



Testimony before the Subcommittee on  
Tactical Air and Land Forces, Committee  
on Armed Services, House of  
Representatives

For Release on Delivery  
Expected at 2:00 p.m. EST  
Thursday, March 16, 2006

# TACTICAL AIRCRAFT

## Recapitalization Goals Are Not Supported by Knowledge-Based F-22A and JSF Business Cases

Statement of Michael Sullivan, Director  
Acquisition and Sourcing Management





Highlights of [GAO-06-487T](#), a testimony before the Subcommittee on Tactical Air and Land Forces, Committee on Armed Services, House of Representatives

## Why GAO Did This Study

The Department of Defense's (DOD) F-22A and Joint Strike Fighter (JSF) programs aim to replace many of the Department's aging tactical fighter aircraft—many of which have been in DOD's inventory for more than 20 years. Together, the F-22A and JSF programs represent a significant investment for DOD—currently estimated at almost \$320 billion.

GAO has reported on the poor outcomes in DOD's acquisitions of tactical aircraft and other major weapon systems. Cost and schedule overruns have diminished DOD's buying power and delayed the delivery of needed capabilities to the warfighter. Last year, GAO testified that weaknesses in the F-22A and JSF programs raised questions as to whether DOD's overarching tactical aircraft recapitalization goals were achievable.

At the request of this Subcommittee, GAO is providing updated testimony on (1) the extent to which the current F-22A and JSF business cases are executable, (2) the current status of DOD's tactical aircraft recapitalization efforts, and (3) potential options for recapitalizing the air forces as DOD moves forward with its tactical aircraft recapitalization efforts.

[www.gao.gov/cgi-bin/getrpt?GAO-06-487T](http://www.gao.gov/cgi-bin/getrpt?GAO-06-487T).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Michael J. Sullivan at (202) 512-4841 or [sullivanm@gao.gov](mailto:sullivanm@gao.gov).

## TACTICAL AIRCRAFT

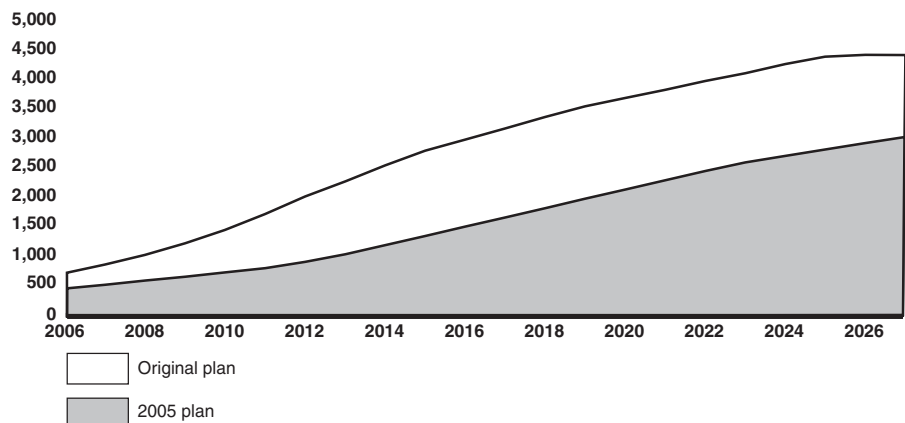
# Recapitalization Goals Are Not Supported by Knowledge-Based F-22A and JSF Business Cases

## What GAO Found

The future of DOD's tactical aircraft recapitalization depends largely on the outcomes of the F-22A and JSF programs—which represent about \$245 billion in investments to be made in the future. Both programs continue to be burdened with risk. The F-22A business case is unexecutable in part because of a 198 aircraft gap between the Air Force requirement and what DOD estimates it can afford. The JSF program, which has 90 percent of its investments still in the future, plans to concurrently test and produce aircraft thus weakening DOD's business case and jeopardizing its recapitalization efforts. It plans to begin producing aircraft in 2007 with less than 1 percent of the flight test program completed.

DOD's current plan to buy about 3,100 new major tactical systems to replace its legacy aircraft represents a 33-percent reduction in quantities from original plans. With reduced buys and delays in delivery of the new systems, costs to keep legacy aircraft operational and relevant have increased. While the Secretary of Defense maintains that continued U.S. air dominance depends on a recapitalized force, DOD has not presented an investment strategy for tactical aircraft systems that measures needs, capability gaps, alternatives, and affordability. Without such a strategy, DOD cannot reasonably ensure it will recapitalize the force and deliver needed capabilities to the warfighter within cost and schedule targets. As DOD moves forward with its efforts to recapitalize its tactical aircraft, it needs to rethink the current business cases for the F-22A and JSF programs. This means matching needs and resources before more F-22A aircraft are procured and ensuring the JSF program demonstrates acceptable aircraft performance before it enters initial production.

**Comparison of Original and Current Procurement Quantities for F/A-18EF, F-22A and JSF**  
Cumulative aircraft orders



Source: GAO analysis of DOD data.

---

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to participate in the subcommittee's hearing on the Department of Defense's (DOD) tactical air forces, including two of its major tactical aircraft fighter programs—the F-22A and the F-35, also known as the Joint Strike Fighter (JSF).<sup>1</sup> Both programs are intended to replace aging tactical fighter aircraft with highly advanced, stealthy aircraft. These two programs together represent a significant investment—currently estimated at almost \$320 billion—for DOD. To date nearly \$75 billion has been appropriated for these programs, and based on current plans, they represent a potential future investment of about \$245 billion over the next 20 years. In fiscal year 2007 alone, the budget request under consideration for these programs represents over \$8 billion. Given the large potential investment that the F-22A and JSF programs represent, decisions based on fact and knowledge about needs and resources are key to ensure that sound program investments are made.

Any discussion of the significance of DOD's investment in these two weapon systems demands that they be placed in the larger context. Fiscal imbalances and competing national needs will continue to constrain discretionary spending for years to come. Over the past 5 years, the department has doubled its planned investments in new weapon systems from about \$700 billion in 2001 to nearly \$1.4 trillion in 2006. At the same time, research and development cost growth on new weapons continues to be about 30 to 40 percent. This is how one must view major new investments, such as the F-22A and JSF, because more money may not be an option for the future. Rather, the key to getting better outcomes is to make individual programs more executable.

We have reported and testified in the past on the disappointing outcomes of DOD's acquisitions of tactical aircraft and other major weapon systems (see GAO Related Products). DOD's budgeting plans and the reality of the costs of its systems have been vastly different. Performance—if defined as the capability that actually reaches the warfighter—tends to fall short of expectations, as cost increases often result in late deliveries of smaller quantities of weapon systems. DOD has lost opportunities and buying power in the process. Last year, we testified that weaknesses in the F-22A

---

<sup>1</sup>The third major program, the F/A-18E/F, currently in production, is not a subject of this testimony.

---

and JSF programs raised questions as to whether DOD's overarching tactical aircraft recapitalization goals were achievable.<sup>2</sup>

My testimony today focuses on (1) the extent to which the current F-22A and JSF business cases are executable, (2) the current status of DOD's tactical aircraft recapitalization efforts, and (3) potential options for recapitalizing the air forces as DOD moves forward with its tactical aircraft recapitalization efforts. We performed our work in accordance with generally accepted government auditing standards.

