments are needed in more than one mission area, the GAO asserted that the Chairman's responsibility to assess their relative priority and contribution to overall warfighting capability is crucial in considering the results of the assessment teams. (p.14, p.91/GAO Draft Report)

**DOD RESPONSE.** Partially concur. The Department agrees that mission assessments are important to decision-making but disagrees that available analytical support has been inadequate to support decision-making. The Chairman provides the integrated assessment that is discussed by the GAO in their draft report in the Chairman's Program Recommendations and Chairman's Program Assessment. Integration of capabilities, limitations, and risks across several warfare areas is difficult. An example of a formal integration of two warfare functional areas in Joint Staff analysis is the "Precision Strike-Intelligence, Surveillance and Reconnaissance" (PSISR) working group in the JWCA process. The PSISR team focuses on understanding "sensor-to-shooter" links and resolving inconsistencies or gaps in these links. Several General Officer Steering Committee (GOSC) sessions of the PSISR have been held, raising awareness of key system relationships and gaps at senior management levels.

There are other examples. The Sea-Air-Space Superiority JWCA conducted an "end-to-end" assessment of the best way to gain air superiority. Ground, Special Operations, and other forces were considered fully, and in some cases endorsed, as the best means of accomplishing selected tasks in gaining air superiority. The Theater Missile Defense (TMD) Attack Operations study, led by the Strike JWCA, drew in five other JWCA teams: Command and Control; Intelligence Surveillance & Reconnaissance; Sea-Air-Space Superiority; Land & Littoral Warfare; and Counterproliferation, with the PSISR study group involved as well. The Land & Littoral Warfare and Strike JWCA's are collaborating on analysis of joint munitions requirements, as well as on other matters.

o **RECOMMENDATION 4:** To enhance the effectiveness of the assessments, the GAO also recommended that the Secretary of Defense and the Chairman of the Joint Chiefs of Staff (1) decide how best to provide analytical support to the assessment teams, (2) assure

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**Appendix IV**  
**Comments From the Department of Defense**

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staff continuity, and (3) allow the teams the latitude to examine the full range of air power issues. (p.14, p.91/GAO Draft Report)

DoD RESPONSE. Partially Concur. The Department agrees that the Secretary of Defense and Chairman of the Joint Chiefs of Staff should give guidance concerning needed analytical support, but disagrees that such support has been inadequate for decision-making. Efforts to further improve the DoD's analytical process are continuing. To satisfy the need for improved joint analysis tools, the Department has initiated the Joint Analytic Model Improvement Program. This program is intended in the near-term to improve existing models' capabilities to treat joint operations and, over the longer term, to develop a fully joint warfare model called "JWARS".

Currently in development, JWARS is planned for release to users in three blocks, in increasing levels of resolution and capability. The first block release is planned for 1998, with subsequent releases at approximately two-year intervals. When complete, JWARS is expected to provide substantial improvements in cross-Service and cross-mission analysis.

# Major Contributors to This Report

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**National Security and  
International Affairs  
Division, Washington,  
D.C.**

Carol R. Schuster, Associate Director  
William C. Meredith, Project Director  
Marvin E. Casterline, Project Manager  
Jason Fong, Evaluator  
Anthony J. DeFrank, Evaluator  
Dale O. Wineholt, Evaluator  
Nancy L. Ragsdale, Evaluator (Communications Analyst)

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**Appendix V**  
**Major Contributors to This Report**

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# Related GAO Products

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U.S. Combat Air Power: Aging Refueling Aircraft Are Costly to Maintain and Operate (GAO/NSIAD-96-160, Aug. 1996).

Combat Air Power: Assessment of Joint Close Support Requirements and Capabilities Is Needed (GAO/NSIAD-96-45, June 1996).

Navy Aviation: F/A-18E/F Will Provide Marginal Operational Improvement at High Cost (GAO/NSIAD-96-98, June 1996).

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Combat Air Power: Funding Priority for Suppression of Enemy Air Defenses May Be Too Low (GAO/NSIAD-96-128, Apr. 1996).

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