

**Sixth Report to Congress on
F-35 Concurrency Costs:
House Report 112-331, Conference Report to
Accompany H.R. 2055**



**Office of the Under Secretary of Defense for
Acquisition, Technology, and Logistics**

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The estimated cost of this report or study for the Department of Defense is approximately \$8,470 for the 2017 Fiscal Year. This includes \$0 in expenses and \$8,470 in DoD labor.

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Background

This report responds to language on pages 584-585 of House Report (H.R.) 112-331, the Conference Report to accompany H.R. 2055, the Military Construction and Veterans Affairs and Related Agencies Appropriations Act, 2012, which states:

“The conferees recognize that, for a variety of reasons, the Joint Strike Fighter program is burdened with what could be the highest level of concurrency ever seen in an acquisition program. Therefore, the conferees direct the Secretary of Defense to provide a semi-annual report to the congressional defense committees that shows the actual concurrency costs for the Joint Strike Fighter program. The report showing these actual concurrency costs shall be made available to the Director, Cost Assessment and Program Evaluation for the purposes of cost estimating and to develop lessons learned from allowing programmatic concurrency, so this cost can be considered when decisions are made regarding allowing such a high degree of concurrency in future programs.”

Introduction

This is the sixth report on F-35 concurrency costs submitted pursuant to a request by House Report 112-331. The five previous reports were submitted in September 2012, May 2013, April 2014, March 2015, and April 2016. Pursuant to an email exchange between representatives of the conferees and the Department on October 17, 2013, the F-35 Joint Program Office (JPO) received permission to submit an annual report in lieu of semi-annual reporting. As a result, follow-on reports will be submitted within 30 days of the President’s Budget submission and will track F-35 concurrency costs through the remainder of the development program.

Concurrency is defined as the overlap in the development and production phases of an acquisition program. Concurrency requires that aircraft built in early production lots will need modification due to technical deficiencies discovered during qualification, ground and flight tests, or as a result of engineering analysis. Incorporation of concurrency changes adds cost because of recurring engineering activities, production cut-in, and retrofit of existing aircraft. These costs do not include the non-recurring engineering costs to develop engineering solutions associated with these changes. These costs are a part of the System Development and Demonstration (SDD) program. Planned and scheduled block upgrades to each aircraft are handled separately and are not considered concurrency costs. Concurrency costs will phase out with the completion of SDD.

For any given Low Rate Initial Production (LRIP) lot, there are three types of concurrency changes:

- (1) changes discovered prior to beginning the production of the lot (Period A);
- (2) changes discovered during the period of performance of the given lot (Period B);
- (3) changes discovered after delivery of the last aircraft in the given lot (Period C).

F-35 concurrency changes are funded under procurement appropriations *Aircraft Procurement, Navy* and *Aircraft Procurement, Air Force* Budget Activity (BA) 01, in which combat aircraft are procured, and BA05, in which in-service aircraft are modified. It should be noted that the following report is not intended to be used for budgeting purposes. It is an estimate of potential cost liability as a result of concurrency. Cumulative estimates had previously been rounded to the nearest \$10 million; however this report includes costs without rounding to minimize confusion and better trace to the source data. The BA in which these changes are funded is dependent on the timing of the change in relation to a specific production lot. Period A and B changes are funded with BA 01 and Period C changes are funded with BA 05.

Cost Model

The concurrency costs previously reported were based on discrete, bottom-up engineering analyses. The costs account for technical issues effecting air vehicle performance, mission systems required for combat operations, and aircraft structures. The current estimate contained in this report reflects the same approach. Since submission of the previous report, the estimate has been updated to account for new known issues (issues not previously forecasted), known issues that have been realized (issues that were forecasted that actually occurred), changes in the costs of known issues, forecasted issues that were retired, and changes in forecasted issues as a result of schedule changes in remaining testing and qualification activities. Below are the definitions for known and forecasted issues.

- **Known Issues:** A technical issue discovered during qualification, flight, and ground test events, and deemed deficient to the contract specification.
- **Forecasted Issues:** An issue that may occur in the future based on historical qualification, ground test, and/or flight test data of other programs, to include the F-16, F-15, F-22, and F/A-18E/F.

