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Report to the Chairman and Ranking Minority Member, Subcommittee on Readiness and Management Support, Committee on Armed Services, U.S. Senate

August 2000

DEFENSE ACQUISITIONS

Air Force Operating and Support Cost Reductions Need Higher Priority

GAO

Accountability * Integrity * Reliability

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Abbreviations

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The Honorable James M. Inhofe, Chairman
The Honorable Charles S. Robb, Ranking Minority Member
Subcommittee on Readiness and Management Support
Committee on Armed Services
United States Senate

The increasing cost of operating and supporting weapon systems is a growing concern because these escalating costs reduce funds available to develop and acquire new weapon systems and modify existing ones. A top Defense official has characterized this problem as a potential "death spiral." Operating and support costs include those for fuel, repair parts, maintenance, and contract services, as well as the costs of all civilian and military personnel associated with a weapon system. History indicates that these costs can account for about 70 percent of a system's total life-cycle costs.[1] In 1999, the Air Force spent more than $16 billion[2] to operate and support its aircraft. To help control operating and support costs, the Department of Defense (DOD) has set cost reduction goals for each military service, both for fielded weapon systems and for those being developed.

This is the first in a series of reports we plan to issue in response to your request that we evaluate DOD's efforts to reduce operating and support costs. For this report, we focused on the Air Force's aircraft and assessed (1) operating and support cost trends, (2) cost reduction initiatives, and (3) factors influencing the success of cost reduction efforts.

We reviewed the operating and support costs of fielded aircraft, focusing on some of the larger programs, including the B-1B bomber, the C-17 and C-5 transports, and the F-16 fighter, which together account for most of the Air Force's operating costs. We also examined new programs under development such as the Joint Strike Fighter, the F-22 fighter, the Global Hawk unmanned reconnaissance aircraft, and the Joint Primary Aircraft

[1]In addition to operating and support, life-cycle costs include those for development, procurement, and disposal.

[2]All operating and support costs are presented in constant year 2000 dollars.

Training System aircraft. Our objectives, scope, and methodology are described in appendix I.

Results in Brief

Air Force operating and support costs are growing at about 4 percent per year, even though the total number of aircraft, the number of hours these aircraft are flown, and the number of personnel who fly and maintain them have been declining for years. From fiscal year 1997 to fiscal year 1999, operating and support costs for aircraft increased from about $15.3 billion to $16.6 billion. Higher costs for repair parts were the principal cause of these increasing costs, and about 25 fault-prone parts on each system we examined were the biggest cost "drivers." If they continue to grow at recent rates, operating and support costs of aircraft will exceed $20 billion by fiscal year 2005. To achieve DOD's cost reduction goals for 2005 that range from 7 to 20 percent, the Air Force would have to reduce these costs by $2.6 billion to as much as $7 billion.

To help reduce the operating and support costs of fielded systems, the Air Force has established several initiatives, including the Reduction in Total Ownership Cost program. Under this program, the Air Force developed a standardized methodology for assessing operating and support costs, identifying likely areas for cost reduction, proposing cost reduction projects, and tracking associated savings. Initially applied to several pilot programs in 1999, including the F-16 and B-1B, the program is now being expanded to other systems, as experience with the pilots increases. However, the projected cost reductions from these efforts average only about $343 million each year, well short of the $2.6 billion to $7 billion needed to achieve DOD's goals. Also, while the estimated operating and support costs of the Joint Primary Aircraft Training System are much lower than the aircraft it is to replace, the costs of the F-22 and the Joint Strike Fighter could be higher than the aircraft they are expected to replace. Since these two developmental aircraft could account for over one-quarter of all the Air Force's future operating and support costs of its aircraft, their higher costs could jeopardize attempts to control operating and support costs well into the future.

Several factors hinder greater operating and support cost reductions. The Air Force does not give operating and support cost management the same high priority it assigns to other program concerns such as weapon performance during system development or improved combat capability after fielding. Instead of establishing an operating and support cost requirement and managing to meet it, new programs focus on initiatives to

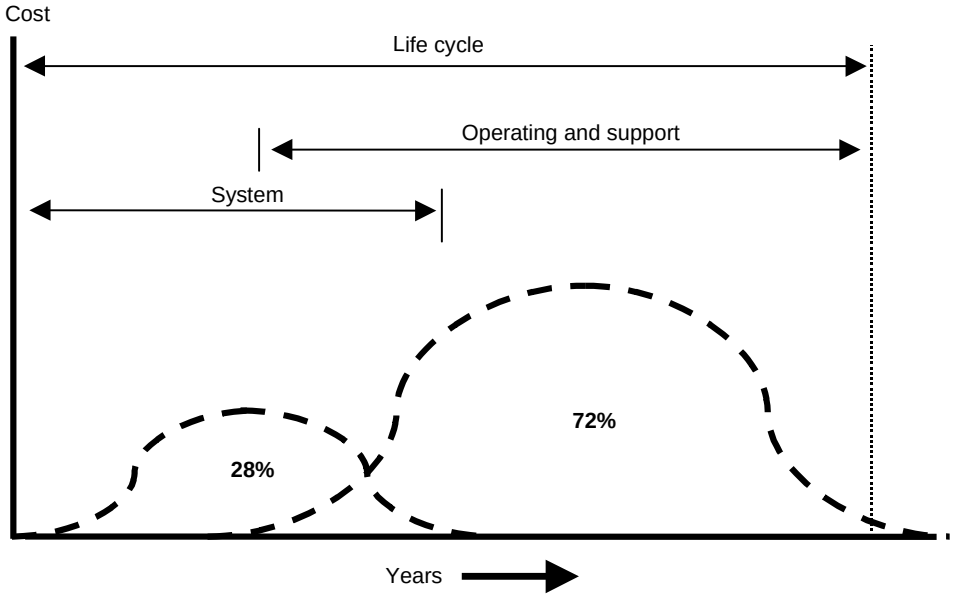
improve reliability, supportability, and maintainability. Although these initiatives do help lower operating costs, their impact on a system's operating and support costs is not tracked. Projects that could lower these costs in fielded systems cannot compete effectively for funding against projects that enhance safety, readiness, or combat capability. Because they are not given the same management priority, operating and support costs are not emphasized. Poor visibility of operating and support costs has been a key factor inhibiting management of operating costs, but the establishment of the new Air Force Total Ownership Cost data system appears to be overcoming this barrier. Despite program managers' limited authority and low incentives, some programs, such as the B-1B, continue to champion cost reduction projects.