---

## Summary

DOD currently does not have an executable business case for buying the F-22A. Over the 19 years that the aircraft has been in development, the world has changed and the capabilities the Air Force once needed and planned for the F-22A no longer satisfy today's needs. The Air Force's current stated need is for 381 F-22As to satisfy original air-to-air missions and recently added requirements for more robust air-to-ground attack and intelligence-gathering capabilities. However, because of past cost overruns and current budget constraints, DOD can now afford only 183 F-22As. This leaves a 198-aircraft gap between the Air Force's stated need and what the acquisition process is able to deliver. DOD's business case for the JSF program still includes significant cost and schedule risk that continues to jeopardize timely recapitalization of the tactical force. We recently reported that DOD plans to begin procuring large quantities of aircraft in 2007 with less than 1 percent of the flight test program completed.<sup>3</sup> By 2010, it expects to have procured 126 aircraft with only 35 percent of the flight test program completed. Concurrently testing and procuring the aircraft adds to the program's cost and schedule risks, further weakening DOD's buying power and jeopardizing its ability to recapitalize its aging tactical air force in a timely and efficient manner.

As there were last year at this time, there are many unanswered questions about whether DOD can achieve its overarching goals for modernizing its aging tactical air forces. In recent testimony on the results of the department's 2006 Quadrennial Defense Review (QDR), the Secretary of Defense stated that continued U.S. air dominance depends on a

---

<sup>2</sup>GAO, *Tactical Aircraft: F/A-22 and JSF Acquisition Plans and Implications for Tactical Aircraft Modernization*, [GAO-05-519T](#) (Washington, D.C.: Apr. 6, 2005).

<sup>3</sup>GAO, *Joint Strike Fighter: DOD Plans to Enter Production before Testing Demonstrates Acceptable Performance*, [GAO-06-356](#) (Washington D.C.: March 15, 2006).

---

recapitalized fleet. However, DOD's 2006 QDR report, issued last month, did not present a detailed investment strategy for tactical aircraft systems that addressed needs, capability gaps, alternatives, and affordability. Lacking a strategy that identifies capability gaps and affordable alternatives, DOD cannot reasonably ensure that new tactical air capabilities will be delivered to the warfighter within cost and schedule targets. Right now, DOD plans to replace legacy aircraft with about 1,400 fewer new major tactical systems than it had originally planned—almost a one-third reduction in quantities. Additionally, delivery of these new systems has lagged far behind original plans, increasing operating costs to keep legacy aircraft relevant and in the inventory longer than expected and delaying delivery of needed capabilities to the warfighter.

Despite these substantial setbacks, we believe DOD can reduce cost risk on its current acquisitions and deliver needed capabilities more quickly. This could allow it to recapitalize the aging tactical air force sooner and reduce costs to maintain the current inventory. To do so, however, DOD must rethink the business cases for the F-22A and JSF programs. Before procuring more F-22A aircraft, the Air Force and the Office of the Secretary of Defense should agree on a business case for the appropriate quantity of F-22A aircraft that (1) satisfies current Air Force needs and (2) is affordable given today's budget realities. The JSF acquisition program can reduce cost and schedule risks by adopting a new knowledge-based business case. The JSF program should delay production and investments in production capability until the aircraft design qualities and integrated mission capabilities of the fully configured and integrated JSF aircraft variants have been proven to work in flight testing. DOD should also develop a knowledge-based business case that matches requirements with proven technologies, design knowledge, and available funding. Capabilities that demand technological advances which are not yet demonstrated should be part of future increments that are funded and managed separately once demonstrated. With such an approach DOD could enter low-rate production sooner and deliver a useful product in sufficient quantities to start replacing DOD's aging tactical aircraft force. The F-16 acquisition program provides strong precedent for this type of acquisition strategy. It began delivering aircraft in 4 years and within predicted costs. GAO recommended these actions in a recent JSF report and DOD agreed that these were appropriate things to do but it believed its current acquisition strategy will allow it to achieve the JSF program objectives.

Finally, at a broader level, DOD needs to apply more discipline and controls to establish realistic business cases for acquisition programs and

---

then execute them more efficiently. This may require a new look at policies and perhaps statute.

---

## Background

Over the past 20 years, DOD has been engaged in an effort to modernize its aging tactical aircraft force. The F-22A and JSF, along with the F/A-18E/F,<sup>4</sup> are the central elements of DOD's overall recapitalization strategy for its tactical air forces. The F-22A was developed to replace the F-15 air superiority aircraft. The continued need for the F-22A, the quantities required, and modification costs to perform its mission have been the subject of a continuing debate within DOD and the Congress. Supporters cite its advanced features—stealth, supercruise speed, maneuverability, and integrated avionics—as integral to the Air Force's Global Strike initiative and for maintaining air superiority over potential future adversaries.<sup>5</sup> Critics argue that the Soviet threat it was originally designed to counter no longer exists and that its remaining budget dollars could be better invested in enhancing current air assets and acquiring new and more transformational capabilities that will allow DOD to meet evolving threats. Its fiscal year 2007 request includes \$800 million for continuing development and modifications for aircraft enhancements such as equipping the F-22A with an improved ground attack capability and improving aircraft reliability. The request also includes about \$2.0 billion for advance procurement of parts and funding of subassembly activities for the initial 20 aircraft of a 60-aircraft multiyear procurement.

JSF is a replacement for a substantial number of aging fighter and attack aircraft currently in the DOD inventory. For the Air Force, it is intended to replace the F-16 and A-10 while complementing the F-22A. For the Marine Corps, the JSF is intended to replace the AV-8B and F/A-18 A/C/D; for the Navy, the JSF is intended to complement the F/A-18E/F. DOD estimates that as currently planned, it will cost \$257 billion to develop and procure about 2,443 aircraft and related support equipment, with total costs to maintain and operate JSF aircraft adding \$347 billion over the program's life cycle. After 9 years in development, the program plans to deliver its

---

<sup>4</sup>The F/A-18E/F, which began development in 1992, evolved from the F/A-18 aircraft program and has been in production since 1997. Currently, the program is producing aircraft under its second multiyear contract. Because of the maturity of the F/A-18E/F program, we did not review it for this engagement.

<sup>5</sup>Global Strike is one of six complementary concepts of operations laying out the Air Force's ability to rapidly plan and deliver limited-duration and extended attacks against targets.

---

first flight test aircraft later this year. The fiscal year 2007 budget request includes \$4 billion for continuing development and \$1.4 billion for the purchase of the first 5 procurement aircraft, initial spares, and advance procurement for 16 more aircraft to be purchased in 2008.

We have frequently reported on the importance of using a sound, executable business case before committing resources to a new product development. In its simplest form, such a business case is evidence that (1) the warfighter's needs are valid and can best be met with the chosen concept and quantities, and (2) the chosen concept can be developed and produced within existing resources—that is, proven technologies, design knowledge, adequate funding, and adequate time to deliver the needed product. At the heart of a good business case is a knowledge-based strategy to product development that demonstrates high levels of knowledge before significant commitments of time and money are made.

