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TACTICAL AIRCRAFT

Status of the F/A-22 Program

Statement of Allen Li, Director
Acquisition and Sourcing Management

April 2, 2003

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Status of the F/A-22 Program

GAO Accountability • Integrity • Reliability

Highlights

Highlights of GAO-03-603T, a testimony before the Subcommittee on Tactical Air and Land Forces, House Committee on Armed Services

Why GAO Did This Study

The Air Force is developing the F/A-22 aircraft to replace its fleet of F-15 air superiority aircraft. The F/A-22 is designed to be superior to the F-15 by being capable of flying at higher speeds for longer distances, less detectable, and able to provide the pilot with substantially improved awareness of the surrounding situation.

The National Defense Authorization Act for Fiscal Year 1998 requires us to annually assess the F/A-22 development program and determine whether the program is meeting key performance, schedule, and cost goals. We have issued six of these annual reports to Congress. We have also reported on F/A-22 production program costs over the last 3 years. Most recently, we reported on F/A-22 production and development in February and March 2003 respectively.

This testimony summarizes our work on the F/A-22 program, covering performance, cost, and scheduling issues.

What GAO Recommends

GAO is not making recommendations in this testimony. However, recommendations in several prior GAO reports have stressed the need for the Air Force to not increase annual production rates until greater knowledge is achieved through the completion of testing.

www.gao.gov/cgi-bin/getrpt?GAO-03-603T.

To view the full testimony, click on the link above.
For more information, contact Allen Li at (202) 512-4841 or Lia@gao.gov.

What GAO Found

In the past several years, we have reported on a range of problems affecting the development of F/A-22. Specifically:

- F/A-22 estimated performance in the areas of supercruise, acceleration, maneuverability, radar observability, combat radius, and range in searching targets have so far been met or exceeded. However, problems have surfaced related to overheating during high-speed flight-testing, reliability, avionics that perform radar, communication, navigation, identification and electronic warfare functions as well as excess movement of the vertical tails. Modifications are being made to some test aircraft to address some of these problems. For now, however, testing in some areas is restricted.

- Each year since 1998, we have reported that assembly of the test aircraft was requiring more time than planned and that this was causing the test aircraft to be delivered late to the test center for flight-testing. We have also reported annually since 2000 that flight-test program efficiency—the amount of flight-testing accomplished—has been less than planned.

- Cost increases have plagued the F/A-22 program since development began in 1991. Since 1997, the Air Force's estimated cost to develop the F/A-22 has increased by $3.2 billion bringing the total estimate to $21.9 billion. In addition, over the last 6 years, DOD has identified about $18 billion in estimated production cost growth bringing the total estimate to $42.2 billion—which exceeds the congressionally mandated production cost limit of $36.8 billion. Further, modernization costs have increased dramatically in recent years. Actions to offset estimated cost growth have had mixed success.

These problems have dramatically affected the F/A-22 program. Cost increases, in part, have forced the Air Force to substantially decrease the number of aircraft to be purchased—from 648 to 276. Delays in testing also have significant consequences. Continuing to acquire aircraft before adequate testing is a high-risk strategy that could serve to further increase production costs.

Moreover, F/A-22 problems have limited DOD's ability to upgrade its aging tactical aircraft fleet. If the F/A-22 program had met its original goals, the Air Force could have been replacing older aircraft with F/A-22 aircraft over 7 years ago. Now, however, it will not begin replacing aircraft until late 2005 at the earliest. The rate of replenishment will be substantially lower, due to the decrease in the number of new aircraft to be purchased. As a result, DOD will have to continue to use tactical aircraft that contribute to increased operating and support costs and it will have to wait longer than anticipated to have access to the advanced capabilities to be offered by the F/A-22.

Chairman Weldon, Ranking Member Abercrombie, and Members of the Subcommittee:

I am pleased to be here today to discuss our work on the F/A-22 development and production programs. Today's hearing occurs at a critical time—with the Department of Defense (DOD) conducting operations overseas while seeking to respond to changes in security threats and still meeting the challenge of transforming the military. DOD is spending an average of $150 billion annually on acquisition to support its current missions and to invest in future capabilities. The magnitude of this investment, combined with fiscal pressures across the government and the public's growing expectations for demonstrable results, clearly requires DOD to be as efficient and effective as possible in obtaining new weapons systems.