We are recommending that the Air Force establish operating and support cost requirements for developmental and fielded aircraft and periodically measure their progress toward meeting them. In addition, we have included a matter for congressional consideration that would require the Secretary of the Air Force to annually report its progress in achieving these requirements. While agreeing that significant steps remain to be taken to reduce operating and support costs, the Department believes that it is premature to establish operating and support requirements for aircraft systems. In addition, the Department disagreed with the need to provide the Congress with an annual operating and support cost report. As discussed in the agency comments section of this report, we believe these are essential steps to take to reduce operating and support costs.

Background

Operating and support costs reflect the purchases of fuel, lubricants, and repair parts and their associated maintenance and contract services, as well as modification kit procurement and installation. These costs typically account for about 70 percent or more of life-cycle costs, depending on how long a system remains in the inventory. Figure 1 depicts the typical life-cycle cost distribution of many weapon systems.

Figure 1: Nominal Life-Cycle Cost of Typical 1980 DOD Acquisition Program With a 30-Year Service Life



Source: Defense Systems Management College Acquisition Guide.

For some systems (such as the B-52 bomber and KC-135 refueling aircraft) that continue to be used many years beyond their expected service life, operating and support costs can amount to a higher percentage of life-cycle costs.

The Under Secretary of Defense for Acquisition, Technology, and Logistics has expressed concern that rising operating costs threaten the Department's modernization efforts. In 1998, he observed:

"Unfortunately, we are trapped in a 'death spiral.' The requirement to maintain our aging equipment is costing us much more each year: in repair costs, down time, and maintenance tempo. But we must keep this equipment in repair to maintain readiness. It drains our resources—resources we should be applying to modernization of the traditional systems and development and deployment of the new systems. So, we stretch out our replacement schedules to ridiculous lengths and reduce the quantities of the new equipment we purchase–raising their costs and still further delaying modernization."

The Congress also identified a need to reduce operating and support costs. Section 816 of the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999 directed the Secretary of Defense to designate 10 pilot programs to test increased program manager oversight of product support. In a February 1999 report, DOD designated the 10 pilot programs to experiment with several broad cost management initiatives over the coming years. DOD has also set broad goals for each service to lower the operating and support costs of its weapon systems. Systems under development are expected to have projected life-cycle costs 20 to 50 percent lower than the actual costs of the systems they are replacing.[3] The actual operating and support costs for fielded systems are expected to be reduced 20 percent by fiscal year 2005.

Aircraft Operating and Support Costs Are Increasing

The Air Force spent more than $16 billion to operate and support its aircraft in fiscal year 1999, an increase of $1.3 billion over fiscal year 1997. Operating and support costs are growing at about 4 percent per year, even though the total number of aircraft, the number of hours these aircraft are flown, and the number of personnel who fly and maintain them have been declining for years. Higher costs for repair parts are the principal cause of these increasing costs, and a small number of parts on each system are the biggest cost drivers. If operating and support costs of the Air Force's aircraft continue to grow at recent rates, they could exceed $20 billion by fiscal year 2005.

Operating and Support Costs Increased Even as Other Measures Declined

Air Force operating and support costs for 36 aircraft systems increased by $1.4 billion from fiscal year 1997 to fiscal year 1999. Most of the increase occurred in the major aircraft programs, including the F-15 and the F-16. While aircraft operating and support costs are increasing, the total number of aircraft, the number of hours these aircraft are flown each year, and the number of personnel who operate and maintain them are decreasing. Air Force statistics show that the number of operational aircraft has decreased steadily, from 9,519 in fiscal year 1986 to 6,228 in fiscal year 1998. During this period, the number of hours these aircraft were flown each year also decreased by 39 percent. Similarly, the number of Air Force military personnel declined from 608,199 in 1986 to 375,512 in 1998—a drop of

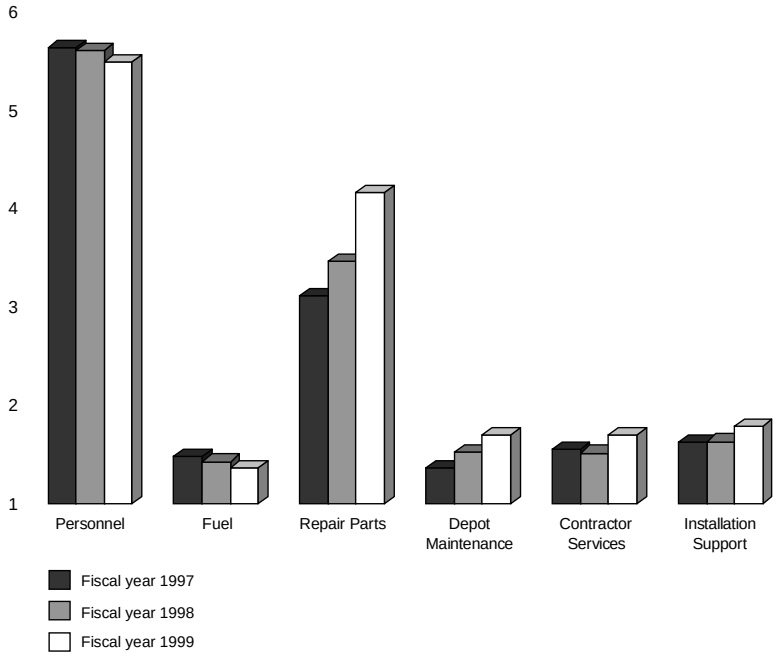
[3]Life-cycle costs are the total costs of acquiring and owning a weapon system over its full life, including development, procurement, operation, support, and disposal.

38 percent.[4] More recently, from 1996 to 1998, aircraft, flying hours, and personnel decreased 2 to 3 percent.

Higher Costs for Repair Parts

We analyzed aircraft operating and support costs in fiscal years 1997 through 1999 to identify the principal costs and those most responsible for the cost growth. The largest components of aircraft operating and support costs are personnel, fuel, repair parts, depot maintenance, contractor services, and installation support. The costs of personnel and fuel both decreased in fiscal years 1997-99, while the costs of repair parts, associated maintenance, contractor services, and installation support increased. Figure 2 shows the change in the major components of the operating and support costs of Air Force aircraft in fiscal years 1997-99.

Figure 2: Major Components of Air Force Aircraft Operating and Support Costs (constant year dollars in billions)



Source: Our analysis of Air Force data.

[4]The percent of reductions in personnel that operate and maintain aircraft may differ from total Air Force military personnel reductions.