---

## F-22A and JSF Acquisition Business Cases Still Include Considerable Risks

The future of DOD's tactical aircraft recapitalization depends largely on the outcomes of the F-22A and JSF programs—which represent about \$245 billion in investments to be made in the future. Yet achieving expected outcomes for both these programs continues to be fraught with risk. We have reported that the F-22A's original business case is unexecutable and does not reflect changing conditions over time. Currently, there is a significant mismatch between the Air Force's stated need for F-22A aircraft and the resources the Office of the Secretary of Defense (OSD) is willing to commit. The business case for the JSF program, which has 90 percent of its investments still in the future, significantly overlaps production with development and system testing—a strategy that often results in cost and schedule increases. Both programs are at critical junctures that require DOD to make important business decisions.

---

## Matching F-22A Requirements and Resources Is Crucial to Future Recapitalization Investment Decisions

According to the Air Force, a minimum of 381 modernized F-22A aircraft are needed to satisfy today's national strategic requirements<sup>6</sup>—a buy that is roughly half the 750 aircraft originally planned, but more than double the 183 aircraft OSD states available funding can support. Since the Air Force began developing the F-22A in 1986, the business case for the program has changed radically— threats have changed, requirements have been added, costs have increased, funds have been added, planned quantities have been reduced, and deliveries of the aircraft to the warfighter have been delayed. There is a 198-aircraft capability gap today. Decisions in the last 2 years have worsened the mismatch between Air Force requirements and available resources, further weakening the F-22A program's business case. Without a new business case, an agreement on an appropriate number of F-22As for our national defense, it is uncertain as to whether additional investments in the program are advisable.

The original business case for the F-22A program was to develop air superiority fighters to counter a projected threat of significant quantities of advanced Soviet fighters. During the 19-year F-22A development program, that threat did not materialize to the degree expected. Today, the requirements for the F-22A have evolved to include what the Air Force has defined as a more robust ground attack capability to destroy expected air defense systems and other ground targets and an intelligence-gathering capability. However, the currently configured F-22A is not equipped to carry out these roles without further investments in its development. The F-22As modernization program is currently being planned for three basic blocks, or spirals, of increasing capability to be developed and delivered over time. Current Air Force estimates of modernization costs, from 2007 through 2016, are about \$4.3 billion. Additional modernization is expected, but the content and costs have not been determined or included in the budget.

OSD has restructured the acquisition program twice in the last 2 years to free up funds for other priorities. In December 2004, DOD reduced the program to 179 F-22As to save about \$10.5 billion. This decision also

---

<sup>6</sup> The Air Force states a need for one squadron of 24 F-22A aircraft for each of the 10 Air Expeditionary Forces, the planned organization of the Air Force aircraft and personnel for operations and deployments. This equates to 240 aircraft. The remaining 141 aircraft are needed for training, and attrition, and to allow for periodic depot maintenance required for each aircraft. The Air Force states that if all 381 aircraft are acquired, the Air Force could retire about 566 legacy aircraft; if not, several billions of modification dollars will be required to extend their structural life to keep them operational.

---

terminated procurement in 2008. In December 2005, DOD changed the F-22A program again, adding \$1 billion to extend production for 2 years to ensure a next-generation fighter aircraft production line would remain in operation in case JSF experienced delays or problems. It also added 4 aircraft for a total planned procurement of 183 F-22As. As part of the 2005 change, aircraft previously scheduled in 2007 will not be fully funded until 2008 or later.

OSD and the Air Force plan to buy the remaining 60 F-22As in a multiyear procurement that would buy 20 aircraft a year for 3 years—2008 through 2010. The Air Force plans to fund these aircraft in four increments—an economic order quantity to buy things cheaper; advanced procurement for titanium and other materials and parts to protect the schedule; subassembly; and final assembly. The Air Force plans to provide Congress a justification for multiyear procurement in May 2006 and the fiscal year 2007 President's Budget includes funds for multiyear procurement. The following table shows the Air Force's plan for funding the multiyear procurement. Air Force officials have told us that an additional \$400 million in funds are needed to complete the multiyear procurement and that the accelerated schedule to obtain approval and start the effort adds risk to the program, creating more weaknesses in the current F-22A business case.

**Table 1: F-22A Proposed Multiyear Procurement Funding**

| Dollars in millions     |                |                  |                  |                  |                  |               |                   |
|-------------------------|----------------|------------------|------------------|------------------|------------------|---------------|-------------------|
|                         | FY 2006        | FY 2007          | FY 2008          | FY 2009          | FY 2010          | FY 2011       | Total             |
| <b>Lot 7 Buy</b>        |                |                  |                  |                  |                  |               |                   |
| Economic Order Quantity |                | 200.0            |                  |                  |                  |               | <b>200.0</b>      |
| Advance Procurement     | 569.2          |                  |                  |                  |                  |               | <b>569.2</b>      |
| Subassembly             |                | 1,503.9          |                  |                  |                  |               | <b>1,503.9</b>    |
| Final Assembly          |                |                  | 1,362.4          |                  |                  |               | <b>1,362.4</b>    |
| Other Cost              |                | 68.1             |                  |                  |                  |               | <b>68.1</b>       |
| <b>Subtotal</b>         | <b>\$569.2</b> | <b>\$1,772.0</b> | <b>\$1,362.4</b> |                  |                  |               | <b>\$3,703.6</b>  |
| <b>Lot 8 Buy</b>        |                |                  |                  |                  |                  |               |                   |
| Advance Procurement     |                | 277.4            |                  |                  |                  |               | <b>277.4</b>      |
| Subassembly             |                |                  | 1,433.3          |                  |                  |               | <b>1,433.3</b>    |
| Final Assembly          |                |                  |                  | 1,342.8          |                  |               | <b>1,342.8</b>    |
| Other Cost              |                |                  | 47.4             |                  |                  |               | <b>47.4</b>       |
| <b>Subtotal</b>         |                | <b>\$277.4</b>   | <b>\$1,480.7</b> | <b>\$1,342.8</b> |                  |               | <b>\$3,100.9</b>  |
| <b>Lot 9 Buy</b>        |                |                  |                  |                  |                  |               |                   |
| Advance Procurement     |                |                  | 366.6            |                  |                  |               | <b>366.6</b>      |
| Subassembly             |                |                  |                  | 1,515.7          |                  |               | <b>1,515.7</b>    |
| Final Assembly          |                |                  |                  |                  | 1,694.5          |               | <b>1,694.5</b>    |
| Other Cost              |                |                  |                  | 48.3             | 16.2             | 12.9          | <b>77.4</b>       |
| <b>Subtotal</b>         |                |                  | <b>\$366.6</b>   | <b>\$1,564.0</b> | <b>\$1,710.7</b> | <b>\$12.9</b> | <b>\$3,654.2</b>  |
| <b>Total</b>            | <b>\$569.2</b> | <b>\$2,049.4</b> | <b>\$3,209.7</b> | <b>\$2,906.8</b> | <b>\$1,710.7</b> | <b>\$12.9</b> | <b>\$10,458.7</b> |

Source: DOD data.

Note: Other cost includes funding for modifications and munitions.

A 198-aircraft gap between what the Air Force needs and what is affordable raises questions about what additional capabilities need to be included in the F-22A program. In March 2005, we recommended that the Air Force develop a new business case that justified additional investments in modernizing the aircraft to include greater ground attack and intelligence-gathering capabilities before moving forward. DOD responded to our report that business case decisions were handled annually in the budget decisions and that the QDR would analyze requirements for the F-22A and make program decisions. However, it is not clear from the QDR report, issued last month, what analyses were conducted to determine the gaps in capability, the alternatives considered, the quantities needed, or the costs and benefits of the F-22A program. Therefore, questions about the F-22A program remain:

- 
- What capability gaps exist today and will exist in the future (air superiority, ground attack, electronic attack, intelligence gathering)?
  - What alternatives besides the F-22A can meet these needs?
  - What are the costs and benefits of each alternative?
  - How many F-22As are needed?
  - What capabilities should be included?

