



Testimony

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F-35 JOINT STRIKE FIGHTER

Slower Than Expected Progress in Software Testing May Limit Initial Warfighting Capabilities

Statement of Michael J. Sullivan, Director
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Chairman Turner, Ranking Member Sanchez, and Members of the Subcommittee:

Thank you for the opportunity to discuss our work on the F-35 Lightning II, also known as the Joint Strike Fighter (JSF). With estimated acquisition costs approaching \$400 billion, the F-35 is the Department of Defense's (DOD) most costly and ambitious acquisition program. The program is developing and fielding a family of next generation fighter aircraft, incorporating low observable (stealth) technologies as well as advanced sensors and computer networking capabilities for the United States Air Force, Navy, and Marine Corps as well as eight international partners.¹

The F-35 family is comprised of three aircraft variants: (1) a conventional takeoff and landing (CTOL) variant, (2) a short takeoff and vertical landing (STOVL) variant, and (3) a carrier-suitable variant (CV). The F-35 is integral to U.S. and partner plans to replace existing fighter aircraft and support future combat operations. According to current plans, the U.S. portion of the program will require annual acquisition funding of more than \$12 billion on average through 2037 to complete development and procure a total of 2,457 aircraft. In addition, the F-35 fleet is estimated to cost around \$1 trillion to operate and support over its lifetime. In a time of austere federal budgets, cost projections of this magnitude pose significant fiscal challenges.

As we have reported in the past, DOD began the F-35 acquisition program in October 2001 without adequate knowledge about the aircraft's critical technologies or its design.² In addition, the program's acquisition strategy called for high levels of concurrency between development, testing, and production. As a result, the program encountered significant cost and schedule growth as well as performance shortfalls and was restructured three times: first in December 2003, then again in March 2007, and most recently in March 2012. The most recent restructuring

¹ The international partners are the United Kingdom, Italy, the Netherlands, Turkey, Canada, Australia, Denmark, and Norway. These nations contributed funds for system development and signed agreements to procure aircraft. In addition, Israel and Japan have signed on as foreign military sales customers.

² GAO, *Joint Strike Fighter: DOD Actions Needed to Further Enhance Restructuring and Address Affordability Risks*, [GAO-12-437](#) (Washington, D.C.: June 14, 2012); *Joint Strike Fighter: Current Outlook Is Improved, but Long-Term Affordability Is a Major Concern*, [GAO-13-309](#) (Washington, D.C.: Mar. 11, 2013); and *Joint Strike Fighter: Restructuring Places Program on Firmer Footing, but Progress Still Lags*, [GAO-11-325](#) (Washington, D.C.: Apr. 7, 2011).

was initiated in early 2010, when the program's unit cost estimates exceeded critical thresholds established by statute—a condition known as a Nunn-McCurdy breach. DOD subsequently certified to the Congress in June 2010 that the program was essential to national security and needed to continue.³ DOD then began efforts to significantly restructure the program and establish a new acquisition program baseline. These restructuring efforts continued through 2011 and into 2012, during which the department increased the program's cost estimates, extended its testing and delivery schedules, and reduced near-term aircraft procurement quantities by deferring the procurement of 410 aircraft into the future. The new F-35 acquisition program baseline was finalized in March 2012, and since that time, costs have remained relatively stable.

At the time the new F-35 acquisition program baseline was finalized, it did not identify new initial operational capability (IOC) dates for the three military services.⁴ The following year DOD issued a memorandum noting that Marine Corps and Air Force were planning to field initial operational capabilities in July 2015 and August 2016, respectively, and that the Navy planned to field its initial capability in August 2018. The memorandum emphasized that the Marine Corps and Air Force initial operational capabilities would be achieved with aircraft that possess initial combat capabilities, and noted that those aircraft would need additional lethality and survivability enhancements to meet the full spectrum of warfighter requirements in the future. These new parameters represented a delay of 5 to 6 years from the program's initial 2001 baseline and a reduction in the capabilities expected at IOC.