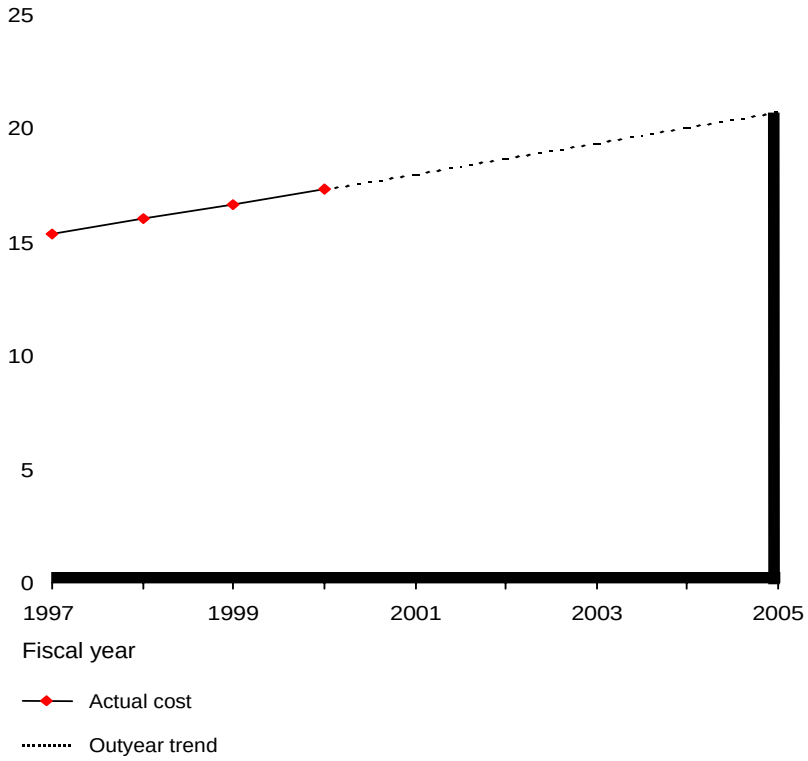
Together, repair parts and depot maintenance costs increased about 31 percent during the period and were responsible for nearly all the increase in aircraft operating and support costs. Most of these costs were for replaceable repair parts such as transistors, gaskets, and fluids—and those that can be refurbished and reused such as engine subcomponents. According to program managers, repair parts are the top candidates for cost reductions because new and more reliable parts and processes can be designed and manufactured to replace parts that fail often or are difficult to obtain. More reliable parts fail less often and require less maintenance. For example, replacing the F-16 main aircraft battery with a maintenance-free battery is expected to cost $3.4 million fleet wide and save $3.8 million over the next 9 years and $6.9 million over the next 25 years.

About 25 parts on each system, especially parts associated with engines and electronic subsystems dominate the maintenance and repair costs of the aircraft we examined. For example, the F-16 fighter has nearly 7,000 repairable parts. Of these, the 25 most fault-prone parts cost $224 million to repair in fiscal year 1998 and accounted for about 44 percent of the system's total repair parts cost. Sixteen of these 25 parts were for the aircraft engine, while another 4 were for the radar system. F-16 personnel told us these parts break often and are expensive to replace.

Projected Operating and Support Cost Growth

If aircraft operating and support costs continue to grow at recent rates, our projections indicate they could exceed $20 billion by fiscal year 2005. This would be more than $5 billion higher than in fiscal year 1997. To determine the impact of continued growth in aircraft operating and support costs, we projected recent cost increases for Air Force aircraft from fiscal year 2000 to 2005. Our projection is shown in figure 3.

Figure 3: Air Force Aircraft Operating and Support Costs (constant year dollars in billions)



Source: Our analysis of Air Force operating and support cost data.

Our projection of Air Force operating and support costs reflects a recent growth rate of over 4 percent per year in fiscal years 1997-99. As figure 3 shows, if aircraft operating and support costs continue to grow at the recent 4-percent rate, they would exceed $20 billion by fiscal year 2005. Our projection is based upon the actual costs from fiscal years 1997 through 1999 for personnel, fuel and lubricants, repair parts, maintenance, contractor services, and other support costs associated with Air Force aircraft. After converting these costs to base year 2000 dollars, we used a cost projection model to project these cost trends through fiscal year 2005.

More Cost Reductions Are Needed to Meet DOD's Goals

Concerned that growing operating and support costs threaten planned force modernization, DOD has set cost reduction goals for both fielded and new weapon systems. The multibillion dollar cost reductions to aircraft operating and support costs needed to meet DOD's goals, however, are unlikely to be achieved in the near term and are uncertain in the long term. Although the Air Force has established several programs to reduce operating costs, currently projected savings fall far short of DOD's goals.

DOD Wants to Reduce Operating and Support Costs by 7 to 20 Percent

To help control and reduce growing operating and support costs, DOD has set goals for each military service to reduce these costs over the next 5 years. For fielded systems—those already operating by fiscal year 2000—DOD wants to reduce operating costs by 7 percent compared with fiscal year 1997 costs (excluding fuel and personnel costs). The reduction goal increases to 10 percent in fiscal year 2001. A 'stretch' goal of 20 percent in operating and support cost reductions is set for fiscal year 2005.

We applied DOD's goals to fielded aircraft and determined that in fiscal year 2000, aircraft operating and support costs should not exceed $14.7 billion. DOD's goals, and our projections of aircraft operating and support costs for fiscal years 2000-05, are shown in table 1.

Table 1: Comparison of Projected Aircraft Operating and Support Costs and DOD's Goals

Constant year 2000 dollars in billions

Fiscal year	Projected operating and support costs	DOD goal	Difference between projection and goal
2000	$17.3	$14.8	$2.6
2001	18.0	14.5	3.5
2002	18.7	14.3	4.4
2003	19.3	14.1	5.2
2004	20.0	13.9	6.1
2005	$20.7	$13.7	$7.0

Source: Our analysis of Air Force operating and support cost data.

The Air Force needs to reach an operating and support funding level below $14 billion in fiscal year 2004 to meet DOD's cost reduction goal. If these costs for aircraft continue to grow at recent rates, however, our projection

shows that in fiscal year 2005 they will exceed $20 billion. Thus, for the Air Force to meet the 2005 goal, operating and support costs would need to be reduced by about $7 billion.

DOD has also set a goal to reduce the projected life-cycle costs of new systems by 20 to 50 percent below the historical experience of at least half its programs. The higher cost reduction goals for new systems recognize the higher potential for savings if appropriate decisions are made early in the life of a new system. In fact, according to DOD, design decisions with the most impact on operating and support costs are usually made soon after program initiation. As system designs are finalized during the development process, the opportunities to influence operating and support costs diminish, and the costs of making design changes increase.