Until these questions are answered and differences are reconciled, further investments in the program—for either the procurement of new aircraft or modernization—cannot be justified.

---

### JSF Business Case Still Contains Cost and Schedule Risks

The JSF program appears to be on the same path as the F-22A program. After being in development for 9 years, the JSF program has not produced the first test aircraft, has experienced substantial cost growth, has reduced the number of planned aircraft, and has delayed delivery of the aircraft to the warfighter. Moreover, the JSF program remains committed to a business case that invests heavily in production before testing has demonstrated acceptable performance of the aircraft. At the same time, the JSF program has contracted to develop and deliver the aircraft's full capability in a single-step, 12-year development program—a daunting task given the need to incorporate the technological advances that, according to DOD, represent a quantum leap in capability. The business case is a clear departure from the DOD policy preference that calls for adopting an evolutionary approach to acquisitions. Furthermore, the length and cost of the remaining development are exceedingly difficult to accurately estimate, thereby increasing DOD's risks in contracting for production. With this risky approach, it is likely that the program will continue to experience significant cost and schedule overruns.

The JSF program expects to begin low-rate initial procurement in 2007 with less than 1 percent of the flight test program completed and no production representative prototypes built for the three JSF variants.<sup>7</sup> Technologies and features critical to JSF's operational success, such as a low observable and highly common airframe, advanced mission systems, and maintenance prognostics systems, will not have been demonstrated in a flight test environment when production begins. Other key

---

<sup>7</sup> The JSF aircraft design includes three variants: a conventional takeoff and landing variant; an aircraft carrier-suitable variant; and a short takeoff and vertical landing.

---

demonstrations that will have not been either started or only in the initial stages before production begins include

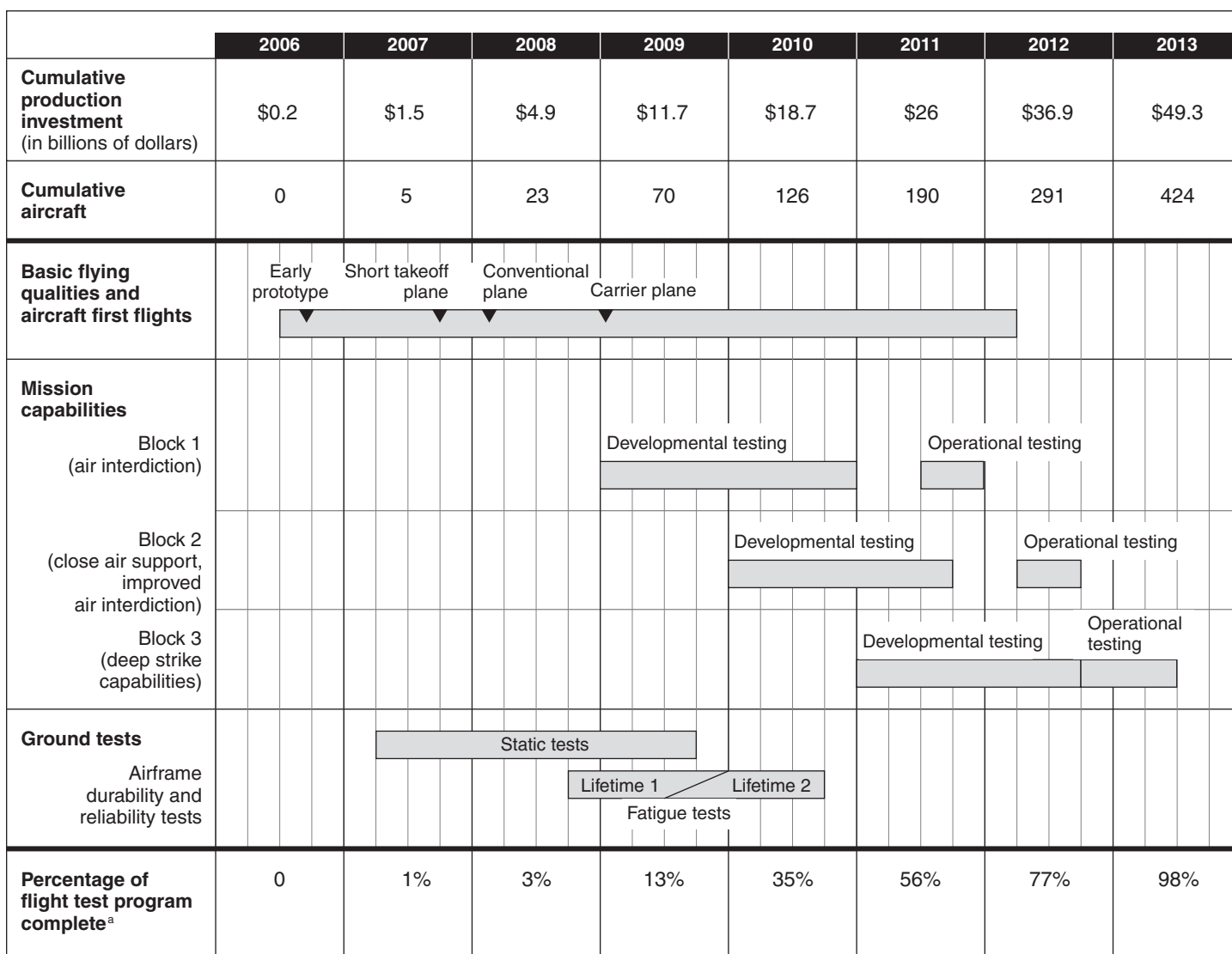
- testing with a fully integrated aircraft—mission systems and full software,
- structural and fatigue testing of the airframe, and
- shipboard testing of Navy and Marine Corps aircraft.

When the first fully integrated and capable development JSF is expected to fly in 2011, DOD will already have committed to buy 190 aircraft at an estimated cost of \$26 billion. According to JSF program plans, DOD's low-rate initial production quantities will increase from 5 aircraft a year in 2007 to 133 a year in 2013, when development and initial operational testing are completed.<sup>8</sup> By then, DOD will have procured more than double that amount—424 aircraft at an estimated cost of about \$49 billion, and spending for monthly production activities is expected to be about \$1 billion, an increase from \$100 million a month when production is scheduled to begin in 2007. Figure 1 shows the significant overlap in development and testing and the major investments in production.

---

<sup>8</sup> These figures do not include the potential for orders for international partners during low-rate initial production. Preliminary data indicate that these orders could significantly increase this rate.

**Figure 1: Overlap of Low-Rate Initial Production Investments and Testing Demonstrations of the JSF Variants**



Source: DOD (2005 data); GAO (analysis and presentation).

<sup>a</sup>Flight testing data reflects the percentage of the total flight tests completed at the time of the planned investment decision, which is currently planned for January of each year.