³ Section 2433 of title 10 of the United States Code, commonly referred to as Nunn-McCurdy, requires DOD to notify Congress whenever a major defense acquisition program's unit cost experiences cost growth that exceeds certain thresholds. This is commonly referred to as a Nunn-McCurdy breach. Significant breaches occur when the program acquisition unit cost or procurement unit cost increases by at least 15 percent over the current baseline estimate or at least 30 percent over the original estimate. For critical breaches, when these unit costs increase at least 25 percent over the current baseline estimate or at least 50 percent over the original, DOD is required to take additional steps, including conducting an in-depth review of the program. Programs with critical breaches must be terminated unless the Secretary of Defense certifies to certain facts related to the program and takes other actions, including restructuring the program. 10 U.S.C. § 2433a.

⁴ Initial operational capability is obtained when organizations or units have received a specified number of systems and have the ability to employ and maintain those systems.

We have reported on F-35 issues for a number of years.⁵ This testimony is based on and summarizes the results of our March 2014 report, which addresses the progress the F-35 program has made and the risks it still faces in the areas of development, testing, affordability, and manufacturing.⁶

For our March 2014 report, we reviewed and analyzed program briefings, management reports, program test results, and internal DOD program analyses. We discussed key aspects of F-35 performance with both military and private contractor test pilots. We interviewed F-35 program and aircraft prime contractor officials to discuss developmental testing. We also collected developmental test plans, and data on test achievements to assess program progress through December 2013. We obtained current program acquisition and life-cycle sustainment cost estimates, reviewed the supporting documentation and discussed the development of those estimates with DOD and prime contractor officials instrumental in producing them. We toured F-35 manufacturing and test facilities and obtained and analyzed production and supply chain data as of December 2013. We assessed the reliability of DOD and contractor data by reviewing existing information about the data, and interviewing agency officials knowledgeable about the data. We determined that the data were sufficiently reliable for the purposes of this report. We also discussed ongoing manufacturing process improvements with prime contractor and Defense Contract Management Agency (DCMA) officials. Further details about the scope and methodology can be found in our March 2014 report.

We conducted this work in accordance with generally accepted government auditing standards. Those standards required that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

In summary, delays in developmental flight testing of the F-35's critical software may hinder delivery of expected warfighting capabilities to the

⁵ See related GAO products at the end of this statement.

⁶ GAO- F-35 *Joint Strike Fighter: Problems Completing Software Testing May Hinder Delivery of Expected Capabilities*, [GAO-14-322](#) (Washington, D.C.: Mar. 24, 2014).

