F-35 Lightning II Joint Strike Fighter (JSF) Program (F-35)
As of FY 2018 President's Budget

Defense Acquisition Management
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Selected Acquisition Report (SAR)

Mission and Description

The F-35 Lightning II Program will develop and field an affordable, highly common family of next-generation strike aircraft for the U.S. Navy, Air Force, Marine Corps, and allies. The three variants are the F-35A; F-35B; and the F-35C. The F-35A will be a stealthy multi-role aircraft, primarily air-to-ground, for the Air Force to replace the F-16 and A-10 and complement the F-22. The F-35B variant will be a multi-role strike fighter aircraft to replace the AV-8B and F/A-18A/C/D for the Marine Corps. The F-35C will provide the U.S. Navy a multi-role, stealthy strike fighter aircraft to complement the F/A-18E/F. The planned DoD F-35 Fleet will replace the joint services' legacy fleets. The transition from multiple type/model/series to a common platform will result in a smaller total force over time and operational and overall cost efficiencies.

Executive Summary

The F-35 remains the DoD's largest cooperative acquisition program, with eight International Partners participating with the U.S. under Memorandums of Understanding for System Development and Demonstration (SDD) and Production, Sustainment and Follow-on Development. Additionally, the program currently has three FMS customers. The F-35 program is executing well across the entire spectrum of acquisition, to include development and design, flight test, production, fielding and base stand-up, sustainment of fielded aircraft, and building a global sustainment enterprise.

The F-35 weapon system is now operational and forward deployed. The size of the fleet continues to grow and is rapidly expanding its capability. Program costs are well understood and are stable. With respect to production costs and operating costs that the program can influence; they are decreasing. The costs to complete the Development program still remain well within the budget established in 2011 after the Nunn-McCurdy Breach. The overall assessment is that the program is making solid progress as it grows and accelerates; and shows improvement as the program continues to manage emerging issues and mitigates program risks.

We are again pleased to report many accomplishments by the F-35 team during the past year but none are more satisfying than the declaration of IOC for the F-35A by the U.S. Air Force (USAF) last summer, and seeing the U.S. Marine Corps (USMC) forward deploy its F-35Bs. The F-35 fleet now exceeds 210 aircraft and it has surpassed 73,000 flight hours.

The Program's main focus areas include: Delivering the full Block 3F capabilities; completing development within the time and resources we have; smoothly transitioning from SDD to Follow-on-Modernization (FoM); completing the production ramp-up while continuing to improve quality and delivery schedule; continuing to grow the global sustainment enterprise and improving the fielded fleet's performance; and continuing to strengthen International partnerships and participation.

Development

Delivering Full Block 3F capabilities: Steady progress is being made toward delivery of full Block 3F warfighter capability and completion of the SDD program. Two important milestones are associated with the closeout of this phase of the program: completion of SDD flight test and the delivery of the full Block 3F capability. The Joint Program Office (JPO)/Industry team will continue SDD until the full Block 3F capability is delivered to the warfighter. Delivery of full 3F capability is projected to meet APB threshold dates for all 3 variants with the exception of F-35B which will be cleared to 1.3 Mach by the threshold date with expansion to 1.6 Mach by May 2018. Critical path for F-35B to 1.6 Mach is a structural integrity update and the air worthiness certification.

Steady progress is being made toward completion of the SDD program. With respect to completion of F-35 flight test, the original 2011 re-baseline Program of Record showed flight testing to end on October 31, 2017. The JPO has maintained that there are three to four months of risk to the completion date and current projection of the end of SDD flight test by February 2018.

As a result of extensive review of work remaining and risk to completion, DoD has directed the JPO to maintain the resources necessary to continue flight testing to May 2018, if necessary, to ensure delivery of the full Block 3F capability. The biggest risks to the timely completion of SDD flight testing include software stability, the discovery of any new software deficiencies, the time it takes to correct deficiencies, and the health of our Developmental Test (DT) fleet. The remaining cost to complete the F-35's $55B development program is estimated to be $2.3B; money which was already budgeted for the program. Should flight testing go beyond February 2018 to May 2018, the JPO has been directed to hold $100M of FoM funding in FY 2018 to pay for this added flight testing. Use of this internal funding will result in no impact to any other DoD programs or the Services/DoD's budget requirements.