The overlap in testing and production is the result of a business case and acquisition strategy that has proven to be risky in past programs like F-22A, Comanche, and B-2A, which far exceeded the cost and delivery goals set at the start of their development programs. JSF has already increased its cost estimate and delayed deliveries despite a lengthy

---

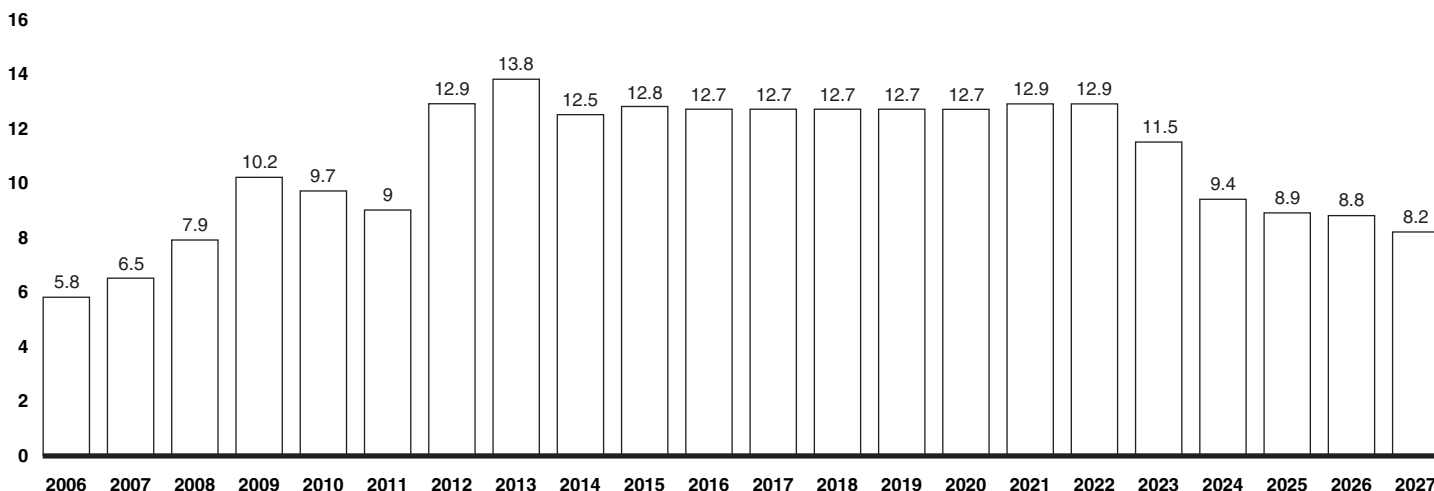
replanning effort that added over \$7 billion and 18 months to the development program. JSF officials have stated that the restructured program has little or no flexibility for future changes or unanticipated risks. The program has planned about 8 years to complete significant remaining activities of the system development and demonstration phase, including

- fully maturing 7 of the 8 critical technologies;
- completing the designs and releasing the engineering drawings for all three variants;
- manufacturing and delivering 15 flight test aircraft and 7 ground test articles;
- developing 19 million lines of software code; and
- completing a 7-year, 12,000-hour flight test program.

The JSF program's latest planned funding profile for development and procurement, produced in December 2004 by the JSF program office, assumes annual funding rates to hover close to \$13 billion between 2012 and 2022, peaking at \$13.8 billion in 2013. If the program fails to achieve its current estimated costs, funding challenges could be even greater than that. The Office of Secretary of Defense Cost Analysis Improvement Group was to update its formal independent cost estimate in the spring of 2005. The group now does not expect to formally complete its estimate until spring 2006, but its preliminary estimate was substantially higher than the program office's. A modest cost increase would have dramatic impacts on funding. For example, a 10 percent increase in production costs would amount to over \$21 billion (see fig. 2).

**Figure 2: JSF's Annual Funding Requirements, as of December 2004**

Billions of then-year dollars



Source: GAO analysis of DOD data.

DOD has recently made decisions to reduce near-term funding requirements that could cause future JSF costs to increase. It had begun to invest in the program to develop an alternative engine for the aircraft, but now plans to cancel further investments in order to make the remaining funds available for other priorities. According to DOD, it believes that there is no cost benefit or savings with an engine competition for the JSF and there is low operational risk with going solely with a single engine supplier. DOD has already invested \$1.2 billion in funding for this development effort through fiscal year 2006. By canceling the program, it expects to save \$1.8 billion through fiscal year 2011. Developing alternative engines is a practice that has been used in past fighter aircraft development programs like the F-16 and F-15 programs. An alternative engine program may help maintain the industrial base for fighter engine technology, result in price competition in the future for engine acquisition and spare parts, instill incentives to develop a more reliable engine, and ensure an operational alternative should the current engine develop a problem that would ground the entire fleet of JSF aircraft. As result, the JSF decision should be supported by a sound business case analysis. To date, we have not seen such an analysis.

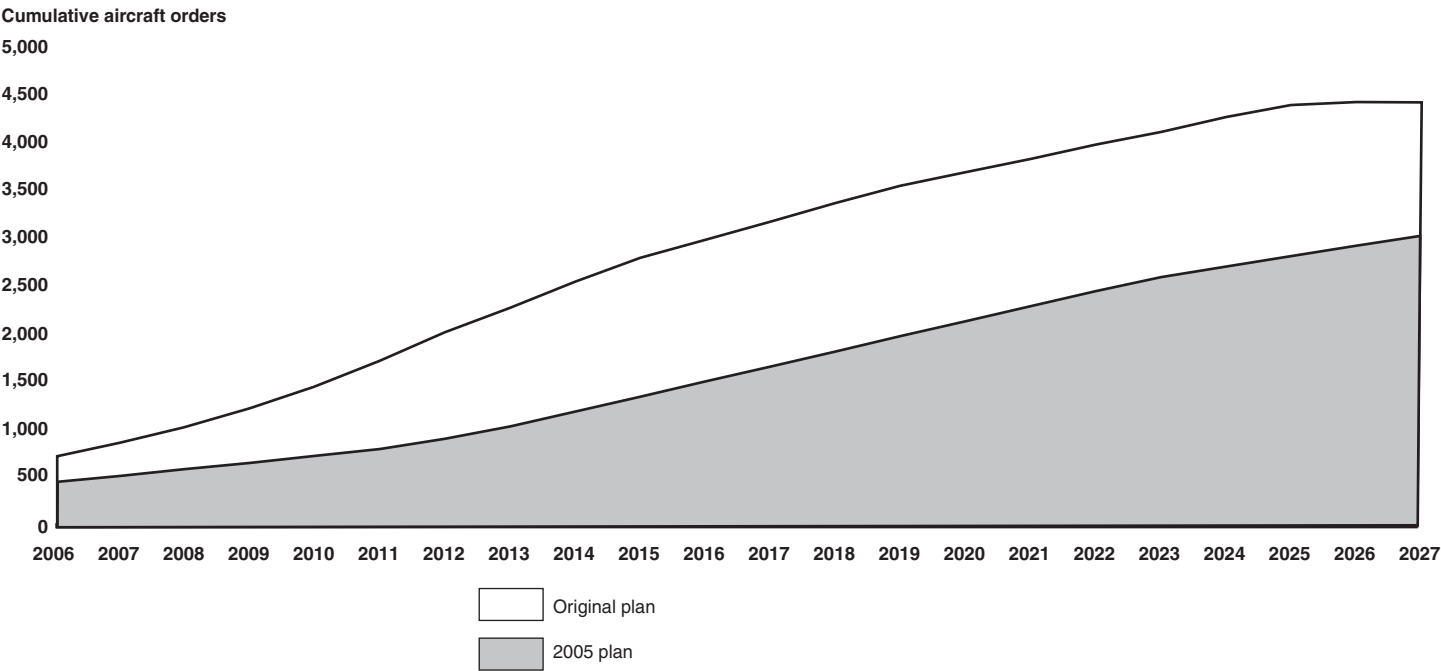
Finally, the uncertainties inherent in concurrently developing, testing, and producing the JSF aircraft prevent the pricing of initial production orders on a fixed price basis. Consequently, the program office plans to place initial procurement orders on cost reimbursement contracts. These

contracts will provide for payment of allowable incurred costs, to the extent prescribed in the contract. With cost reimbursement contracts a greater cost risk is placed on the buyer—in this case, DOD. For the JSF, procurement should start when risk is low enough to enter into a fixed price agreement with the contractor based on demonstrations of the fully configured aircraft and manufacturing processes.