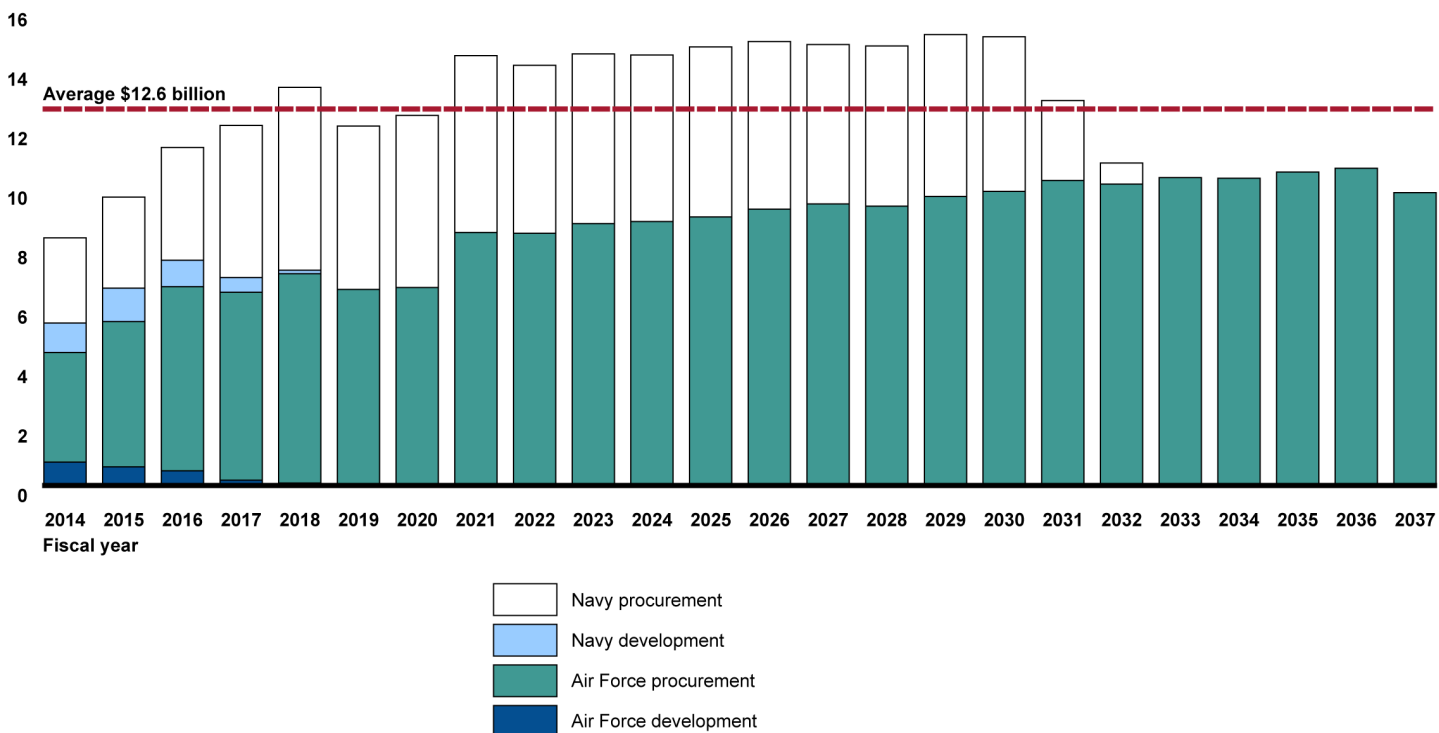
military services. F-35 developmental flight testing comprises two key areas: mission systems and flight sciences. Mission systems testing verifies that the software-intensive systems that provide critical warfighting capabilities function properly and meet requirements, while flight sciences testing verifies the aircraft's basic flying capabilities. Challenges in development and testing of mission systems software continued through 2013, due largely to delays in software delivery, limited capability in the software when delivered, and the need to fix problems and retest multiple software versions. The Director of Operational Test and Evaluation predicts delivery of warfighting capabilities could be delayed by as much as 13 months. Delays of this magnitude will likely limit the warfighting capabilities that are delivered to support the military services' initial operational capabilities—the first of which is scheduled for July 2015—and at this time it is not clear what those specific capabilities will be because testing is still ongoing. In addition, delays could increase the already significant concurrency between testing and aircraft procurement and result in additional cost growth. Without a clear understanding of the specific capabilities that will initially be delivered, Congress and the military services may not be able to make fully informed resource allocation decisions.⁷ Flight sciences testing has seen better progress, as the F-35 program has been able to accomplish nearly all of its planned test flights and test points. Testing of the aircraft's operational capabilities in a realistic threat environment is scheduled to begin in 2015. The program has continued to make progress in addressing some key technical risks.

To execute the program as planned, the DOD will have to increase funds steeply over the next 5 years and sustain an average of \$12.6 billion per year through 2037; for several years, funding requirements will peak at around \$15 billion (see figure 1).

⁷ We made a recommendation in our March 2014 report to address this issue which is discussed later in this statement.

Figure 1: Budgeted Development and Procurement Costs by Service, 2014-2037

Dollars (in then year billions)



Source: GAO analysis of DOD data.