To help lower life-cycle costs, the Air Force has begun implementing both the DOD-wide Cost as an Independent Variable initiative and its own Reduction in Total Ownership Cost initiative. The first applies mostly to developmental systems, the second primarily to fielded systems. Guidance for developmental systems stresses that (1) system costs are capped, and any additional funding obtained by one system comes at the expense of others and (2) trade-offs between cost and performance are required if maximum cost effectiveness is to be achieved. These reforms require setting realistic and aggressive goals early and periodically measuring progress. Once a system is fielded and actual operating and support cost data becomes available, the reforms require establishing baselines identifying the cost drivers and implementing cost reduction initiatives.

Greater Reductions Are Needed to Meet Fielded System Goals

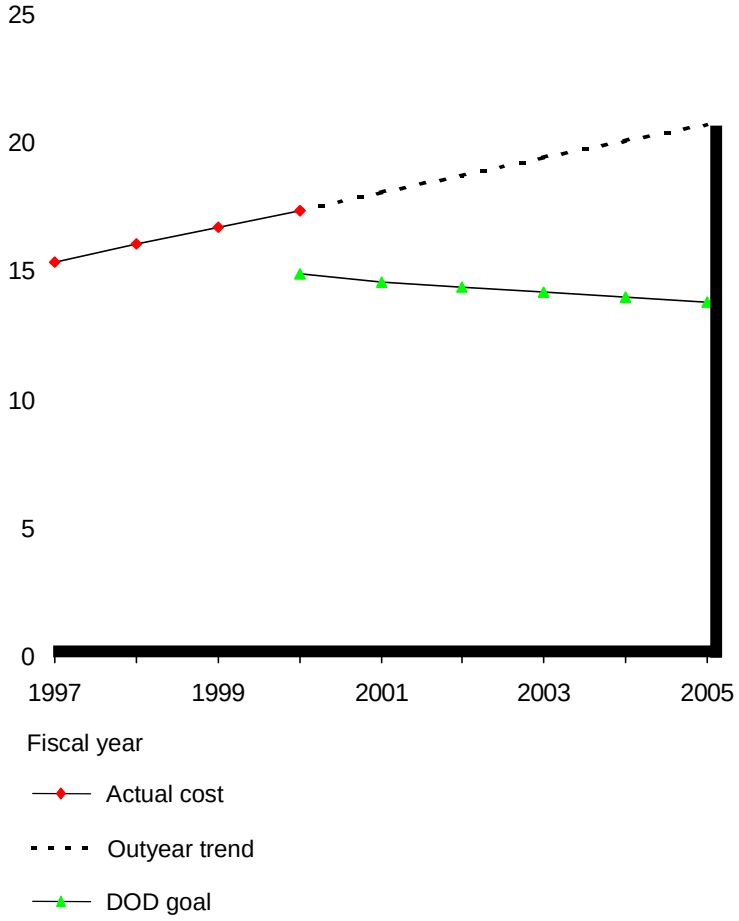
Beginning in December 1997, the Air Force established a new initiative, Reduction in Total Ownership Cost, to lower operating and support costs. Under this initiative, the Air Force developed a standardized methodology for assessing operating and support costs, identifying likely areas for cost reduction, proposing cost reduction projects, and tracking associated costs. This methodology was initially applied to several pilot programs in 1998, including the F-16 and B-1B. As more experience with the initial programs is obtained, it is being expanded to other Air Force programs. Among the objectives of the methodology are to have comprehensive, consistent business cases; sound, executable action plans; and effective, all-inclusive mechanisms for identifying and reporting cost savings associated with Reduction in Total Ownership Cost initiatives.

As of February 2000, the Air Force had approved 43 cost reduction projects that use the Reduction in Total Ownership Cost approach and are either under way or planned for 8 fielded aircraft over the next several years. Between fiscal year 2000 and 2009, the Air Force plans to invest $7.9 billion in these projects. Annual average savings over the next 10 years are expected to reach $343 million. The Reduction in Total Ownership Cost Program Manager told us that savings for many projects are realized slowly because, once they are approved and funded, it takes several years to design, test, and produce the new part or process and install it in all the affected aircraft. Once installed, however, many projects realize savings over the aircraft's remaining useful life, which can be 20 years or more. By 2009, the Air Force expects savings and avoided costs to exceed $3.4 billion.

Our examination of the 43 proposed projects for fielded aircraft shows that some of them, particularly those having the largest investments, are intended principally to provide readiness and performance improvements. Reduced operating and support costs are a secondary benefit. For example, the two largest B-1B projects are to replace the bomber's main computer and electronic defensive systems. Together, these two projects account for more than $980 million of the $1 billion in planned investment for all B-1B projects. These two projects have been justified for years on the basis of mission performance shortfalls and needed combat capability improvements. While both projects provide significant operating and support cost savings, neither has the high near-term return on investment required to meet Air Force criteria for approval as a project justified solely on the basis of operating and support cost reduction.

Even if all the proposed initiatives are included, however, the projected cost reductions of about $343 million a year, or $3.4 billion over 10 years, fall far short of DOD's goals. In fact, projected savings are not sufficient to reverse the current trend of rising operating and support costs. Figure 4 shows actual aircraft operating and support costs for fiscal years 1997-99, our projection of those costs for fiscal years 2000-05, and the level of operating and support costs needed to meet DOD's goals.

Figure 4: Aircraft Operating and Support Costs, Out-Year Cost Trends, and DOD Goals (constant year dollars in billions)



Source: Our analysis of Air Force operating and support cost data.

We estimate that the Air Force must further reduce its operating and support costs by about $2.6 billion to $6.1 billion to reach DOD's reduction goal for fiscal years 2000-04. Operating and support cost reductions of more than $7 billion will be needed to meet DOD's "stretch" goal of a 20-percent operating cost reduction in fiscal year 2005.

Greater Reductions Are Needed to Meet New System Goals

DOD has set goals to lower life-cycle costs of new aircraft by 20 to 50 percent below the historical experience of predecessor systems. Assuming these new systems are retained for 30 years or more and are consistent with past programs, about 72 percent of their life-cycle costs would be for operating and support. Therefore, in order to reduce life-cycle costs by 20 to 50 percent, operating and support costs would have to be reduced by at least an equal percentage.