Initial Operational Test and Evaluation (IOT&E): A number of criteria are required to be met by the Director, Operational Test & Evaluation before IOT&E can begin. These include the release of the final Block 3F aircraft capability, the release of Autonomic Logistics Information System (ALIS) 3.0, the release of a verified and validated Mission Data File (MDF), the

readiness of 23 instrumented aircraft in a Block 3F production representative configuration, and functioning Air-to-Air Range Infrastructure 2 (AARI 2) capability on the test aircraft and ranges. Additionally, a verified, validated, and accredited F-35 simulator must be delivered approximately four months prior to completion of the 13-month long IOT&E program. This simulator requirement will be met by the Joint Simulation Environment located at Naval Air Station Patuxent River in Maryland.

It is likely that by February 2018, the field release of ALIS 3.0, the field release of a verified and validated MDF, and the modifications necessary to place all 23 aircraft into a production representative configuration will not be completed. However, a large subset of those entrance criteria to start IOT&E will be met by February 2018. DOT&E has agreed to execute certain pre-IOT&E events to the advantage of ship availabilities and seasonal weather conditions. Additionally, in cooperation with the JPO, DOT&E is assessing the feasibility to start IOT&E as soon as possible with less than all 23 Block 3F Operational Test (OT) jets; potentially as early as March-April 2018. This IOT&E start approach is desirable for many reasons: First, obtaining earlier feedback from the OT community will enable the JPO and Industry to make corrections and fixes sooner, providing better capabilities to the warfighter. Second, delaying IOT&E will result in higher costs because IOT&E support will have to continue longer than planned. The JPO estimates that a six-month delay in the start of IOT&E will cost an additional $30M. Finally, since F-35s will be produced at over 100+ airplanes per year during IOT&E, the sooner deficiencies are discovered, the quicker they can be cut into production, saving the time and resources that would otherwise be needed to retrofit these jets if they were to be produced without the corrections.

Transition to FoM: The F-35 FoM program continues to move forward and execute the acquisition strategy for the Block 4 planning and systems engineering phase. FoM systems engineering has been less efficient than planned which coupled with previous funding reductions have required the JPO to begin an update of the program execution plan. The F-35 JPO will manage FoM as a continuation of the F-35 program with full transparency to the enterprise for reporting on cost, schedule and performance as if it were a new program. SAR 2016 RDT&E cost excludes FoM funding; F-35B/C Sustainment/ Capability enhancements; F-35A Deployability and Suitability enhancements; and F-35A Dual Capable Aircraft enhancements. FoM costs will not be included in the SAR until modernization is properly baselined.

Production

In August of 2016, Lockheed Martin declared an issue with non-conforming insulation on the polyalphaolefin (PAO) cooling tubes in some F-35A wing fuel tanks. The subsequent investigation and repairs affected 42 production aircraft which resulted in delays for re-work, limiting the production delivery to 46 aircraft of the planned 53 aircraft in 2016. Of the 46 delivered aircraft, 40 aircraft were assembled in the Fort Worth, Texas, Final Assembly and Check Out (FACO) facility and six aircraft were from the Italian FACO in Cameri, Italy.

In 2017, the goal is to deliver a total of 66 aircraft, which includes carryover of the seven aircraft originally planned for delivery in 2016. Of those 66 aircraft, 61 aircraft will be delivered from the Fort Worth FACO, three aircraft from the Italian FACO, which includes its first "B" model produced, and the first 2 aircraft deliveries from the Japanese FACO in Nagoya, Japan.

The DoD intends on executing an F-35 Block Buy contracting strategy for F-35 International Partners and FMS customers for production Lot 12 (FY 2018), Lot 13 (FY 2019) and Lot 14 (FY 2020). This strategy gives the F-35 Partners and FMS customers the flexibility to procure all aircraft in a single procurement lot, or to procure aircraft and engines in a multiple Lot format. The U.S. Services will procure Lots 12, 13 and 14 as single year procurements and will only request Congressional approval to award a single contract to procure material and equipment in Economic Order Quantity (EOQ) for FY 2019 and FY 2020. Procuring approximately 445 aircraft with this Block Buy/EOQ strategy is estimated to save approximately $2B compared to the Lot 11 annual procurement price. The estimated savings have been validated by an F-35 JPO cost estimate, an industry analysis study, and an independent assessment conducted by RAND Corporation.