### DOD’s Tactical Aircraft Recapitalization Goals Are Not Being Met

DOD has not been able to achieve its recapitalization goals for its tactical aircraft forces. Originally, DOD had planned to buy a total of 4,500 tactical aircraft to replace the aging legacy force. Today, because of delays in the acquisition programs, increased development and procurement costs, and affordability pressures, it plans to buy almost one-third fewer tactical aircraft (see fig. 3). The delivery of these new aircraft has also been delayed past original plans. DOD has spent nearly \$75 billion on the F-22A and JSF programs since they began, but this accounts for only 122 new operational aircraft.

Figure 3: Comparison of Original and Current Procurement Quantities for the F/A-18E/F, F-22A, and JSF Tactical Aircraft



Source: GAO analysis of DOD data.

---

Because DOD's recapitalization efforts have not materialized as planned, many aircraft acquired in the 1980s will have to remain in the inventory longer than originally expected, incurring higher investment costs to keep them operational. According to DOD officials, these aging aircraft are approaching the end of their service lives and are costly to maintain at a high readiness level. While Air Force officials assert that aircraft readiness rates are steady, they agree that the costs to operate and maintain its aircraft over the last decade have risen substantially. Regardless, the military utility of the aging aircraft is decreasing.

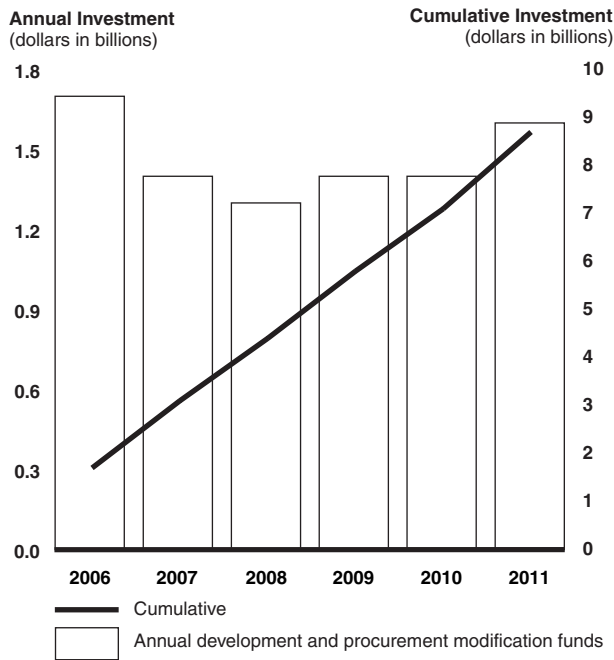
The funds used to operate, support, and upgrade the current inventory of legacy aircraft represent opportunity costs that could be used to develop and buy new aircraft. From fiscal years 2006 to 2011, DOD plans to spend about \$57 billion<sup>9</sup> for operations and maintenance and military personnel for legacy tactical fighter aircraft. Some of these funds could be invested in newer aircraft that would be more capable and less costly to operate. For example, the Air Force Independent Cost Estimate Summary shows that the F-22A will be less expensive to operate than the F-15. The F-22A will require fewer maintenance personnel for each squadron, and one squadron of F-22As can replace two squadrons of F-15. This saves about 780 maintenance personnel as well as about \$148 million in annual operating and support cost according to the independent cost estimate.

Over the same time frame, DOD also plans to spend an average of \$1.5 billion each year—or \$8.8 billion total—to modernize or improve legacy tactical fighter aircraft (see fig. 4). Further delays or changes in the F-22A or JSF programs could require additional funding to keep legacy aircraft in the inventory and relevant to the warfighter's needs.

---

<sup>9</sup>Figure includes cost data for F/A-18 E/F because it could not be broken out from the F-18 costs.

**Figure 4: Development and Modification Estimates for Legacy Tactical Fighter Aircraft**



Source: Fiscal year 2007 President's Budget Request.

Note: Not all modification costs may be reflected. Decisions stemming from the 2006 QDR or recent DOD actions have changed tactical aircraft program funding. Also, F/A-18E/F data were included because they could not be broken out from the F/A-18 data.

In testimony last year, we suggested that the QDR would provide an opportunity for DOD to assess its tactical aircraft recapitalization plans and weigh options for accomplishing its specific and overarching goals. In February 2006, the Secretary of Defense testified that recapitalization of DOD's tactical aircraft is important to maintain America's air dominance. Despite this continued declaration about recapitalizing tactical aircraft, DOD's 2006 QDR report did not present a detailed investment strategy that addressed needs and gaps, identified alternatives, and assessed costs and benefits. With limited information contained in the QDR report, many questions are still unanswered about the future of DOD's tactical aircraft modernization efforts.

---

## DOD Has an Opportunity to Set Its Tactical Aircraft Recapitalization Efforts on Track

As DOD moves forward with its efforts to recapitalize its tactical aircraft force, it has the opportunity to reduce operating costs and deliver needed capabilities to the warfighter more quickly. To take advantage of this opportunity, however, DOD must fundamentally change the way it buys weapon systems. Specifically, the department must change how it selects weapon systems to buy, and how it establishes and executes the business case. Although the F-22A program has progressed further in the acquisition process than the JSF program, both programs are at critical decision-making junctures, and the time for DOD to implement change is now.

Before additional investments in the F-22A program are made, DOD and the Air Force must agree on the aircraft's capabilities and quantities and the resources that can be made available to meet these requirements. A cost and benefit analysis of F-22A capabilities and alternative solutions weighed against current and expected threats is needed to determine whether a sound business case for the F-22A is possible and whether investing an additional \$13.8 billion over the next 5 years to procure or modernize these aircraft is justified.

