JOINT STRIKE FIGHTER (JSF)

**Joint ACAT ID Program:**
- Total Number of Systems: 2,852
- Total Program Cost (TY$): $200B
- Average Unit Cost (TY$): $70M
- Full-rate production: 1QFY09

**Prime Contractor**
- Boeing or Lockheed Martin

**Service Certified Y2K Compliant**
- Yes

**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 Royal Navy. 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 with a supersonic STOVL fighter/attack aircraft to replace the Sea Harrier. 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 originates from the Joint Advanced Strike Technology (JAST) program. JAST evolved from the 1993 Bottom Up Review (BUR), which acknowledged the services’ need to affordably replace their aging strike assets. As a result of the BUR, the USN A/FX program, continued production of USAF F-16s after 1994, and USAF follow-on Multi-Role Fighter were all canceled in favor of a new joint program. JAST was chartered by DEPSECDEF, with SECAF and SECNAV as additional signatories. The program’s objectives were to facilitate the services’ development of a validated set of joint requirements, demonstrate key leveraging technologies, and develop operational concepts for subsequent strike weapon systems. Congressional action later combined the Common Affordable Lightweight Fighter (Calf) program with the JAST program structure. The Calf program was in development under the leadership of ARPA and incorporated the United Kingdom (U.K.) as an international partner. The Calf program’s aim was to develop the technologies and concepts to support the next generation Advanced Short Take-Off Vertical Landing aircraft for the USMC and Royal Navy (RN). The combination of these programs presents a unique opportunity to solve the three services’ and the RN’s requirement for the next generation strike weapon system.

A multi-year $2.2 billion JSF Concept Demonstration effort commenced in November 1996 with competitive contract awards to Boeing and Lockheed Martin for the Concept Demonstration Program. These competing contractors will build and fly concept demonstrator aircraft, conduct concept unique 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 Concept Demonstration efforts. The JSF Alternate Engine Program with General Electric continues technical efforts related to the development of an alternate engine for production in order to reap the financial and operational benefits of competition.

TEST & EVALUATION ACTIVITY

DOT&E began monitoring JSF OT&E and LFT&E planning activities in June 1995 when it was known as the JAST program. IPT meetings are being held to address both OT&E and LFT&E. The Systems Test IPT is responsible for all T&E efforts in executing the JSF Concept Demonstration Program and planning for the EMD program. The Systems Test IPT 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 Concept Demonstration 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 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. Government personnel will actively participate in test planning and execution at the
discretion of the respective competing contractors. The OTAs for JSF, AFOTEC, and COMOPTEVFOR, will conduct an EOA during the JSF Concept Demonstration Phase to support an FY01 Milestone II decision. 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 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 FY08-FY09 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 Concept Demonstration 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.

**TEST & EVALUATION ASSESSMENT**

At this relatively early 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 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 provides needed avenues to improve the linkage between the 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 Concept Demonstration Phase will allow early test insights into the viability of the 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 Concept Demonstration 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 the 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 OT&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 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.

In consideration of the cooperative teamwork exhibited and the sound T&E planning, DOT&E approved the JSF interim TEMP in June 1998. During the TEMP development and review process, DOT&E made several recommendations regarding survivability design and LFT&E:

- Since this aircraft will take advantage of state-of-the-art system integration, most of which has never been tested against threats, it is most important that full-up, system-level testing be conducted to identify vulnerability issues as early as possible in the design process.

- A waiver from full-up, system-level LFT&E, if requested, would have to be thoroughly justified and supported by plans to use a large, highly realistic subassembly—such as the static test article—in its place.

- Early commitment by the JSF Program to a specific test article acceptable to DOT&E would be required.

**LESSONS LEARNED**

A program as complex as the JSF (multiple aircraft configurations for multiple users) needs to use the IPPD process to develop ORs and formulate integrated T&E strategies. OTAs must participate fully and continuously in the selection and understanding of program associated models and simulations to ensure the applicability of such models to meet T&E requirements.

The need to protect proprietary, competition-sensitive information and classified low-observable information has made DOT&E involvement with contractor T&E activities challenging.