The current estimate for F-35 total procurement quantity increased from 2443 to 2456. This is the result of an increase of 13 F-35B aircraft to be procured by the United States Marine Corps (USMC). The increase is reflected in both the aircraft and engine subprogram and results in a change from 680 to 693 in the Department of Navy Aircraft Procurement accounts. The USMC validated this requirement through the Marine Corps Requirements Oversight Council (MROC). The additional aircraft are fully funded and the funding is reflected in the FY 2018 President's Budget submission. The additional aircraft were added after the completion of the congressionally directed Department-wide fighter mix study. The strategic review will assess future tactical fighter force inventory requirements across the Department.

Sustainment

In October 2016, F-35 JPO Product Support Manager (PSM) released a request for information (RFI) for F-35 warehousing and support equipment repairs. The current RFI includes 709 components from which we anticipate the DoD will assign to the Services and Partners as well as the FMS customers such as wheels and brakes, electrical and hydraulic systems, maintenance of support equipment and warehousing for the global supply chain. These same capabilities either currently exist or are being developed at the U.S. Services' depots in the U.S. in accordance with current U.S. law.

The Hybrid Product Support Integrator (HPSI) was established in 2016 as outlined within the Global Support Solution and as directed by the PSM. In 2017, the PSM working with Department of the Air Force and Department of the Navy established an event based three-phased approach to continue the transition of the HPSI. Phase one is the initial HPSI Activation, Phase two is Solution maturation and Cost Reduction and Phase three is Solution Optimization. The primary focus within Phase 1 will be to achieve the Warfighters required performance outcomes within allocated budgets. During this phase, system-level performance outcomes will continue to be managed by the PSM, with accountability and metrics flowed from the PSM to HPSI Manager and Industry Leads through Service Level Agreements (SLAs) and contracts. In addition, this phase will also allow refinement of processes to include establishment by the PSM of individual Performance Based Agreements (PBAs) with F-35 Users as well as internal performance arrangements with other elements of the JPO providing support to achieve the required sustainment outcomes. This will ensure "best for enterprise" behaviors are evaluated to determine what, if any, changes or improvements are needed to deliver program commitments.

International and FMS

International participation on the program with eight Partners and three FMS customers remains strong. Over the past ten months, aircraft deliveries to our United Kingdom, Italy, and Norway Partners have continued, while FMS customers Israel and Japan received their first aircraft deliveries. Two significant milestones for Italy included the delivery of its first jet completed at the Italian FACO facility in Cameri, Italy and also the first aircraft arrival into its operational base located in Amendola, Italy. Notably, Israel also achieved first aircraft arrival into its operational base in Nevatim, Israel and it has identified a requirement for an additional 17 aircraft from an existing fleet of 33. Also, the Japanese aircraft FACO in Nagoya and engine FACO in Mizuho are both on track to deliver their first respective Japanese aircraft and engine later this year.

In May 2016, the two Dutch aircraft that are part of the DT fleet at Edwards Air Force Base (AFB) in California completed their first deployment to the Netherlands, where they conducted aerial and ground environmental noise surveys, performed flights over the North Sea range, and also appeared at the Netherlands' Open Days, the largest air show held annually in the Netherlands.

In early June 2016, the Danish Parliament approved its government’s recommendation to acquire 27 F-35As, and Denmark became the 7th partner nation and 11th nation overall to buy the F-35. Also, that same month, F-35Bs landed for the first time in the United Kingdom. The United Kingdom F-35B was the first to touch down and was followed shortly afterwards by two other F-35Bs from the USMC and two USAF F-35As. The F-35s were in the United Kingdom to support the Royal International Air Tattoo and the Farnborough Air Show taking place in early July. More importantly, this was a deployment for the United Kingdom, USMC and USAF where they sustained and maintained the aircraft, generated sorties, and ultimately provided lessons learned on future F-35 operations.

In September 2016, Turkey held the 65 percent Design Review for its first Main Operating Base which will be located in Malatya, Turkey. This review is a major milestone on the way to ensuring Turkey’s infrastructure is ready for aircraft arrival in 2019. In late October 2016, the Turkey Defense Industrial Executive Committee met and approved the Block Buy for 24 aircraft over three contract years.

Following flight testing and the USAF's recommendation, Australia authorized aerial refueling operations between its KC-30A tanker aircraft and F-35As in January. Preparations at Australia's first operating base, Royal Australian AFB in Williamtown continue as construction of hangers, training centers, and information support centers remain on schedule.