We reviewed efforts by new aircraft programs to lower operating and support costs, including those of the Air Force variant of the Joint Strike Fighter, which is to replace the F-16 and the A-10; the F-22, to replace the F-15; and the variant of the Joint Primary Aircraft Training System, to replace the T-37B. The F-15, the F-16, the A-10, and the T-37B aircraft accounted for 31 percent of all fiscal year 1999 aircraft operating and support costs. Were the new replacement systems to meet DOD's minimum operating and support cost reduction goal (20 percent by fiscal year 2005), overall operating and support costs for Air Force aircraft would be reduced by about 6 percent. This could be sufficient to reverse the recent growth trend in operating and support costs. Accordingly, the new aircraft being developed could have a powerful effect on the Air Force's long-term operating and support costs.

In fiscal year 1999, operating and support costs of the four existing aircraft to be replaced were $5.1 billion. As shown in table 2, the Joint Primary Aircraft Training System and, perhaps, the F-22 are expected to have significantly lower operating costs and achieve DOD's goals.

Table 2: Annual Operating and Support Costs of Predecessor Aircraft Compared With Those Estimated for New Systems

Constant year 2000 dollars in millions

Predecessor aircraft	Fiscal year 1999 annual operating and support costs	New aircraft	Projected annual operating and support costs	Annual savings	Annual savings (percent)
F-16 and A-10	$3,305	Joint Strike Fighter	$4,124	($819)	(25)
F-15	1,503	F-22			
		Contractor estimate	1,481	22	1
		Air Force estimate	952	551	37
T-37B	296	Joint Primary Aircraft Training System	82	214	72

Source: Our analysis of Air Force operating and support cost data.

The F-22 is already designed and undergoing testing, with a production decision planned for fiscal year 2001. However, the F-22 may not achieve the substantial cost reductions needed to reach DOD's goals. In July 1999, the systems contractor estimated annual operating and support costs for the F-22 fleet to be about $1.5 billion. Because that estimate was considerably higher than earlier ones, the F-22 program office and the Air Force Cost Analysis Agency reexamined the contractor's estimate and identified several changes that would reduce costs to about $952 million. The Air Force plans to continue its analysis of the estimate during the summer of 2000 and finalize it in time for the program's production decision.

Nevertheless, even if the Air Force's lower estimate for the F-22 is affirmed, overall operating and support costs for Air Force aircraft may not be lower. Table 3 compares the operating cost of F-15 and F-22 aircraft at the fleet, squadron, and individual aircraft level.

Table 3: Comparison of F-15 and Estimated F-22 Operating and Support Costs

Constant year 2000 dollars in millions

			Operating and support cost	
Aircraft	**Number of aircraft**		**Fleet**	**Each aircraft**
F-15	522		$1,503	$2.9
F-22	339	Contractor estimate	1,481	4.4
	339	Air Force estimate	952	2.8

Source: Our analysis of Air Force operating and support cost data.

As table 3 shows, when both aircraft are considered at fleet level, the $1.5-billion operating costs of the F-15 are comparable with the high estimate of F-22 costs. The F-22's lower operating cost estimate of $952 million per year would represent a 36-percent reduction and would meet DOD's cost reduction goal for new systems. When the operating cost per aircraft is considered, however, the cost of the F-22 aircraft is about the same or higher than that of the F-15. Moreover, the Air Force does not plan to retire the F-15s as F-22s are fielded. According to the Air Force's Force Structure Plan for 2000, 179 F-15s will be retained until at least 2030. These F-15s cost about $519 million to operate in 1999. Assuming the operating costs of these 179 aircraft remain about the same and are combined with the projected F-22 costs, the operating costs of all these aircraft are likely to be about as high or higher, not lower, than those of the current F-15 force.

The Joint Strike Fighter fleet will likely be the most expensive to operate and support on an annual basis than any aircraft currently in development or operated by the Air Force. The Joint Strike Fighter is expected to replace the existing Air Force fleet of 1,372[5] F-16s and 368 A-10s, which together cost $3.3 billion to operate and support in fiscal year 1999. To meet DOD's 20-percent cost reduction goal, the Joint Strike Fighter would need to reduce its operating and support costs to about $2.6 billion a year.

The Joint Strike Fighter program office has not issued an estimate of the operation and support costs of the system. At present, the only goal or target for the Joint Strike Fighter is the program direction to the

[5]As of January 2000.

contractors that the aircraft not cost more to operate and support than the aircraft it is replacing. Based on our analysis of program office data, the cost ceiling provided to the contractors is $4.1 billion per year. This is, however, 25 percent higher than the $3.3-billion operating and support cost of the F-16 and A-10 aircraft fleets combined in fiscal year 1999. We believe that unless significant cost reductions are achieved, the Joint Strike Fighter is unlikely to meet DOD's goals. Moreover, considering that the F-22 and the Joint Strike Fighter could account for over 25 percent of the Air Force's future operating and support costs, these costs are likely to be higher, not lower, in the future.

Several Factors Limit Air Force Cost Reduction Efforts

Our evaluation disclosed several factors that limit greater attention to operating and support cost reductions. The Air Force does not give operating and support cost management the same high priority it assigns to other program issues such as weapon performance during system development or improved combat capability after a system is fielded. Instead of establishing an operating cost requirement and managing in such a way as to meet it, new programs focus on initiatives to improve system reliability, supportability, and maintainability. While these initiatives do help lower operating costs, their impact on the system's operating and support costs is not tracked. Projects that could lower operating and support costs are unable to compete effectively for funding against projects that enhance safety or readiness or improve combat capability.

Poor visibility of operating and support costs has been a key factor inhibiting management of operating costs, but the establishment of the new Air Force Total Ownership Cost data system appears to be overcoming this barrier. Although program managers of pilot programs have been given greater responsibility for weapon system support, they told us that limited authority and few incentives are major obstacles to managing operating costs. The Air Force has decided not to increase program managers' authority over operating and support costs, but it is working to increase incentives for major commands to invest in cost reduction initiatives.

Operating and Support Costs Are Not Priorities of New Systems and Remain Relatively Unconstrained

DOD and Air Force guidance direct program managers to optimize system performance and minimize the cost of ownership. Weapon systems in development have requirements for acquisition costs, program schedule, and system performance, but they have no similar requirement for operating and support costs. The system requirements for performance, acquisition costs, and schedule are usually clear, well defined, and

frequently tracked to actual performance. They are incorporated into key program baselines and other management documents. Through these documents, the program's most important characteristics are projected, tracked, measured, and reported within the Air Force, to the Office of the Secretary of Defense, and to the Congress. In other words, the system requirements are an important means of establishing accountability and priority. They are key guides for setting design limits, making trade-offs among requirements, and formulating investment decisions.

As DOD recently reported to the Congress, setting performance requirements early in an acquisition program without adequate knowledge of the total cost can lead to very costly and unstable system designs.[6] Yet the new programs we examined do not have comparable operating and support cost requirements. Further, they are not required to determine and justify the consequences of design decisions that are based on the system's projected operating and support costs. Without such a requirement, there is no accountability for minimizing the systems' operating and support costs.