The F/A-22 Raptor, designed to be superior to any known or projected adversary aircraft, is a key component in DOD's modernization strategy as it is designed to replace the F-15 fighter. As you know, the Air Force started developing the F/A-22 in 1991. While it plans to complete development in July 2004, important operational test and evaluation activities have yet to be completed. Low-rate production was approved in August 2001, and the Air Force plans to procure a minimum of 276 aircraft for $42.2 billion.

As requested, I will discuss our past and recent findings related to the F/A-22 program. Specifically, I will highlight the Air Force's progress in (1) addressing performance issues and the status of actions to address them, (2) resolving delays in flight-testing and (3) dealing with cost growth. I will also identify risks in the Air Force's acquisition plan. Problems in these areas have dramatically affected the program. For example, cost increases have been a factor in the Air Force substantially decreasing the number of aircraft to be purchased—from 648 to 276. Performance problems, which are now being addressed, have limited the Air Force's ability to test the aircraft. Delays in testing have significant consequences. Continuing to acquire aircraft before adequate testing is a high-risk strategy that could serve to further increase production costs.

Together, these problems have rippling effects on DOD's ability to upgrade its aging tactical aircraft fleet. If the F/A-22 program had met its original goals, the Air Force could have been replacing older aircraft with F/A-22 aircraft over 7 years ago. Now, however, it will not begin replacing aircraft until late 2005 at the earliest. Moreover, the rate of replenishment will be substantially lower, due to the decrease in the number of new aircraft to

be purchased. As a result, DOD will have to continue to use tactical aircraft that contribute to increased operating and support costs and it will have to wait longer than anticipated to have access to the advanced capabilities offered by the F/A-22.

Background

The Air Force is developing the F/A-22[1] aircraft to replace its fleet of F-15 air superiority aircraft. The F/A-22 is designed to be superior to the F-15 by being capable of flying at higher speeds for longer distances, less detectable, and able to provide the pilot with substantially improved awareness of the surrounding situation.

The National Defense Authorization Act for Fiscal Year 1998[2] requires us to annually assess the F/A-22 development program and determine whether the program is meeting key performance, schedule, and cost goals. We have issued six of these annual reports to Congress. We have also reported on F/A-22 production program costs over the last 3 years. Most recently, we reported on F/A-22 production and development in February and March 2003, respectively.[3]

Following a history of increasing cost estimates to complete the development phase of the F/A-22 program, the National Defense Authorization Act for Fiscal Year 1998 established a cost limitation for both the development and production programs.[4] Subsequently, the National Defense Authorization Act for Fiscal Year 2002 eliminated the cost limitation for the development program but left the cost limit for production in place.[5] The production program is now limited to $36.8

[1] "F/A" stands for fighter/attack aircraft. The Air Force changed the designation from F-22 to F/A-22 in September 2002 to reflect the aircraft's air-to-surface attack capability.

[2] P.L. 105-85, section 217, Nov. 18, 1997.

[3] See U.S. General Accounting Office, *Tactical Aircraft: DOD Needs to Better Inform Congress about Implications of Continuing F/A-22 Cost Growth*, GAO-03-280 (Washington D.C.: Feb. 28, 2003) and *Tactical Aircraft: DOD Should Reconsider Decision to Increase F/A-22 Production Rates While Development Risks Continue*, GAO-03-431 (Washington, D.C.: Mar. 14, 2003).

[4] P.L. 105-85, section 217, Nov. 18, 1997.

[5] P.L. 107-107, section 213, Dec. 28, 2001.

billion.[6] The current cost estimate of the development program is $21.9 billion.

Performance Issues

In the past several years, we have reported on a range of performance issues that have arisen during the development of the F/A-22. F/A-22 estimated performance in the areas of supercruise, acceleration, maneuverability, radar observability, combat radius, and radar range in searching targets have so far been met or exceeded. However, problems have surfaced related to some overheating concerns during high-speed flight-testing, reliability, avionics that perform radar, communication, navigation, identification and electronic warfare functions as well as excess movement of the vertical tails. Modifications are being made to some test aircraft to address some of these problems. For now, however, testing in some areas is restricted.

In 2001, we reported on continuing increases in aircraft weight and that more frequent maintenance than planned on the aircraft was being required. We also reported on structural inadequacies in the aft (rear) fuselage and on problems with the separation of some materials within the horizontal tail section and cracking of the clear section of the canopy. In 2002, we again reported that the F/A-22's performance could be affected by increased aircraft weight and maintenance needs as well as a potential problem with "buffeting", or excessive movement, of the aircraft's vertical tails. We also continued to report on problems with the separation of materials within the horizontal tail section and cracking of the clear section of the canopy.