Annual funding of this magnitude clearly poses long-term affordability risks given the current fiscal environment. The program has been directed to reduce unit costs to meet established affordability targets before full-rate production begins in 2019, but meeting those targets will be challenging as significant cost reductions are needed. Additionally, the most recent cost estimate for operating and supporting the F-35 fleet is more than \$1 trillion, which DOD officials have deemed unaffordable. This estimate reflects assumptions about key cost drivers the program can control, like aircraft reliability, and those it cannot control, including fuel costs, labor costs, and inflation rates. Reliability is lower than expected for two variants, and the Director of Operational Test and Evaluation reports that the F-35 program has limited additional opportunities to improve reliability.

Aircraft manufacturing continued to improve in 2013, and management of the supply chain is evolving. As the number of aircraft in production has increased, critical learning has taken place and manufacturing efficiency

has improved. For example, the prime contractor has seen reductions in overall labor hours needed to manufacture the aircraft, as expected. In 2013, the contractor delivered 35 aircraft to the government, 5 more than it delivered in 2012 and 26 more than it delivered in 2011. The prime contractor has put in place a supplier management system to oversee key supplier performance.

In conclusion, DOD has made a number of difficult decisions to put the F-35 on a more sound footing. More such decisions may lie ahead. For example, if software testing continues to be delayed, if funding falls short of expectations, or if unit cost targets cannot be met, DOD may have to make decisions about whether to proceed with production as planned with less capable aircraft or to alter the production rate. Also, if reliability falls short of goals, DOD may have to make decisions about other ways to reduce sustainment costs, such as reduced flying hours. Eventually, DOD will be faced with making contingency plans for these and other issues. At this point, we believe the most pressing issue is the effect software testing delays are likely to have on the capabilities of the initial operational aircraft that each military service will receive. In order to make informed decisions about weapon system investments and future force structure, it is important that Congress and the services have a clear understanding of the capabilities that the initial operational F-35 aircraft will possess. Thus, in our March 2014 report we recommended that DOD assess the specific capabilities that realistically can be delivered and those that will not likely be delivered to each of the military services by their established initial operational capability dates, and share the results of that assessment with the Congress and military services as soon as possible but no later than July 2015. DOD agreed with our recommendation and noted that it would conduct an assessment and share the results with Congress and military services in a timely manner.

Chairman Turner, Ranking Member Sanchez, and members of the House Armed Services Committee, Subcommittee on Tactical Air and Land Forces this completes my prepared statement. I would be pleased to respond to any questions you may have. We look forward to continuing to work with the Congress as we continue to monitor and report on the progress of the F-35 program.

GAO Contacts and Acknowledgments

For further information on this statement, please contact Michael Sullivan at (202) 512-4841 or sullivanm@gao.gov. Contact points for our Office of Congressional Relations and Public Affairs may be found on the last page of this statement. Individuals making key contributions to this statement are Travis Masters, Pete Anderson, Marvin Bonner, Megan Porter, and Abby Volk.

Related GAO Products

F-35 Joint Strike Fighter: Problems Completing Software Testing May Hinder Delivery of Expected Warfighting Capabilities. [GAO-14-322](#). Washington, D.C.: March 24, 2014.

F-35 Joint Strike Fighter: Current Outlook Is Improved, but Long-Term Affordability Is a Major Concern. [GAO-13-309](#). Washington, D.C.: March 11, 2013.

Joint Strike Fighter: DOD Actions Needed to Further Enhance Restructuring and Address Affordability Risks. [GAO-12-437](#). Washington, D.C.: June 14, 2012.

Joint Strike Fighter: Restructuring Added Resources and Reduced Risk, but Concurrency Is Still a Major Concern. [GAO-12-525T](#). Washington, D.C.: March 20, 2012.

Joint Strike Fighter: Restructuring Places Program on Firmer Footing, but Progress Is Still Lagging. [GAO-11-677T](#). Washington, D.C.: May 19, 2011.

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Joint Strike Fighter: Restructuring Should Improve Outcomes, but Progress Is Still Lagging Overall. [GAO-11-450T](#). Washington, D.C.: March 15, 2011.

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Joint Strike Fighter: Progress Made and Challenges Remain. [GAO-07-360](#). Washington, D.C.: March 15, 2007.

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

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