The cost estimate for known and forecasted issues is developed from the actual costs of approved changes that have been implemented. While not all forecasted issues may occur, some un-forecasted issues are likely to arise during testing. As changes become apparent, the discrete costs of these changes accrue and become a liability to the program. The aggregate liabilities represented in known and forecasted issues illustrate the cost-impact of concurrency to the F-35 program. Retrofit activities to incorporate changes into operational aircraft compose the major portion of concurrency costs. Examples of retrofits that have been performed include the F-35B Auxiliary Air Inlet Door Assembly, the F-35B Fuselage Station 496 Bulkhead modification, and the Forward Root Rib modification for the F-35A and F-35B.

Costs associated with Third-Life Teardown and Inspection (T&I), and its associated Inspection Report and subsequent Root Cause and Corrective Action investigations and resolving Engineering Change Proposals (ECPs), is not included in the cost model underpinning this report. Since concurrency only applies to the SDD-phase effort, as outlined in the report Introduction, Third-Life T&I and related activity will necessarily need to be provisioned for in the post-SDD/-LRIP period.

Current Concurrency Cost Estimate

Figure 1, *U.S. Government F-35 Total Concurrency Cost*, depicts a summary of the current March 2017 estimate along with the five estimates previously reported. Figure 2, *U.S. Government F-35 Concurrency Cost by LRIP Lot*, portrays total estimated concurrency cost for each LRIP lot. The purple shaded areas in Figures 1 and 2 show the cost estimate of known issues. The gray shaded areas show the forecasted concurrency change cost through the end of development. Figure 3, *U.S. Government F-35 Concurrency Cost per Aircraft*, presents the average unit cost per aircraft for all six estimates.