With more than 90 percent of investment decisions to develop, test, and buy JSF aircraft remaining, DOD could implement significant changes in its business case before investing further in the JSF program. The JSF program should delay production and investments in production capability until the aircraft design qualities and integrated mission capabilities of the fully configured and integrated JSF aircraft variants have been proven to work in flight testing. Also, an evolutionary acquisition strategy to limit requirements for the aircraft's first increment of capabilities that can be achieved with proven technologies and available resources could significantly reduce the JSF program's cost and schedule risks. Such a strategy would allow the program to begin testing and low-rate production sooner and, ultimately, to deliver a useful product in sufficient quantities to the warfighter sooner. Once the JSF is delivered, DOD could begin retiring its aging and costly tactical aircraft. Capabilities that demand as yet undemonstrated technologies would be included as requirements in future JSF aircraft increments that would be separately managed. An evolutionary, knowledge-based acquisition approach would not only help

---

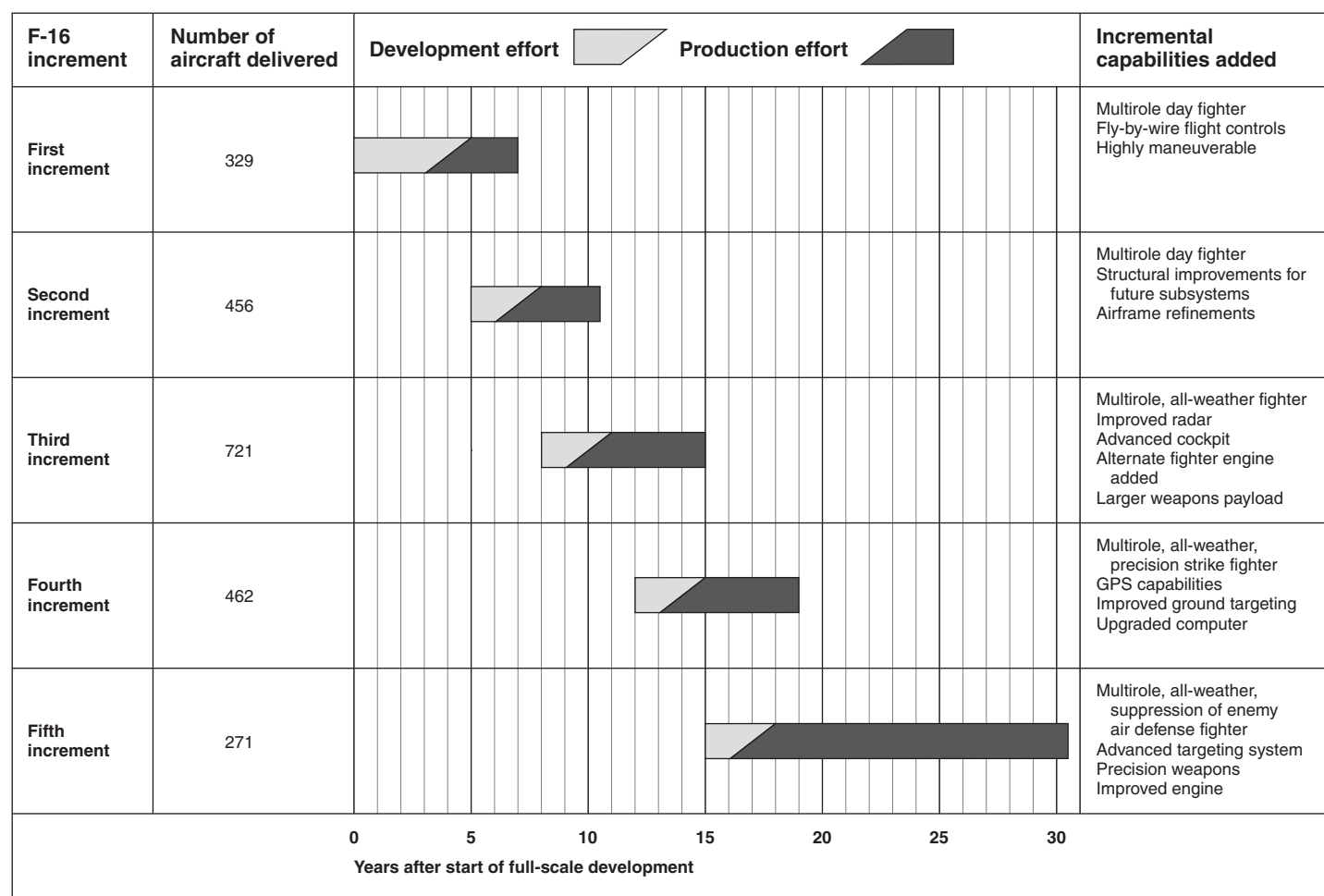
significantly minimize risk and deliver capabilities to the warfighter sooner, it would be in line with current DOD policy preferences.<sup>10</sup>

DOD's use of an evolutionary, knowledge-based approach is not unprecedented. The F-16 program successfully evolved capabilities over the span of 30 years, with an initial F-16 capability delivered to the warfighter about 4 years after development started. Figure 5 illustrates the F-16 incremental development approach.

---

<sup>10</sup> DOD argues that the JSF program is using an evolutionary approach because it is developing capabilities in a series of blocks. However, the approach is not truly evolutionary, as DOD does not consider each block as a separate program—a critical aspect of an evolutionary approach. In addition, DOD currently expects to buy 95 percent of the JSF aircraft in the final block—which delays providing useful capabilities to the warfighter.

**Figure 5: F-16 Incremental Development Approach**



Source: DOD (data); GAO (analysis and presentation).

The F-16 program provides a good acquisition model for the JSF program. For JSF, an evolutionary approach could entail delivering a first increment aircraft with at least as much capability as legacy aircraft with sufficient quantities to allow DOD to retire its aging tactical aircraft sooner and reduce operating inefficiencies. Limiting development to 5-year increments or less, as suggested in DOD's acquisition policy, would force smaller, more manageable commitments in capabilities and make costs and schedules more predictable. Some of the more challenging JSF capabilities, such as advanced mission systems or prognostics technologies, would be deferred and added to follow-on efforts once they are demonstrated in the technology development environment—a more

---

conducive environment to maturing and proving new technologies. A shorter system development phase would have other important benefits. It would allow DOD to align a program manager's tenure to the completion of the phase, which would enable program managers to be held accountable for decisions. It also would allow DOD to use fixed-price-type contracts for production, and thereby reduce the government's cost risk.

Additionally, DOD should do a more comprehensive business case analysis of the costs, benefits and risks before terminating the alternative engine effort. A competitive engine program may (1) incentivize contractors' to minimize life cycle costs; (2) improve engine reliability and quality in the future; (3) provide operational options; and (4) maintain the industrial base.

At a broader level, DOD needs to make more substantive changes to its requirements, funding, and acquisition processes to improve weapon system program outcomes. We have recommended these changes in past reports and DOD has agreed with them. The January 2006 Defense Acquisition Performance Assessment report, based on a study directed by the Deputy Secretary of Defense, made some important observations regarding DOD acquisitions. The report concluded that the current acquisition process is slow, overly complex, and incompatible with meeting the needs of DOD in a diverse marketplace. Notably, the report confirmed that a successful acquisition process must be based on requirements that are relevant, timely, informed by the combatant commanders, and supported by mature technologies and resources necessary to realize development. The report also pointed out that DOD's acquisition process currently operates under a "conspiracy of hope," striving to achieve full capability in a single step and consistently underestimating what it would cost to attain this capability. The report makes a number of key recommendations for changing DOD's acquisition process including the following:

- develop a new requirements process that has greater combatant commander involvement and is time-phased, fiscally informed, and jointly prioritized;
- change the current acquisition policy to ensure a time-constrained development program is strictly followed;
- keep program managers from the start of development through delivery of the "Beyond Low-Rate Initial Production Report"; and
- move the start of a development program to the point in time that a successful preliminary design review is completed.