November was a significant month for South Korea as it was one of the countries assigned initial F-35 component repair capability. In addition, the first six Korean aircraft were awarded as part of the recent Lot 10 aircraft contract, with expected delivery in 2018.

Over the past year, the JPO has worked closely with the U.S. Defense Security Cooperation Agency to promptly and thoroughly answer all questions provided by the Canadian government in support of its fighter replacement analysis. Further, the JPO has continued to work with potential FMS customers, including Belgium, Finland, and Spain, responding to all requests for information and other official inquiries.

In summary, the F-35 Program is nearing delivery of full Block 3F capability and completion of development within the cost and schedule boundaries laid in during the 2011 Rebaseline, remaining work in SDD is understood and stable, the program continues to plan the development transition to FoM, the F-35 fleet is rapidly expanding and F-35s are now flying in the U.S., Japan, Italy, and Israel. The Program is also continuing to ramp up production and building the global sustainment enterprise. As always, our number one overarching priority is to continue to drive cost out of all aspects of the F-35 Program, making it more affordable for all our customers.

Performance Characteristics					
SAR Baseline Development Estimate	**Current APB Development Objective/Threshold**		**Demonstrated Performance**	**Current Estimate**	
STOVL Mission Performance - STO Distance Flat Deck					
With four 1000# JDAMs and two internal AIM-120s, full expendables, execute a 600 foot (450 UK STOVL) STO from LHA, LHD, and aircraft carriers (sea level, tropical day, 10 kts operational WOD) and with a combat radius of 550 nm (STOVL profile). Also must perform STOVL vertical landing with two 1000# JDAMs and two internal AIM-120s, full expendables, and fuel to fly the STOVL Recovery profile.	With four 1000# JDAMs and two internal AIM-120s, full expendables, execute a 600 foot (450 UK STOVL) STO from LHA, LHD, and aircraft carriers (sea level, tropical day, 10 kts operational WOD) and with a combat radius of 550 nm (STOVL profile). Also must perform STOVL vertical landing with two 1000# JDAMs and two internal AIM-120s, full expendables, and fuel to fly the STOVL Recovery profile.	With two 1000# JDAMs and two internal AIM-120s, full expendables, execute a 600 foot (450 UK STOVL) STO from LHA, LHD, and aircraft carriers (sea level, tropical day, 10 kts operational WOD) and with a combat radius of 450 nm (STOVL profile). Also must perform STOVL vertical landing with two 1000# JDAMs and two internal AIM-120s, full expendables, and fuel to fly the STOVL Recovery profile.	Execute 549 ft. STO with 2 JDAM (internal), 2 AIM-120 (internal), fuel to fly 450nm	Execute 549 ft. STO with 2 JDAM (internal), 2 AIM-120 (internal), fuel to fly 450nm	(Ch-1)
Combat Radius NM -CTOL Variant					
690	690	590	669	669	(Ch-1)
Combat Radius NM -STOVL Variant					
550	550	450	505	505	(Ch-1)
Combat Radius NM -CV Variant					
730	730	600	TBD	640	(Ch-1)

Change Explanations

(Ch-1) Operational Requirements Document (ORD) Change 3 dated August 19, 2008 as modified by JROC Memorandum 040-12 dated March 16, 2012. For Demonstrated Performance, extensive flight test data was used to calibrate the aero-performance model. The values listed herein as “Demonstrated Performance” are based on the final aero-performance model (up-and-away) for the F-35A and F-35B.

Notes

The F-35 Program is currently in developmental testing, and will provide demonstrated performance with the Block 3F full capability aircraft.

CV Recovery Performance (Vpa)				
Vpa. Maximum approach speed (Vpa) at required carrier landing weight (RCLW) of less than 140 knots.	Vpa at required carrier landing weight (RCLW) of less than 140 knots.	Vpa at required carrier landing weight (RCLW) of less than 145 knots.	Vpa. Maximum approach speed (Vpa) at required carrier landing weight (RCLW) of less than 144 knots.	Vpa. Maximum approach speed (Vpa) at required carrier landing weight (RCLW) of less than 144 knots.

Requirements Reference

Operational Requirements Document (ORD) Change 3 dated August 19, 2008 as modified by Joint Requirements Oversight Council Memorandum 040-12 dated March 16, 2012