Of particular concern to us are the F-22 and the Joint Strike Fighter programs, which together are to replace aircraft that accounted for 33 percent of all the Air Force's aircraft operating and support costs in 1999. The F-22 low-rate initial production decision is scheduled for December 2000. The aircraft was designed without a specific top-level operating and support cost requirement. As its low-rate initial production decision approaches, the program office, the principal contractor, and the Air Force Cost Analysis Agency are trying to determine how much more or less the F-22 will cost to operate and support than the F-15 it will replace. Because the F-22 design is mature, there are now few opportunities to significantly reduce its operating and support costs, yet these costs will continue for at least the next 30 years.

Like the F-22, the Joint Strike Fighter does not have a system-level operating and support cost requirement. Its managers are also pursuing several efforts to improve its supportability, reliability, and maintainability. This system, however, is in the early design stage. Without an operating and support requirement to guide design decisions that are now being made, there is no assurance that the fighter will cost 20 percent less to operate and support than the F-16 and A-10 aircraft that it will replace. Cost data

[6]Section 912c Report: Requirements and Acquisition (June 1999).

provided by the program office and our analysis indicate that the fighter may cost more, perhaps considerably more, to operate.

Supportability, Reliability, and Maintainability Initiatives Have Unknown Effects on Operating and Support Costs

The developmental programs we examined do not have operating and support cost requirements for the total system, but they generally have efforts underway to improve supportability, reliability, and maintainability. Improving these characteristics can lower operating and support costs. For example, development of a system that can diagnose and predict engine problems in the Joint Strike Fighter before they develop is expected to reduce significantly, engine maintenance and downtime. In essence, a system component that is easier to access, remove, and replace costs less to maintain. Similarly, a more reliable component requires less maintenance and repair. Improvements to all of these characteristics increase system readiness and can lower operating and support costs.

However, an Air Force acquisition reform official told us that focusing on reliability-related characteristics historically has not been sufficient to control future operating and support costs. Accordingly, we asked program officials about the effects of their reliability improvement efforts on the total system's operating and support costs. The program offices generally did not know what these effects would be. For example, the Joint Strike Fighter program has evaluated numerous methods to improve the aircraft's reliability, but program officials could not tell us what effects these changes would have on total operating and support costs. While these efforts are expected to result in weapons that cost less to operate and support than they would otherwise, the missing linkage between improvement efforts and their effect on overall operating and support costs limits the ability of programs to predict and manage these costs.

Cost Reduction Initiatives for Fielded Systems Compete Poorly Against Other Priorities

Projects that could reduce operating and support costs of fielded systems have a lower priority and are generally less able to compete for investment funds than those offering improved safety, readiness, or combat capability. This happens primarily for two reasons. First, most cost reduction initiatives require up-front investments of procurement funds that take many years to pay back the initial investments. This slow pay-back, and the many uncertainties that accompany improvement projects, make it difficult for the initiatives to compete against investments that provide near-term improvements in safety, availability, or combat capability. In fact, the largest of the 43 cost reduction initiatives approved by the Air Force are not

specifically aimed at operating and support cost reduction but at improving readiness and combat capability.

Second, the Air Force sees improved combat capability as the most important priority. Decisionmakers we spoke with, whether in program offices, major commands, product centers, or air bases, told us that their principal focus is to improve combat capability. They work continuously to enhance system safety, increase readiness, and improve performance. While they acknowledge the importance of managing operating and support costs and recognize that growth of these costs may threaten the Air Force's ability to modernize, they also told us that near-term combat capability is their top priority.

Two Air Force surveys conducted in 1999 showed that very few projects aimed specifically at reducing operating and support costs through improvements to fielded aircraft were carried out in 1997 and 1998. Both program managers and major command leaders told us the reason for this was that limited funds available were invested in improvements in combat capability and that there is a general reluctance to forego improved combat capability in the near term for uncertain savings in the longer term.

We visited the Air Combat Command and the Air Mobility Command and found that both have a comprehensive and detailed process for proposing, reviewing, and approving procurement funds for aircraft improvements, but this process strongly favors projects that enhance combat capability. They told us that their primary mission is to prepare for combat and ensure those pilots and support crews have the best equipment and support possible. But, they acknowledged that controlling operating and support costs is becoming increasingly important. Leaders at both commands told us that they were reassessing the process used to evaluate aircraft improvement projects so that those providing operating and support cost reductions will compete better in the future.

Limited Cost Visibility and Lack of Reporting Requirements Hinder Cost Management

Accurate and complete operating and support cost data and estimates are important for cost management because they often serve as the basis for establishing cost requirements that guide design choices and other trade-offs during development. Similarly, reliable cost data is necessary for managers of fielded aircraft to guide investment and system management decisions. Until very recently, however, tracking aircraft operating and support costs was difficult because the cost data was either unavailable in a usable format or of poor quality. The Air Force's Total Ownership Cost

system is making operating and support cost data more available and usable and may, with time, enable improved management.

In 1998, the Air Force began to set up a Total Ownership Cost database, which is expected to make it easier not only to track costs of fielded systems over the long term, but also help establish clear cost goals for systems in development. Accurate and reliable operating and support costs are a fundamental starting point for setting cost goals, gauging overall progress, identifying shortfalls, and making informed decisions on improvements to fielded aircraft. In the past, accurate, complete, and comparable operating and support cost data was not readily available. Program managers and cost analysts told us that past operating and support cost estimates were weakened by poor cost data.

According to its program manager, the new database is fully functional and is being steadily improved. Cost data, however, will have to be accumulated for several more years before the full benefits of the system are realized.

Limited Authority and Few Incentives Limit Program Managers

In 1999, the Air Force established 10 pilot programs in which program managers were given more responsibility for and oversight of weapon system support. Program managers, however, have limited authority and opportunity to control or influence the operation and support costs of fielded aircraft. Similarly, they do not control, influence, or have incentives to encourage investments in cost reduction initiatives.

Air Force program managers have limited visibility over a system's operating and support costs. Control over the essential resources and processes that determine how these functions are managed, however, remain largely with the major commands and headquarters organizations. Operating and support costs for a system are largely determined when an aircraft is designed. Once a system is fielded, however, a program manager of a system such as the F-16, for example, can directly influence no more than about 14-17 percent of the system's operating and support costs. Program managers can influence the cost of maintenance by acquiring a more reliable part or revising a maintenance procedure, but they cannot control when or how often a system is used. They cannot decide the number of pilots or support personnel that are needed, the number of hours a system is to be used, or major maintenance schedules. Thus, significant personnel, base operations, maintenance, and overhead costs are outside their control or influence.