We reported last month that the F/A-22 developmental program did not meet key performance goals established for fiscal year 2002 and continues to confront numerous technical challenges, specifically:

- Avionics instability: Software instability has hampered efforts to integrate advanced avionics capabilities into the F/A-22 system. Avionics control and integrated airborne electronics and sensors are designed to provide an increased awareness of the situation around the pilot. The Air Force told us avionics have failed or shut down during numerous tests of F/A-22 aircraft due to software problems. The shutdowns have occurred when the pilot attempts to use the radar, communication, navigation, identification,

[6] The cost limitation, before adjustment under the act's provisions, was $43.4 billon.

and electronic warfare systems concurrently. Although the plane can still be flown after the avionics have failed, the pilot is unable to successfully demonstrate the performance of the avionics. Therefore, the Air Force has had to extend the test program schedule.

The Air Force has recognized that the avionics problems pose a high technical risk to the F/A-22 program, and in June 2002 the Air Force convened a special team to address the problem. According to the team, the unpredictable nature of the shutdowns was not surprising considering the complexity of the avionics system. The team recommended that the software be stabilized in the laboratory before releasing it to flight-testing. The team further recommended conducting a stress test on the software system architecture to reduce problems and ensure it is operating properly. The Air Force implemented these recommendations. Further, the Air Force extended the avionics schedule to accommodate avionics stability testing and it now plans to complete avionics testing in the first quarter of 2005. However, Air Force officials stated they do not yet understand the problems associated with the instability of the avionics software well enough to predict when they will be able to resolve this problem.

- Vertical fin buffeting: Under some circumstances, the F/A-22 experiences violent movement, or buffeting, of the vertical fins in the tail section of the aircraft. Buffeting occurs as air, moving first over the body and the wings of the aircraft, places unequal pressures on the vertical fins and rudders. The buffeting problem has restricted the testing of aerial maneuvers of the aircraft. In addition, unless the violent movement is resolved or the fins strengthened, the fins will break over time because the pressures experienced exceed the strength limits of the fins. This could have an impact on the expected structural life of the aircraft. Lockheed Martin has developed several modifications to strengthen the vertical fins.

- Overheating concerns: Overheating in the rear portions of the aircraft has significantly restricted the duration of high-speed flight-testing. As the F/A-22 flies, heat builds up inside several areas in the rear of the aircraft. Continued exposure to high temperatures would weaken these areas. For example, a portion of the airframe that sits between the engines' exhausts experiences the highest temperatures. This intense heat could weaken or damage the airframe. To prevent this heat buildup during flight-testing, the aircraft is restricted to flying just over 500 miles per hour, about the same

speed as a modern jet liner, and significantly below the supercruise[7] requirement. Currently, the F/A-22 flies with temperature sensors in those areas of the aircraft and slows down whenever the temperature approaches a certain level. The Air Force may incorporate a modification that adds copper sheets to the rear of the aircraft to alleviate the problem. The Air Force began these modifications in January 2003 and plans to complete them by July 2003.

- Horizontal tail material separations: F/A-22 aircraft have experienced separations of materials in the horizontal tail and the shaft, which allow the tail to pivot. Because the separations reduce tail strength, the Air Force restricted flight-testing of some aircraft until it had determined that this problem would not affect flight safety during testing. The Air Force and the contractor initially believed that improvements to the aircraft's manufacturing process would solve this problem. However, the Air Force has determined that it could only solve this problem by redesigning the aircraft's tail. The Air Force plans to conduct flight-testing of the redesigned tail between February 2004 and April 2004.

- Airlift support requirements: The Air Force estimates it will not meet the F/A-22 airlift support requirement—a key performance parameter.[8] The airlift support requirement is that 8 C-141 aircraft or their equivalents would be sufficient to deploy a squadron of 24 F/A-22s for 30 days without resupply. Today, the Air Force estimates that 8.8 C-141 equivalents will be necessary.

- Impact of maintenance needs on performance: The F/A-22's performance may also be affected by maintenance needs that exceed established objectives. The Air Force estimates that the F/A-22 should, at this point in its development, be able to complete 1.67 flying hours between maintenance actions and 1.95 flying hours by the end of development. However, aircraft are requiring five times the maintenance actions expected at this point in development. As of November 2002, the development test aircraft have been completing only .29 flying hours between maintenance actions. Therefore, the development test aircraft are spending more time than planned on the ground undergoing maintenance.

