JOINT STRIKE FIGHTER (JSF)

Joint ACAT ID Program

<table>
<thead>
<tr>
<th>Total Number of Systems:</th>
<th>3,128</th>
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<tr>
<td>Total Program Cost (TYS):</td>
<td>$200B</td>
</tr>
<tr>
<td>Average Unit Cost (TYS):</td>
<td>$35M</td>
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<td>Full-rate production:</td>
<td>1QFY09</td>
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Prime Contractor
Lockheed Martin or Boeing

SYSTEM DESCRIPTION & CONTRIBUTION TO JOINT VISION 2010

The Joint Strike Fighter (JSF) Program will develop and deploy a family of strike aircraft by capitalizing on commonality and modularity to maximize affordability while addressing the needs of the Air Force, Navy, Marine Corps, and United Kingdom Royal Navy and Royal Air Force. This family of strike aircraft will consist of three variants: (1) Conventional Takeoff and Landing (CTOL); (2) Aircraft Carrier Suitable (CV); and (3) Short Takeoff and Vertical Landing (STOVL). The focus of the program is affordability: reducing the development, production, and ownership costs of the JSF family of aircraft. The family of JSF variants will provide the Navy with a first-day-of-the-war, survivable aircraft to complement the F/A-18E/F; the Air Force with a replacement for the F-16 and A-10 and complement the F-22; the Marines with a single STOVL platform to replace the AV-8B and F/A-18C/D; and the Royal Navy and Royal Air Force with a supersonic STOVL fighter/attack aircraft to replace the Sea Harrier and GR-7, respectively. Foreign interest in the program is high, and a number of allies have entered into cooperative agreements to participate in the program. All variants will contribute to the Joint Vision 2010 concepts of precision engagement and full-dimensional protection. The JSF will be a single-seat, single-engine aircraft capable of performing and surviving lethal strike warfare missions using an
affordable blend of key technologies. CV and STOVL variants require an option for a two-seat version. A missionized second seat is desired for the CV variant. The JSF system consists of the JSF air vehicles and all support training equipment, related facilities, materiel, software, services, and personnel to ensure that the system can accomplish its intended operational role.

BACKGROUND INFORMATION

The purpose of the JSF Program is to affordably develop the next-generation strike fighter weapons system to meet an advanced threat (2010 and beyond), while improving lethality, survivability, and supportability. The JSF Program originated from the Joint Advanced Strike Technology (JAST) program.

A multi-year $2.2 billion JSF Concept Demonstration and Risk Reduction (CDRR) effort commenced in November 1996 with competitive contract awards to Boeing and Lockheed Martin for the CDRR Program. These competing contractors are each building two-concept demonstrator flight test aircraft to conduct concept-uniform ground demonstrations and continue refinement of their ultimate delivered weapon system concepts. Pratt and Whitney is providing propulsion hardware and engineering support for both Boeing's and Lockheed Martin's ongoing JSF CDRR efforts. The JSF Alternate Engine Program with General Electric continues technical efforts related to the development of an alternate engine for production to reap the financial and operational benefits of competition.

TEST & EVALUATION ACTIVITY

DOT&E has continuously participated in JSF OT&E and monitored LFT&E planning activities since June 1995 when it was known as the JAST program. Integrated Product Team meetings are being held to address OT&E and LFT&E. The Combined Test Working Group (CTWG) (a systems test IPT) is responsible for all T&E efforts in executing the JSF CDRR Program and planning for the EMD program. The CTWG provides a single point of contact for the member services, OSD, and the Weapon Systems Contractors for all T&E related matters. During the JSF CDRR Phase, competing contractor teams led by Boeing and Lockheed Martin will each build, qualify, and fly two Concept Demonstrator Aircraft designated the X-32 and X-35, respectively. Rather than being prototypes with full-up systems, these demonstrators will incorporate the engine and outer mold lines of the contractor's JSF design and largely use off-the-shelf systems and avionics. These demonstrators are intended to demonstrate the viability of each contractor's airframe design concept, including the ability to accomplish short takeoff, hover and transition to wingborne flight, up-and-away performance, and low-speed handling consistent with landing aboard a carrier. During this phase, each contractor is responsible for planning and executing the ground and flight tests and demonstrations. During the current CDRR phase, government personnel will actively participate in test planning and execution at the discretion of the respective competing contractors. The OTAs for JSF, AFOTEC, and COMOPEVFOR are conducting an EOA to support the FY01 Milestone II decision. During EMD, an integrated test team will perform all developmental testing and OTAs will conduct dedicated OT&E.