Similarly, program managers do not manage or control the funds used to pay for operations and support functions and activities or the investment funds used to make cost reduction improvements. Authority for managing operating and support funds, as well as aircraft improvement funds, again rests with the major commands and Air Force headquarters. Program office personnel told us that there are few incentives for promoting investments in cost reduction initiatives because the Air Force's top priority is to improve readiness and combat performance. Also, the major commands or Air Force headquarters routinely deduct the estimated savings from programs' future budgets before the savings are actually realized. If a cost reduction initiative does not go as planned or does not achieve the estimated savings, the program must make up for the insufficient investment or unrealized savings. As a result, and in spite of the widespread belief that there are many available opportunities to reduce operating and support costs, many worthy projects or ideas go unfunded.

The Air Force considered giving program managers more control over operating and support as well as investment funds, but it rejected this idea because it believes fund management must be accomplished above the individual program level to ensure optimum use of limited funds. To encourage greater investment in cost reduction initiatives, the Air Force is considering allowing the major commands to retain savings obtained from cost reduction projects to use as investment funds for future projects.

Conclusions

Operating and support costs of Air Force aircraft have grown over the last 3 years, and if this growth continues at the same rate, the service could face difficult choices over whether to cut research and development funds, procurement funds, or readiness levels in the years ahead. We project that operating and support costs for aircraft could exceed $20 billion by fiscal year 2005, about $7 billion higher than DOD's goal. With planned budgets of $13 billion for research and development and $11 billion for aircraft procurement in fiscal year 2005, the projected $7-billion growth in operating and support costs poses a serious problem. The Air Force's operating and support cost reduction initiatives for fielded systems are projected to save only a relatively small amount. Further, the projected operating and support costs for new aircraft may be more, instead of less, than those of currently fielded aircraft.

The absence of clear, well understood, and frequently reported operating and support cost requirements for new systems undermines effective cost management during the critical design phase, when most future operating

and support costs are determined. Similarly, the absence of an operating and support cost requirement for fielded systems precludes management attention and inhibits investments in cost reduction projects needed to meet DOD's goals. Accordingly, it is unclear what maximum acceptable operating and support costs the Air Force is willing to pay during a system's life; therefore, there is no way of knowing whether incurred or projected costs are reasonable. Ultimately, because there is no accountability for operating and support costs of aircraft programs, oversight and management remain difficult.

To establish accountability for reaching DOD's goals of significant operating and support cost reductions, the Air Force needs to establish operating and support cost requirements for aircraft it is developing and for those that are already in service.

Recommendations

We recommend that the Secretary of Defense direct the Secretary of the Air Force to

- establish an operating and support cost requirement for developmental and fielded weapon systems to ensure full consideration of these costs among other program priorities and
- measure and periodically assess progress toward meeting individual program operating cost requirements.

Matter for Congressional Consideration

The Congress may also wish to require the Secretary of Defense to direct the Secretary of the Air Force to submit an annual report summarizing each program's operating cost requirement, its actual costs, and the actions planned to achieve the requirement.

Agency Comments and Our Evaluation

In written comments on a draft of this report, DOD agreed that significant steps remain to be taken to reduce operating and support costs. The Department also stated that it shares some of our concerns about the pace, risk, and costs associated with reducing operating costs and acknowledged the difficulty of devising a strategy that allows meaningful cost reductions while focusing on its highest priorities–improving safety, readiness, and combat capability. DOD noted that pilot programs are investigating various cost reduction approaches, but that it was too soon to determine which approaches would yield the best results. DOD also stated that our

calculations of potential operating and support costs and needed reductions were unclear. We modified our report to clarify these calculations.

DOD partially agreed with our recommendation to establish an operating and support cost requirement for both developmental and fielded systems and to periodically assess progress in meeting those requirements. As for fielded systems, DOD stated that it is premature to establish such a requirement because the ability to track total operating and support costs is still evolving. While we agree that the Air Force's ability to identify and track operating and support costs is still evolving, we believe improvements to the Air Force Total Ownership Cost system have progressed to the point that the system can be used effectively to track operating and support costs. This system, for example, is being used to track the operating costs of Air Force pilot programs, including the F-16 and B-1B, two of its largest and most costly. As DOD noted in its comments, the Air Force and other military services are already reporting operating and support costs of pilot programs and their progress toward meeting DOD's cost reduction goals. Accordingly, we believe DOD can implement our recommendation for the other fielded systems as well.

For developmental systems, DOD only noted that the operational requirements documents, selected acquisition reports, and pilot program baselines establish cost goals or report costs that, in some cases, may include total ownership costs. None of these documents, however, establishes a specific operating and support cost requirement that would ensure full consideration of these costs along with other program priorities or demand trade-offs between these requirements. We believe such trade-offs are essential to lowering the Department's operating and support costs. We also believe such requirements should be consistently established and periodically assessed for all major developmental programs.

DOD did not agree with our matter for congressional consideration and noted that the Department already addresses life-cycle costs, which are similar to total ownership costs, in a variety of documents and does not wish to have a separate reporting system imposed on it. As noted in our report, we do not believe the Department currently provides sufficient emphasis on operating and support costs. In addition, existing requirement documents cited by the Department do not include a requirement for operating and support costs, nor do these documents report on these costs in the same way. We believe an annual reporting requirement would

provide a stronger emphasis on operating and support costs and a more consistent reporting mechanism.

We have provided additional clarifications in our report to address other technical comments included in DOD's letter. Appendix II contains the full text of DOD's comments.

We are sending copies of this report to the Honorable William S. Cohen, Secretary of Defense; the Honorable F. Whitten Peters, Secretary of the Air Force; the Honorable Jacob J. Lew, Director, Office of Management and Budget; and other interested congressional committees. We will also make copies available to others upon request.

If you or your staff have any questions concerning this report, please call me on (202) 512-4841. Key contributors to this report are listed in appendix III.

James Wiggins
Associate Director
Defense Acquisitions Issues

Scope and Methodology

We reviewed the Air Force's Total Ownership Cost assessment methodology and discussed its use with aircraft program office officials. We also assembled and analyzed data on fielded weapon systems from the Air Force's Total Ownership Cost information system. In addition, we discussed operating and support cost data with the programs reviewed in this report.