[7] Supercruise is the aircraft's ability to travel at high speeds for long ranges. The F/A-22's supercruise requirement is approximately 1,000 miles per hour.

[8] U.S. General Accounting Office, *Tactical Aircraft: F-22 Delays Indicate Initial Production Rates Should Be Lower to Reduce Risks*, GAO-02-298 (Washington, D.C.: Mar. 5, 2002).

Flight Test Schedule Delays

Testing is instrumental to gauging the progress being made when an idea or a concept is translated into an actual product that people use. DOD divides testing into two categories: developmental and operational. The goal of developmental tests is to determine whether the weapon system meets the technical specifications of the contract. The goal of operational testing is to evaluate the effectiveness and suitability of the weapon system in realistic combat conditions. Operational testing is managed by different military test organizations that represent the customers, such as the combat units that will use the weapons. The results of operational tests are provided to Congress as well as the Secretary of Defense and senior service officials.

Our reviews over the years have underscored the importance of not delaying tests too late in development—when it is more difficult, costly, and time consuming to fix any problems discovered. Yet, we have been reporting on delays of flight tests for the F/A-22 and that these delays have contributed to scheduling and cost problems affecting the program.

F/A-22 flight-testing began in late 1997. Each year since 1998, we have reported that assembly of the test aircraft was requiring more time than planned and that this was causing the test aircraft to be delivered late to the test center for flight-testing. We have also reported annually since 2000 that the flight-test program efficiency—the amount of flight-testing accomplished—has been less than planned.

In March 2003, we reported that F/A-22 flight-testing was slower than expected in 2002 in all test areas according to Office of the Secretary of Defense (OSD) testing officials. Consequently, the Air Force extended flight test schedules and reduced the number of flight tests. Many tasks originally planned for 2002 were rescheduled for 2003. Further, the Air Force now plans to conduct more developmental flight-testing concurrently with operational testing.

Continuing technical problems were the primary reasons for the most recent delay in flight-testing. In addition, late delivery of development aircraft to the flight-test center continued to be a contributing problem. Late deliveries were due not only to technical problems but also to ongoing problems associated with the manufacture and assembly of development aircraft by the prime contractor.

With the new schedule, the Air Force delayed the beginning of operational testing for 4 months, until the portion of developmental testing required to begin operational testing could be completed. Operational testing is now

planned to begin in August 2003. Table 1 shows the changes in key F/A-22 schedule events.

Table 1: Schedule Changes for Key F/A-22 Test Program Events

Key Events	Prior Schedule	Revised Schedule	Change in months
Completion of development flight testing necessary prior to operational testing	Apr. 2003	Aug. 2003	4
Start of operational testing	Apr. 2003	Aug. 2003	4
Completion of operational testing	Dec. 2003	Jul. 2004	7
High-rate production decision	Mar. 2004	Mar. 2004	0

Source: U.S. Air Force.

Further, according to OSD officials involved in operational testing, there is a high risk of not completing an adequate amount of development flight-testing before operational testing is scheduled to begin. Indeed, we believe that it is unlikely that the Air Force will be able to complete all necessary avionics flight-testing prior to the planned start of operational testing. Based on F/A-22 flight test accomplishment data and current flight test plans, we project that the start of operational testing might be delayed until January 2004. As a result, operational testing could be delayed by several months beyond the current planned date of August 2003.

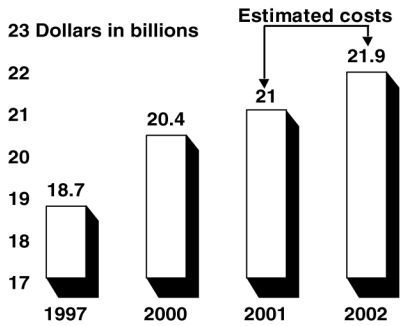
Cost Increases

Cost increases have plagued the F/A-22 program since it began in 1991. They have spurred Congress to impose spending limits and have forced the Air Force to scale back production. Nevertheless, the Air Force is still contending with cost increases in three principal areas: development, production, and modernization.

Development Costs

Since 1997, the Air Force's estimated cost to develop the F/A-22 has increased by $3.2 billion. Figure 1 highlights development cost limitation and estimate increases during the past 6 years.

Figure 1: Development Cost Limitation and Estimate Increases Since 1997



Source: U.S. Air Force.