During EMD, ten flight test aircraft will be built representing all three variants. The OTAs and DOT&E will continue as active participants in the Combined Test Working Group throughout EMD; and the OTAs as members of the JSF Integrated Test Force, will independently plan, conduct, and report a series of OAs. OTA activity will culminate with the conduct of Dedicated IOT&E/OPEVAL in the FY10 timeframe, in support of a Milestone III decision.
As a result of acquisition reform initiatives such as performance-based specifications, normal LFT&E activities have not been required of the two competing contractor teams during the CDRR Phase. The option of whether or not to conduct vulnerability reduction design refinement, risk reduction, and live fire testing has been left up to the competitors to choose in attempting to meet performance-based specifications. DOT&E is monitoring the planning and conduct of large-scale component testing (such as the engine and wings).

**TEST & EVALUATION ASSESSMENT**

At this stage of the JSF program, the integration of program planning and T&E planning appears to be on a solid foundation. However, in view of the complexity of the program objectives, numerous T&E opportunities and challenges are being, and will likely continue to be, encountered.

In support of its commitment for an affordable, highly common family of next-generation multi-role strike fighter aircraft; the JSF program has adopted an iterative approach toward facilitating the Services’ development of fully validated, affordable ORs. This approach emphasizes the early and extensive use of cost-performance trades. To assess military utility in support of these trades, the JSF program is continuing development of its Virtual Strike Warfare Environment (VSWE), a baseline-common modeling and simulation environment to ensure consistent models and data bases. The open process for requirements development and the availability of the VSWE provide needed avenues to improve the linkage between test and requirements processes. In addition, the models used in conjunction with the VSWE may prove useful in the T&E process, although experience has shown that the "best available" models are not always sufficiently credible for T&E needs.

The ongoing CDRR Phase will allow early test insights into the viability of basic aircraft designs of the competing contractors to meet the requirements of commonality/modularity for an affordable family of multi-Service aircraft. In addition, these aircraft will demonstrate specific short takeoff and vertical landing, hover, transition, and low-speed approach characteristics. More challenging to assess during the CDRR Phase will be the contractors’ progress in developing the integrated avionics suite that will be essential to the final JSF design, as well as validating needed improvements in operational supportability and the cost of ownership. Improved insights into the risks of integrated avionics may be available prior to the planned JSF Milestone II decision (FY01) from the ongoing F-22 program, which is leading the way in facing such challenges. Since both of the competing JSF contractors are key members of the F-22 team, the lessons learned from that program should reduce the risks in similar areas of the JSF. The planning for EMD provides ample opportunities for the conduct of OAs leading up to Dedicated IOT&E/OPEVAL. As the program matures, it will be essential to define specific accomplishments/characteristics that each of the operational test periods can confirm consistent with the event-driven acquisition strategy required by DoD Regulation 5000.2-R and adopted by JSF. The current planning for Dedicated IOT&E/OPEVAL includes 12 LRIP test articles. While this quantity of aircraft is adequate for the conduct of a thorough operational test, it is not too many since three different aircraft configurations must be tested in the accomplishment of a variety of missions.

The LFT&E portion of the JSF TEMP will be written from a high-level perspective; i.e., it will not contain an approach specific to any one design since contract award will not be made until Milestone II (after the TEMP will be submitted). LFT&E issues in the TEMP will have to address, in a generic fashion, how the program intends to complete realistic survivability testing of the JSF, while at the same time not defining it to a level of detail that will prejudice any one contractor. This will permit the contractor, using the TEMP as one of its tools, to propose a survivability program plan/proposal that will address all of the issues pertaining to their unique designs.
There is a risk, however, that if the TEMP is too generic, the competitors might misinterpret the testing requirements and develop a proposal that will not adequately address how real survivability testing will be completed prior to full-rate production. Since down-select is shortly before Milestone II (waiver/alternate LFT&E strategy deadline), a least-cost strategy may not adequately address real testing. This strategy might not gain approval from DOT&E after a contractor (and associated program plan) has been selected, leading to heavily contested testing issues and associated program costs. DOT&E is working closely, as a member of the CTWG, to ensure the TEMP is written to the detail required to prevent this from happening.

The most significant LFT&E issue is whether the program will conduct full-up, system-level testing. The program has not yet committed and is still investigating the waiver to full-up, system-level LFT&E. DOT&E has proposed that the JSF program conduct a full-up, system level test on one of the designs and request a waiver from full-up, system-level testing for the remaining two designs. Additionally, this office has recommended that they pursue a strategy that also includes testing one full-scale test article (possibly the Navy’s drop test article) in addition to the required component and sub-system tests.

CONCLUSIONS, RECOMMENDATIONS, LESSONS LEARNED

Based on the multi-mission and multi-role nature of the JSF effort, and the multiple points of view of the various warfighters/users, testing and evaluating the different variants will be extremely challenging.