To determine how the Air Force identifies and resolves operating and support cost issues for fielded aircraft, we visited and obtained information from Air Combat Command, Langley Air Force Base, Virginia, and Air Mobility Command, Scott Air Force Base, Illinois. We obtained specific information from the B-1B, C-17, F-16, and F-117A program offices at Wright-Patterson Air Force Base, Ohio. We discussed F-117A support at the 49th Fighter Wing, Holloman Air Force Base, New Mexico, and B-1B support at the Oklahoma City Air Logistics Center, Oklahoma City, Oklahoma, and the Warner Robins Air Logistics Center, Warner Robins, Georgia. We obtained and analyzed information on the Air Force Reduction of Total Ownership Cost program from Air Force Headquarters, Washington, D.C.

To determine how the Air Force is minimizing operating and support costs during the design and development phase of new aircraft, we obtained and analyzed information from the Joint Strike Fighter program office at Crystal City, Virginia. We also obtained information from the F-22 System Program Office, the Joint Primary Aircraft Trainer System Program Office, the Global Hawk Program Office, and the C-5 Development Office at Wright-Patterson Air Force Base, Ohio. We reviewed Department of Defense and Air Force acquisition guidance and discussed the guidance, including cost as an independent variable acquisition reform effort, with officials from the Office of the Secretary of Defense, Program Analysis and Evaluation; the Defense Systems Management College; and the Air Force acquisition reform office.

We conducted our review from February 1999 through June 2000 in accordance with generally accepted government auditing standards

Comments From the Department of Defense

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON DC 20301-3000

ACQUISITION AND TECHNOLOGY

04 AUG 2000

Mr. James Wiggins
Associate Director
Defense Acquisitions Issues
National Security and International Affairs Division
U.S. General Accounting Office
Washington, D.C. 20548

Dear Mr. Wiggins,

This is the Department of Defense (DoD) response to the GAO draft report, "DEFENSE ACQUISITIONS: Higher Air Force Priority Needed to Achieve Operating and Support Cost Reductions," dated June 6, 2000 (GAO Code 707384/OSD Case 2032). The Department partially concurs with the report and agrees that significant steps remain to be taken to reduce Operating and Support (O&S) costs.

Reducing O&S costs is a high-priority objective in the Office of the Secretary of Defense, the Military Services, and the Defense agencies. Unprecedented attention is being given to reducing these costs, not only because, as your report recognizes, it is a large and growing share of the total DoD budget, but also because supportability is a critical component of operational effectiveness. While combat capability, safety, and readiness have been and remain our highest priorities, we must also place a high priority on reducing O&S costs.

We share some of your concerns about the pace, risk, and costs of business practices reengineering and O&S cost reduction. Our challenge is in devising a strategy that allows for meaningful O&S cost reductions while focusing on our highest priorities. As your report recognizes, there are dramatic initiatives proposed by the DoD Components to test new concepts. Technological changes and new business practices position DoD operations to provide dramatically better service to the warfighter while reducing O&S costs. We must also operate within the guidelines of the 50/50 depot maintenance workload rules and maintain core competency in addition to other outsourcing requirements. Meeting all of these requirements demands a balanced and carefully crafted approach. While the pilot programs are investigating diverse and innovative approaches to meet these requirements, it is too soon now to determine which approach(es) will prove to yield the best results. As we evaluate the results of the pilot programs, we will adopt the successes and apply them to other programs to gain the widest possible benefits of the innovations. While we hope and expect that these efforts will allow us to reach the stretch goal of 20% cost reduction compared to what we would have spent without these efforts, we also hope for even greater savings.

Your report states that the operating and support costs in the Air Force will increase to $20 billion by year 2005. You also state that to meet goals the Air Force will have to reduce these costs by up to $7 billion per year for the next four to five years. The arithmetic that led to that conclusion is not clear.

DoD comments on the draft GAO report recommendations are provided in the enclosure. We have also provided separately some technical comments. The DoD appreciates the opportunity to comment on the draft report.

Sincerely,

George R. Schneiter
Director
Strategic and Tactical Systems

Enclosure

GAO DRAFT REPORT, DATED JUNE 6, 2000
GAO CODE 707384/OSD CASE 2032

"DEFENSE ACQUISITIONS: HIGHER AIR FORCE PRIORITY NEEDED TO ACHIEVE OPERATING AND SUPPORT COST REDUCTIONS"

DEPARTMENT OF DEFENSE (DOD) COMMENTS TO THE GAO RECOMMENDATIONS

RECOMMENDATIONS: To establish accountability for reaching DOD's goals of significant operating and support cost reductions, the Air Force needs to establish operating and support cost requirements for the aircraft it is developing and for those that are already in service. Specifically, we recommend that the Secretary of Defense direct the Secretary of the Air Force to

- establish an operating and support cost requirement for developmental and fielded weapon systems to ensure full consideration of these costs among the other program priorities and

- measure and periodically assess progress toward meeting the individual program operating cost requirements.

DOD RESPONSE: Partially concur. For major acquisition programs, total ownership cost (TOC) estimates are permitted by the DoD 5000.2 directive. For fielded systems, tracking TOC is still an evolving effort and, therefore, it is premature to direct such reporting. However, for those fielded systems that are DoD pilot programs, all of the military departments report O&S cost as well as progress made towards cost avoidance, in accordance with the individual program goals. DoD documents that set cost goals or that report on costs, which in some cases include total ownership cost, as well as other program parameters are: the operational requirements document (for "newer" programs), selected acquisition reports, and pilot program baselines.

GAO DRAFT REPORT, DATED JUNE 6, 2000
GAO CODE 707384/OSD CASE 2032

"DEFENSE ACQUISITIONS: HIGHER AIR FORCE PRIORITY NEEDED TO ACHIEVE OPERATING AND SUPPORT COST REDUCTIONS"

DEPARTMENT OF DEFENSE (DOD) COMMENTS ON MATTER FOR CONGRESSIONAL CONSIDERATION

MATTER: The GAO has suggested that "Congress may also wish to require the Secretary of the Air Force to submit an annual report summarizing each program's operating cost requirement, its actual cost, and the actions planned to achieve the requirement."

DOD RESPONSE: Non-concur. DoD, as explained earlier, already addresses cost in a variety of ways (acquisition program baselines, selected acquisition reports, and even in requirements documents). These costs include life cycle costs, which are similar to total ownership costs. We tailor our data collection and reporting efforts to suit the program's needs and management approach. We would not wish to have a system imposed across the board for a certain group of programs.

GAO Contacts and Acknowledgments

GAO Contacts

James F. Wiggins (202) 512-4343
William Graveline (256) 650-1414

Acknowledgments

In addition to those named above, Dave Best, Matt Mongin, and Jerry Wood made key contributions to this report.

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