Increases prior to 1998 have prompted limitations on spending from Congress. While the Air Force held the position that these limitations could be met until recently, our reviews showed that there was a potential for additional increases because of delays. Table 2 presents a time line of congressional limitations, our findings and DOD's positions.

Table 2: Chronology of Development Cost Growth

Year of GAO report (annually in March)	Congressional limitation/ DOD estimate	GAO findings	DOD position
N/A	$18.688 billion (1997)	N/A	N/A
1998	$18.884 billion[a]	Schedule delays may impact cost estimate.	Development can be completed within cost limitation.
1999	$18.939 billion	Potential cost growth of $482 million.	Development can be completed within cost limitation.
2000	$18.880 billion[b] Adjusted to $20.443 billion in May 2000.	Keeping within cost limit depends on (1) completing the development program as scheduled and (2) offsetting identified cost growth.	Development can be completed within cost limitation.
2001	$20.443 billion Cost limitation removed in late 2001.	Flight-testing and operational testing completion likely delayed, resulting in additional cost growth. Recommend limiting production rate.	Congressionally approved increase in cost limit will be necessary to complete adequate testing.
2002	DOD estimate $21 billion Changed to $21.9 billion in Dec. 2002.	Costs likely to exceed $21 billion estimate. Recommend DOD reassess costs to complete development and limit production rate.	Air Force increases estimate by $557 million to $21 billion to ensure adequate testing.
2003	$21.9 billion	Schedule delays continue. Recommend reconsidering decision to increase production rate.	DOD acknowledges $876 million cost growth. Estimate grows to $21.9 billion.

Source: GAO.

[a]Adjusted to reflect conferee direction and reduced effect of inflation.

[b]Adjusted for inflation.

The initial congressional limitation of $18.688 billion established in 1997 followed an Air Force team's review of estimated development and production costs. That team concluded in 1997 that additional time would be required to complete the development program and estimated that costs would increase from $17.4 billion to $18.688 billion. The team recommended several changes to the development program's schedule, including slower manufacturing than planned for a more efficient transition from development to low-rate initial production and an additional 12 months to complete avionics development.

The National Defense Authorization Act for Fiscal Year 1998 then established this $18.688 billion amount as a cost limitation for the development program.[9] Congressional direction in fiscal year 2000 legislation shifted six production representative test aircraft to the development program and caused the cost limitation to be adjusted upward to $20.4 billion. In September 2001, DOD acknowledged that the cost to complete the development program would exceed the cost limitation by $557 million. This increase brought the development cost estimate to $21 billion. Subsequently, in December 2001, the National Defense Authorization Act for fiscal year 2002 eliminated the development cost limitation.

In March 2003, we reported that the Air Force estimated that development costs had increased by $876 million, bringing total development cost to $21.9 billion. This increase was due to the technical problems and schedule delays related to avionics and vertical fin buffeting discussed earlier.

Production Cost Growth

Over the last 6 years, DOD has identified about $18 billion in estimated production cost growth during the course of two DOD program reviews. As a result, the estimated cost of the production program currently exceeds the congressional cost limit. The Air Force has implemented cost reduction plans designed to offset a significant amount of this estimated cost growth. But the effectiveness of these cost reduction plans has varied.

During a 1997 review, the Air Force estimated cost growth of $13.1 billion.[10] The major contributing factors to this cost growth were inflation, increased estimates of labor costs and materials associated with the airframe and engine, and engineering changes to the airframe and engine. These factors made up about 75 percent of the cost growth identified in 1997.

In August 2001, DOD estimated an additional $5.4 billion in cost growth for the production of the F/A-22, bringing total estimated production cost to $43 billion. The major contributing factors to this cost growth were again due to increased labor costs and airframe and engine costs. These factors totaled almost 70 percent of the cost growth. According to program

[9] P.L. 105-85, section 217, Nov. 18, 1997.

[10] Based on a plan to procure 438 aircraft.

officials, major contractors' and suppliers' inability to achieve the expected reductions in labor costs throughout the building of the development and early production aircraft has been the primary reason for estimating this additional cost growth.

Mixed Success With Cost Reduction Plans

The Air Force was able to implement cost reduction plans and offset cost growth by nearly $2 billion in the first four production contracts awarded. As shown in table 2, the total offsets for these contracts slightly exceeded earlier projections by about $.5 million.