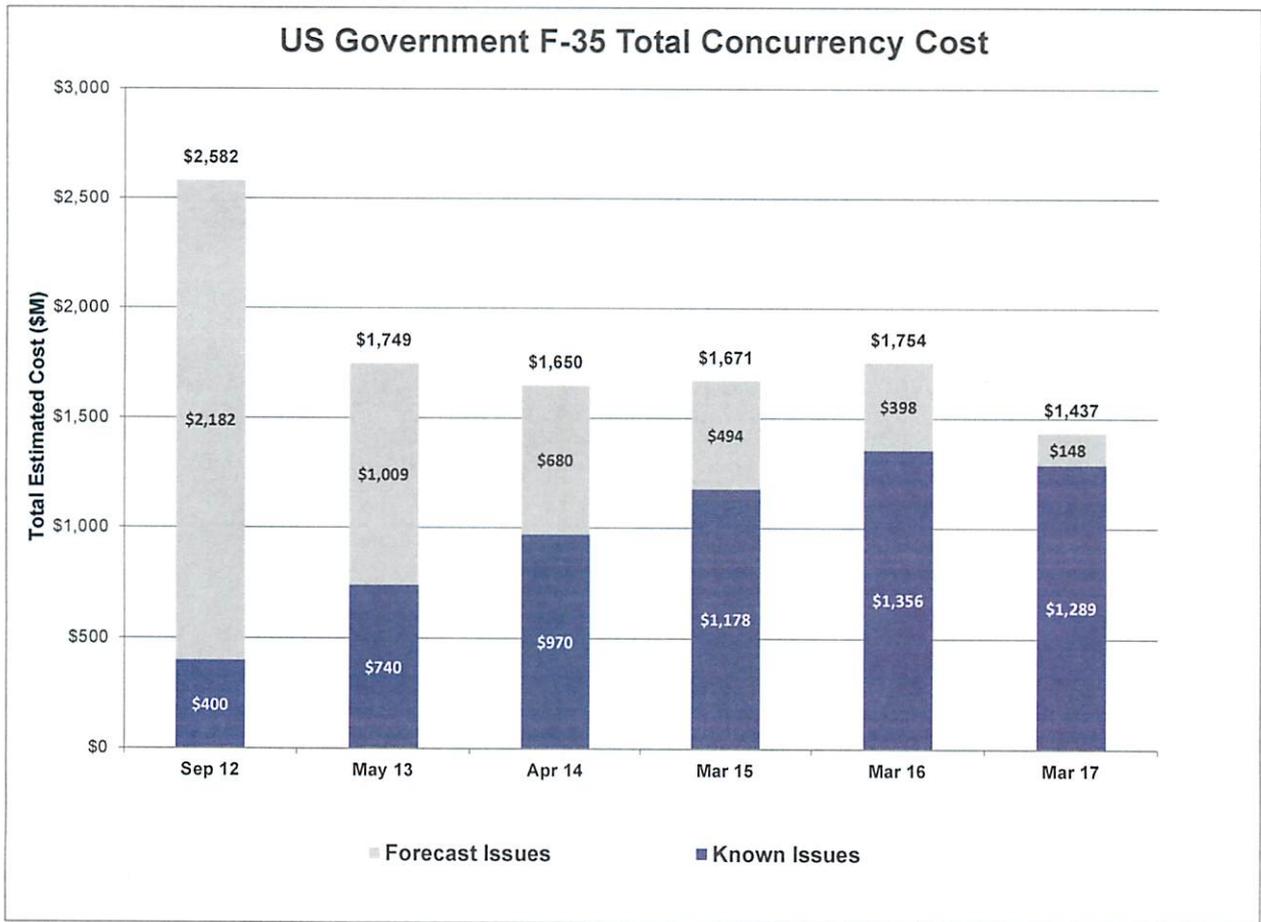


Figure 1

US Government F-35 Concurrency Cost by LRIP Lot

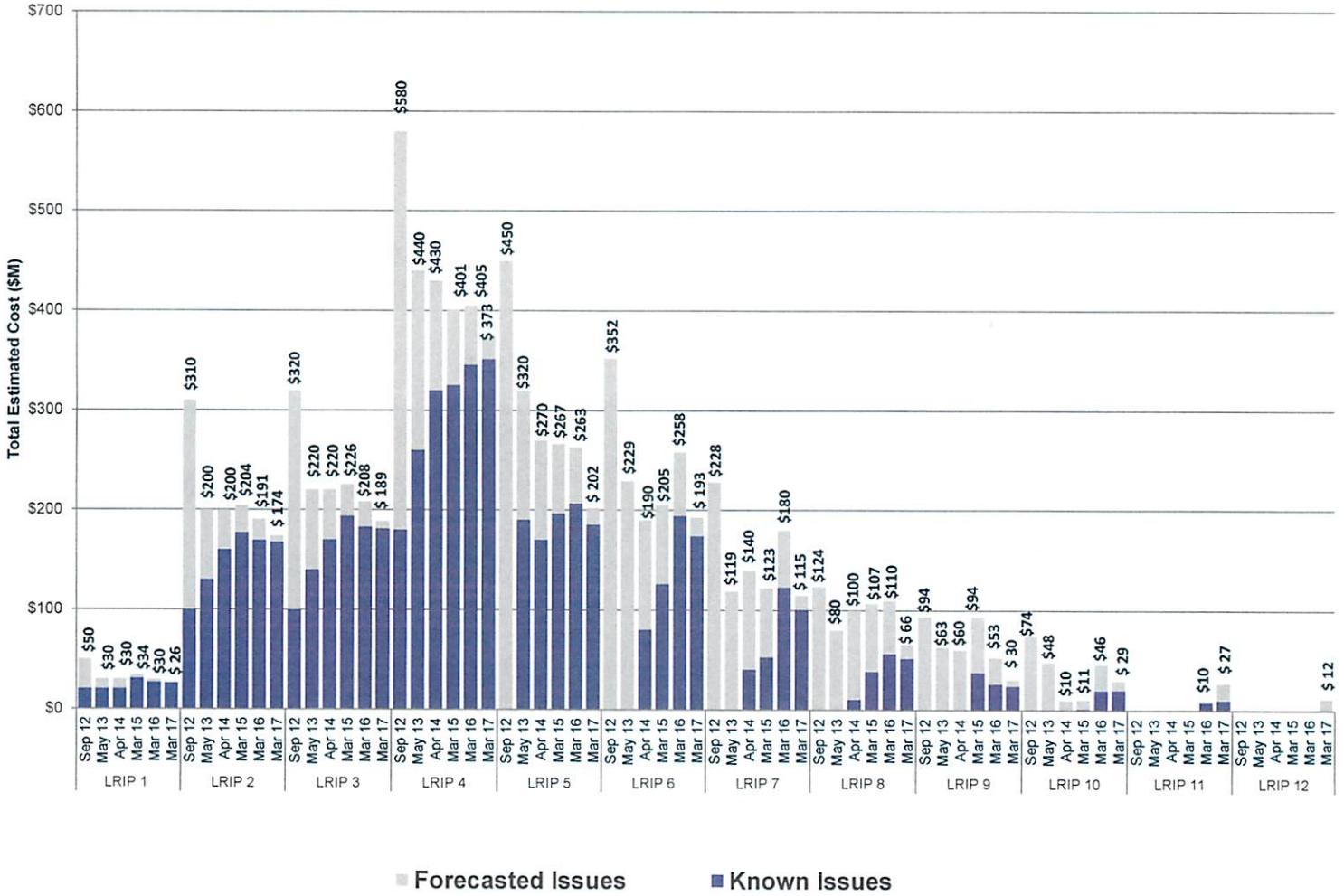


Figure 2

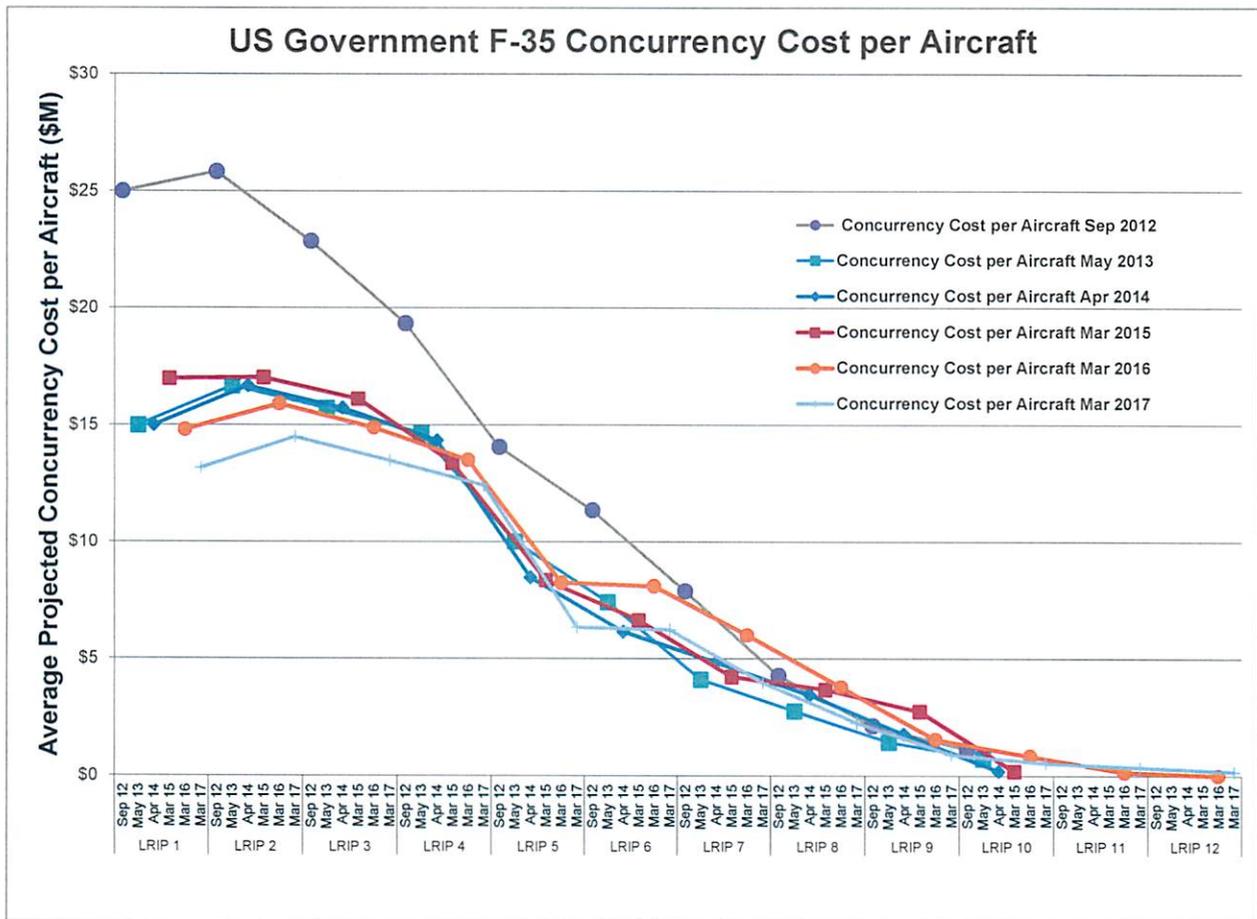


Figure 3

Changes from April 2016 Report

Overall, the F-35 concurrency cost estimate has declined. The estimate for March 2017 is a decrease of approximately 24 percent from the previous report. The April 2016 estimate was \$1,760 million, and the March 2017 estimate is \$1,330 million, as reflected in Figure 1. The changes between the two most recent reports are further broken down by LRIP contract in Figures 2 and 3. These changes are attributable to various factors:

- 1) Forecasted issues have declined from \$390 million in the previous April 2016 report to \$40 million in the current March 2017 estimate - an 89.7 percent reduction. A driver in the reduction is the removal of projected Third-Life Teardown and Inspection (T&I) costs from the forecasted totals (\$230 million). The Third-Life T&I activities occur after completion of SDD to which the concurrency management effort specifically applies. Therefore, these forecasted costs were removed as they are out of scope for concurrency. Another reduction-driver is that a subset of previously forecasted issues has been determined, through continuing engineering investigations, not to be required for retrofit (\$80 million).