---

Our work in weapons acquisition and best practices over the past several years has drawn similar conclusions. We have made numerous recommendations on DOD's acquisition processes and policy—as well as recommendations on specific major weapon system programs—to improve cost, schedule, and performance outcomes and to increase accountability for investment decisions. In 2000, DOD revised its acquisition policy to address some of our recommendations. Specifically, DOD has written into its policy an approach that emphasizes the importance of knowledge at critical junctures before managers agree to invest more money in the next phase of weapon system development. Theoretically, a knowledge-based approach results in evolutionary—that is, incremental, manageable, predictable—development and uses controls to help managers gauge progress in meeting cost, schedule, and performance goals. However, DOD policy lacks the controls needed to ensure effective implementation of this approach. Furthermore, decision makers have not consistently applied the necessary discipline to implement its acquisition policy and assign much-needed accountability for decisions and outcomes. Some of key elements of acquisition that we believe DOD needs to focus on include the following:

- constraining individual program requirements by working within available resources and by leveraging systems engineering;
- establishing clear business cases for each individual investment;
- enabling science and technology organizations to shoulder the technology burden;
- ensuring that the workforce is capable of managing requirements trades, source selection, and knowledge-based acquisition strategies;
- establishing and enforcing controls to ensure appropriate knowledge is captured and used at critical junctures before moving programs forward and investing more money; and
- aligning tenure for program managers that matches the program's acquisition time to ensure greater accountability for outcomes.

In conclusion, despite DOD's repeated declaration that recapitalizing its aging tactical aircraft fleet is a top priority, the department continues to follow an acquisition strategy that consistently results in escalating costs that undercut DOD's buying power, forces DOD to reduce aircraft purchases, and delays delivering needed capabilities to the warfighter. Continuing to follow a strategy that results in disappointing outcomes cannot be encouraged—particularly given our current fiscal and national security realities.

---

## GAO Related Products

Mr. Chairman, this concludes my prepared statement. I will be happy to answer any questions you or other members of the subcommittee may have.

*Joint Strike Fighter: DOD Plans to Enter Production before Testing Demonstrates Acceptable Performance*, GAO-06-356 (Washington D.C.: March 15, 2006).

*Defense Acquisitions: Business Case and Business Arrangements Key for Future Combat System's Success*, [GAO-06-478T](#) (Washington D.C.: March 1, 2006).

*Defense Acquisitions: DOD Management Approach and Processes Not Well-Suited to Support Development of Global Information Grid*, [GAO-06-211](#), (Washington D.C.: January 30, 2006).

*Defense Acquisitions: DOD Has Paid Billions in Award and Incentive Fees Regardless of Acquisition Outcomes*, [GAO-06-66](#), (Washington D.C.: December 19, 2005).

*Unmanned Aircraft Systems: Global Hawk Cost Increase Understated in Nunn-McCurdy Report*, [GAO-06-222R](#), (Washington D.C.: December 15, 2005)

*DOD Acquisition Outcomes: A Case for Change*, [GAO-06-257T](#), (Washington D.C.: November 15, 2005).

*Defense Acquisitions: Progress and Challenges Facing the DD(X) Surface Combatant Program* [GAO-05-924T](#). (Washington D.C.: 07/19/2005).

*Defense Acquisitions: Incentives and Pressures That Drive Problems Affecting Satellite and Related Acquisitions*. [GAO-05-570R](#). (Washington D.C.: 06/23/2005).

*Defense Acquisitions: Resolving Development Risks in the Army's Networked Communications Capabilities is Key Fielding Future Force*. [GAO-05-669](#) (Washington D.C.: 06/15/2005).

*Progress of the DD(X) Destroyer Program*. [GAO-05-752R](#). (Washington D.C.: 06/14/2005)

---

*Tactical Aircraft: F/A-22 and JSF Acquisition Plans and Implications for Tactical Aircraft Modernization.* [GAO-05-519T](#). (Washington D.C.: 04/06/2005).

*Defense Acquisitions: Assessments of Selected Major Weapon Programs.* [GAO-05-301](#) (Washington D.C.: 03/31/2005).

*Defense Acquisitions: Future Combat Systems Challenges and Prospects for Success.* [GAO-05-428T](#). (Washington D.C.: 03/16/2005).

*Defense Acquisitions: Changes in E-10A Acquisition Strategy Needed Before Development Starts.* [GAO-05-273](#) (Washington D.C.: 03/15/2005).

*Defense Acquisitions: Future Combat Systems Challenges and Prospects for Success.* [GAO-05-442T](#) (Washington D.C.: 03/15/2005).

*Tactical Aircraft: Air Force Still Needs Business Case to Support F/A-22 Quantities and Increased Capabilities.* [GAO-05-304](#). (Washington D.C.: 03/15/2005).

*Tactical Aircraft: Opportunity to Reduce Risks in the Joint Strike Fighter Program with Different Acquisition Strategy.* [GAO-05-271](#). (Washington D.C.: 03/15/2005).

*Tactical Aircraft: Status of F/A-22 and JSF Acquisition Programs and Implications for Tactical Aircraft Modernization.* [GAO-05-390T](#) (Washington D.C.: 03/03/2005).

*Defense Acquisitions: Plans Need to Allow Enough Time to Demonstrate Capability of First Littoral Combat Ships.* [GAO-05-255](#) (Washington D.C.: 03/01/2005).

*Defense Acquisitions: Improved Management Practices Could Help Minimize Cost Growth in Navy Shipbuilding Programs.* [GAO-05-183](#) (Washington D.C.: 02/28/2005).

*Unmanned Aerial Vehicles: Changes in Global Hawk's Acquisition Strategy Are Needed to Reduce Program Risks.* [GAO-05-06](#) (Washington D.C.: 11/05/2004).

---

---

This is a work of the U.S. government and is not subject to copyright protection in the United States. It may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.

---

## GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

---

## Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site ([www.gao.gov](http://www.gao.gov)). Each weekday, GAO posts newly released reports, testimony, and correspondence on its Web site. To have GAO e-mail you a list of newly posted products every afternoon, go to [www.gao.gov](http://www.gao.gov) and select "Subscribe to Updates."

---

## Order by Mail or Phone

The first copy of each printed report is free. Additional copies are \$2 each. A check or money order should be made out to the Superintendent of Documents. GAO also accepts VISA and Mastercard. Orders for 100 or more copies mailed to a single address are discounted 25 percent. Orders should be sent to:

U.S. Government Accountability Office  
441 G Street NW, Room LM  
Washington, D.C. 20548

To order by Phone: Voice: (202) 512-6000  
TDD: (202) 512-2537  
Fax: (202) 512-6061

---

## To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Web site: [www.gao.gov/fraudnet/fraudnet.htm](http://www.gao.gov/fraudnet/fraudnet.htm)

E-mail: [fraudnet@gao.gov](mailto:fraudnet@gao.gov)

Automated answering system: (800) 424-5454 or (202) 512-7470

---

## Congressional Relations

Gloria Jarmon, Managing Director, [JarmonG@gao.gov](mailto:JarmonG@gao.gov) (202) 512-4400  
U.S. Government Accountability Office, 441 G Street NW, Room 7125  
Washington, D.C. 20548

---

## Public Affairs

Paul Anderson, Managing Director, [AndersonP1@gao.gov](mailto:AndersonP1@gao.gov) (202) 512-4800  
U.S. Government Accountability Office, 441 G Street NW, Room 7149  
Washington, D.C. 20548