Table 3: Comparison of Planned Versus Implemented Cost Reduction Offsets for Awarded Production Contracts

(Dollars in millions)

Production lot	Planned offsets	Implemented offsets	Difference
Fiscal Year 1999 (2 aircraft)	$199.0	$200.5	$1.5
Fiscal Year 2000 (6 aircraft)	$329.3	$336.4	$7.1
Fiscal Year 2001 (10 aircraft)	$580.2	$611.1	$30.9
Fiscal Year 2002 (13 aircraft)	$827.2	$788.2	$(39.0)
Total	**$1,935.7**	**$1,936.2**	**$.5**

Source: Air Force.

Cost reduction plans exist but have not yet been implemented for subsequent production lots planned for fiscal years 2003 through 2010 because contracts for these production lots have not yet been awarded. If implemented successfully, the Air Force expects these cost reduction plans to achieve billions of dollars in offsets to estimated cost growth and to allow the production program to be completed within the current production cost estimate of $43 billion.[11] However, this amount exceeds the production cost limit of $36.8 billion.

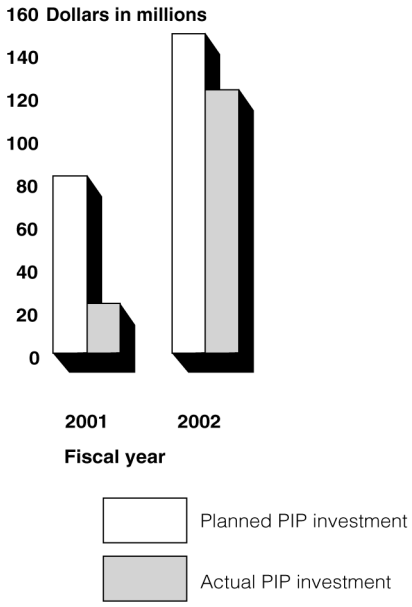
In addition, while the Air Force has been attempting to offset costs through production improvement programs (PIP), recent funding cutbacks for PIPs may reduce their effectiveness. PIPs focus specifically on improving production processes to realize savings by using an initial government investment. The earlier the Air Force implements PIPs, the greater the impact on the cost of production. Examples of PIPs previously

[11] The F/A-22 President's budget for fiscal year 2004 would transfer $876 million in production funding to help fund estimated cost increases in development. As a result, the current production cost estimate is $42.2 billion.

implemented by the Air Force include manufacturing process improvements for avionics, improvements in fabrication and assembly processes for the airframe, and redesign of several components to enable lower production costs.

As shown in figure 2, the Air Force reduced the funding available for investment in PIPs by $61 million for lot 1 and $26 million for lot 2 to cover cost growth in production lots 1 and 2.[12] As a result, it is unlikely that PIPs covering these two lots will be able to offset cost growth as planned.

Figure 2: Planned Versus Actual F/A-22 Production Improvement Program Investment for Production Lots 1 (Fiscal Year 2001) and 2 (Fiscal Year 2002)

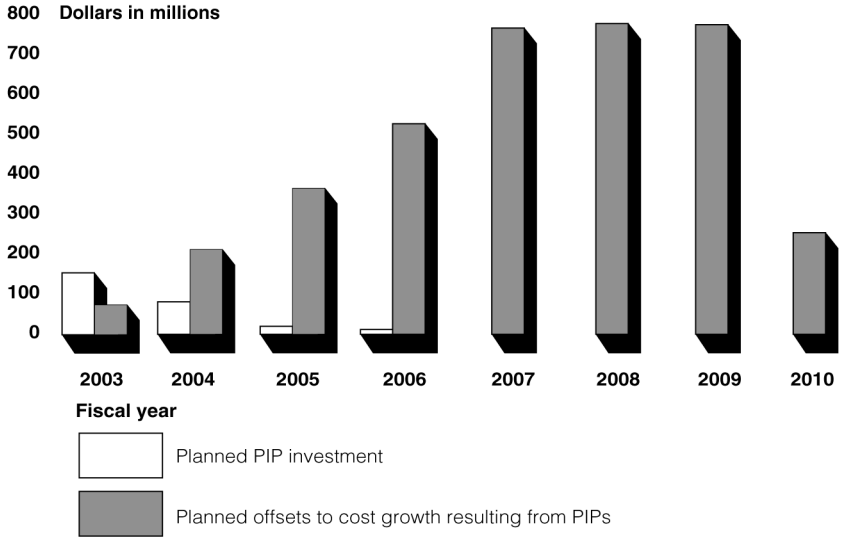


Source: U.S. Air Force.