- 2) Known issues have declined \$70 million from the \$1,360 million indicated in the April 2016 estimate to \$1,290 million in the current March 2017 estimate – a 5.1 percent reduction. This net reduction is caused by a combination of:
 - (a) Final cost estimates realized for some known issues are lower than the initial estimates due to the Engineering Change Proposal (ECP) definitization process.
 - (b) New known issues that have been realized.

An example of this reduction is the 270V Battery Gunfire Vibration Failure. In this case, formulation of an alternative corrective action approach resulted in a \$55 million reduction.

Conclusion

Lockheed Martin (LM) continues to work collaboratively with the F-35 JPO to process and incorporate changes as expeditiously and efficiently as possible. Toward that end, LM and the F-35 JPO continue to utilize a Modifications War Room, initiated in 2015, that maintains a comprehensive modification database for strategic long range planning. From a near-term perspective, the database prioritizes and tracks modifications by individual aircraft to include the inherent capability associated with that modification. As can be seen by the declining costs shown in Figures 1 through 3, the program continues to make strong, continuous progress in maturing and stabilizing the air system hardware design.

Contract language remains in place to reduce concurrency costs to the Government. The completed LRIP 5-10 contracts contain clauses that implement 50/50 cost sharing with no fee for specified changes known before contract award that will not be incorporated until after aircraft delivery. This cost sharing approach is intended to motivate LM to incorporate concurrency changes as quickly as possible in the production line.

The F-35 JPO projects that known costs will continue to converge toward the total projected estimate until development has completed. Estimates will be reviewed and updated on a semi-annual basis. These will contain adjustments as a result of retiring, realizing, rescheduling, or adding changes as the program progresses.

This report has been coordinated with the Director, Cost Assessment and Program Evaluation, in order to derive lessons learned regarding concurrency and corresponding cost implications that can be applied to future acquisition programs.