Figure 3 shows the remaining planned investment in PIPs through fiscal year 2006 and the $3.7 billion in estimated cost growth that can potentially be offset through fiscal year 2010 if the Air Force invests as planned in these PIPs.

[12] Production lot 1 was awarded in fiscal year 2001 and production lot 2 was awarded in fiscal year 2002.

Figure 3: Planned Offsets to Cost Growth From Investing in and Implementing PIPs



Source: U.S.Air Force.

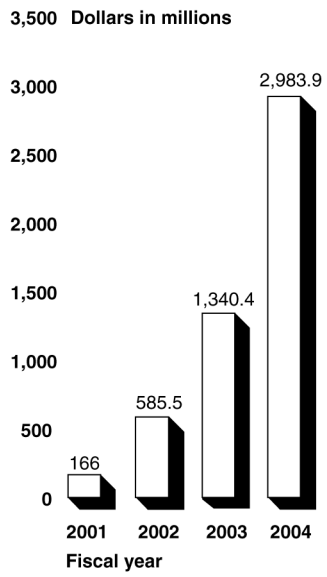
In the past, Congress has been concerned about the Air Force's practice of requesting fiscal year funding for these PIPs but then using part of that funding for F/A-22 airframe cost increases. [13] Recently, Congress directed the Air Force to submit a request if it plans to use PIP funds for an alternate purpose.

Modernization Cost Increases

Modernization costs have increased dramatically in recent years. In fiscal year 2001, the Air Force plan was to spend a total of $166 million for upgrades to enhance the operational capabilities of the F/A-22. Currently, Air Force plans in 2004 call for spending almost $3 billion through fiscal year 2009 for modernization projects. (See fig. 4). Most of the recent increase in modernization funding is necessary to provide increased ground attack capability. Other modernization projects include upgrading avionics software, adding an improved short-range missile capability, upgrading instrumentation for testing, and incorporating a classified project.

[13] Report 107-298, Nov. 19, 2001.

Figure 4: Planned Modernization Funding Increases, Fiscal Year President's budgets for 2001-2004



Source: U.S. Air Force.

Broader Effects of Cost Increases

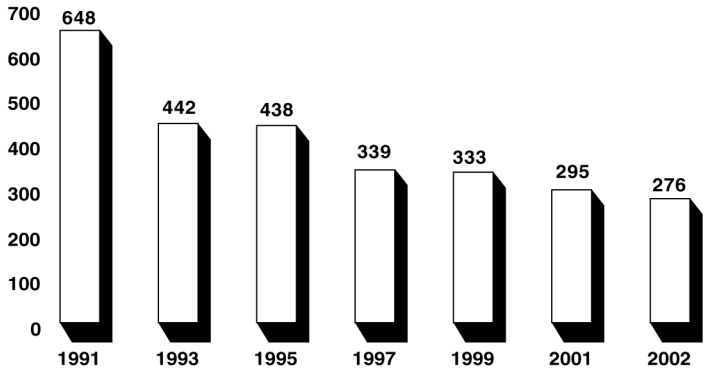
The cost increases experienced by the F/A-22 program have, in part, forced the Air Force to reduce its planned procurement over time by more than half (see fig. 5). Such a decrease, in turn, has jeopardized the Air Force's ability to modernize its fleet of tactical aircraft.

In late 2001, in the face of a significant cost overrun in the estimated cost to produce the F/A-22, the total aircraft to be produced was reduced. At the same time, DOD requested that Congress remove the production cost limit. While the congressional limit on production costs remains in effect, DOD transferred production funding to help offset $876 million in development cost growth. The net effect was another decrease in total aircraft to be produced—now estimated at 276.

This reduction may have a negative effect on Air Force plans to modernize its tactical aircraft fleet. The F/A-22 is designed to be a replacement for the F-15 aircraft, but the F/A-22 quantity reductions that have occurred since 1991 tend to exacerbate the increasing trend in the average age of current Air Force fighter aircraft. In 2001, we reported that the average age of Air Force tactical fighters would continue to increase until the fleet reached an average age of 21 years in 2011. This is almost twice the average age

goal of the Air Force. Aging equipment contributes significantly to increased operating and support costs.

Figure 5: Aircraft Quantity Reduction Since 1991



Source: U.S.Air Force.

Risks in the F/A-22 Acquisition Plan

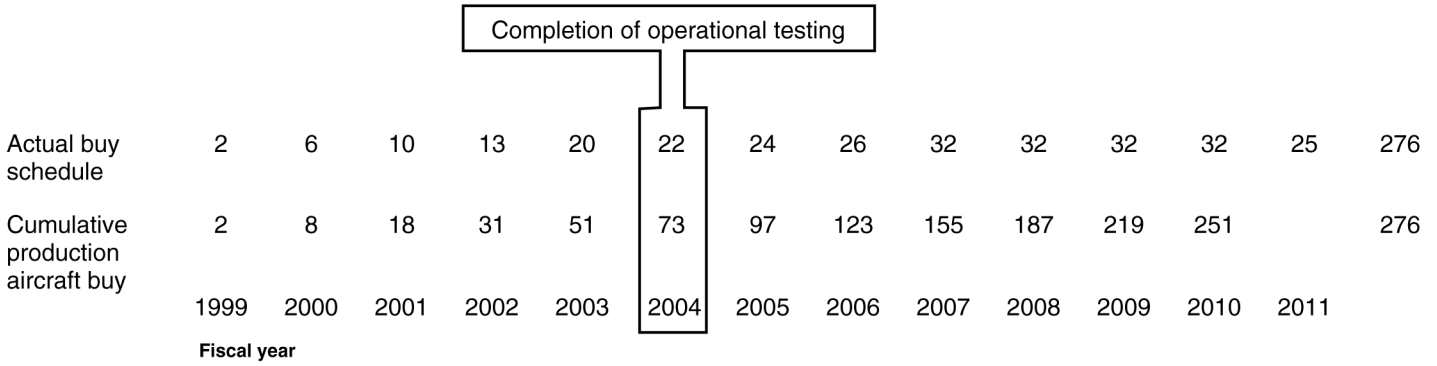
Despite continuing development problems and challenges, the Air Force plans to continue acquiring production aircraft at increasing annual rates. For example, the Air Force plans to acquire 20 aircraft during 2003, rather than the maximum of 16 Congress allowed without DOD's submittal of a risk assessment and certification.[14] Since 2001, we have reported that this is a very risky strategy because the Air Force runs the chance of higher production costs by acquiring significant quantities of aircraft before adequate testing is complete. Late testing could identify problems requiring costly modifications to achieve satisfactory performance.

As shown in figure 6, the Air Force is committed to acquiring 73 production aircraft (26 percent) before operational and development testing is complete. We believe that this is an overly optimistic strategy given the remaining F/A-22 technical problems and the current status of testing. As we have noted, acquiring aircraft before completing adequate testing to resolve significant technical problems increases the risk of costly modifications later. If F/A-22 testing schedules slip further—as we believe is likely—even more aircraft will be acquired before development

[14] DOD justified this strategy in the December 2002 risk assessment and certification it submitted to Congress.

and operational testing is complete, and the risk of costly modifications will increase still more.

Figure 6: Number of Production Aircraft on Contract Prior to Completion of Operational Testing



Source: U.S. Air Force.

Conclusions

The F/A-22 has the potential for being the most advanced air superiority aircraft ever to join the Air Force's inventory—using several advanced technologies and capabilities. But performance problems, schedule delays, and cost overruns threaten the program's success as well as DOD's ability to modernize its tactical aircraft fleet. Moreover, uncertainties about some of the performance capabilities have increased the risk that the Air Force will have to modify a larger quantity of aircraft after they are built. For these reasons, our recommendations have stressed the need for the Air Force to (1) avail itself of all opportunities for gaining manufacturing efficiencies during production, (2) find ways to fund cost reduction plans that require initial government investment instead of using funding to cover cost growth in earlier aircraft lots, and (3) reconsider its decision to increase the annual production rate beyond 16 until greater knowledge on any need for modifications is established through operational testing. Moreover, we have also recommended, in light of the high risk nature of the program, that Congress be informed about the amount of cost reduction plans identified to offset cost growth, the potential cost of production if cost reduction plans are not as effective as planned, or the quantity of aircraft that can be produced within the cost limit. Congress would be able to use this information to help exercise proper program oversight.

Mr. Chairman, that concludes my statement. I will be happy to respond to any questions you or other Members of the Subcommittee may have.

Contacts and Acknowledgements

For future questions regarding this testimony, please contact Allen Li, (202) 512-4841. Individuals making key contributions include Marvin E. Bonner, Edward Browning, Cristina Chaplain, Gary Middleton, Sameena Nooruddin, Don M. Springman, and Ralph White.