

Paul Solomon
3307 Meadow Oak Drive
Westlake Village, CA 91361
Paul.solomon@pb-ev.com

February 2, 2022

The Honorable Heidi Shyu
Office of the Under Secretary of Defense, Research and Engineering (USD(R&E))
The Pentagon, Washington, DC 20301

Subject: Continuing Failures in Using Agile Methods on F-35 Block 4 Modernization

Dear USD Shyu:

I have been reporting problems in the development of F-35 software to Sen. McCain and DoD officials since 2015. I first reported issues on Block 2. The *FY2021 DOT&E Annual Report* disclosed that the same problems exist today despite the use of Agile methods (called C2D2 on the F-35 program) and the expenditure of additional \$billions.

It is time to change the program management policies, processes, metrics, and incentives in order to deliver needed capabilities faster and cheaper. Findings and my recommendations follow.

Excerpts from *FY 2021 Report*:

Block 4 Development

The JPO designed the current development process, referred to as Continuous Capability Development and Delivery (C2D2), to provide new capabilities and updates in six-month increments, but it ***has not worked as envisioned***. The program continues to field immature, deficient, and insufficiently tested mission systems software to fielded units without adequate operational testing. Although the program designed C2D2 around commercial “***agile software***” development concepts, it ***does not adhere to the published best practices that include clear articulation of the capabilities required*** in the ***Minimum Viable Product***, focused testing, comprehensive characterization of the product, and full delivery of the specified operational capabilities. The program did not deliver programmed capabilities to operational units, as defined in the Air Systems Playbook.

Although designed to introduce new capabilities or fix deficiencies, the C2D2 process has often introduced stability problems and/or adversely affected other functionality. This results in the operational test units and the field units discovering deficiencies in the software.

The JSF program continues to carry a large number of deficiencies, and conducts recurring reviews with Service requirements representatives to prioritize resources to address them. Although initial development in Block 4 focused on addressing deficiencies that were identified during SDD while developing some new capabilities, the ***overall number of open deficiencies has not significantly decreased since the completion of SDD due to the continued discovery of new problems***.

Excerpts from Letter to Chairman Smith, Subj: F-35 Software Deliveries Using Agile Methods; Schedule Slips and “Technical Debt” per DOT&E with copy to USD Ellen Lord 2/6/20

My letter to Sen. McCain on Jan. 21, 2015, subject: “Cost Controls on the F-35 and Need for Acquisition Reform of EVM, described deficiencies in Block 2B software problems. These deficiencies were not fixed before the completion or release of Block 2B. Instead, some of the intended capabilities or functionality were deferred to subsequent blocks.

An excerpt from the letter follows.

“As you know, Dr. Michael Gilmore, just issued the “DOT&E FY2014 Annual Report.” ... He also reported deficiencies in the Block 2B software in fusion, radar, passive sensors, identification friend-or-foe and electro-optical targeting.” Thus, problems regarding deferred functionality pre-date LM’s use of C2D2/Agile methods. Unfortunately, LM’s use of the new methods has failed to provide “timely, affordable incremental warfighting capability improvements.”

Note: the subject should have been Technical Debt and “Functional Debt”

Excerpts from Letter to USD Kausner, Subj: Recommendations to Amend NDAA and DoD Policy; Agile Methods, Technical Debt, and Award/Incentive Fees, August 6, 2021

Status of F-35 SW Modernization

The F-35 program is over budget and behind schedule. One symptom is the F-35’s Block 4 technical debt. A summary of the reported open deficiencies in the technical debt reveals disturbingly little progress, as follows.

F-35 Block 4 SW Technical Debt		
Date	Open deficiencies	Category 1 Deficiencies
Nov. 2019	873	13
Nov. 2020	872	11
June 2021	864	8

My letter to Smith, Subj: *HR 6395 EH, Sec. 1710N, Agile Program and Project Management (Agile P/PM); Maximum Viable Profit for Minimum Viable Product (MVP)*, 10/6/20, included the following concern:

...the current policies, guidance, and regulations ***do not provide sufficient incentives to deliver the MVP within cost and schedule objectives and to reduce the technical debt.*** More importantly, the lack of disincentives or financial penalties provide no deterrence to contractors from continuing to receive undeserved award fees. Without more contractual definition and oversight, contractors are enabled to ***earn the Maximum Viable Profit despite delivering a subjectively defined and downwardly revised MVP.***

In that letter, I requested an assessment of the effectiveness and use of incentive and award fees when Agile practices are used to acquire SW that is embedded in weapon systems and other military-unique hardware systems.

Request SEI to assess the following when Agile practices are used on the F-35 program and other programs to acquire SW that is embedded in weapon systems and other military-unique hardware systems:

- Does the contractor maintain traceability in requirements decomposition from the source requirement (e.g., feature) to lower-level requirements (e.g., user story) as well as from the road map to the prioritized backlog?
- Are metrics identified and tracked that are used to impact decision making? Do the metrics allow traceability from the road map through releases and items in the product backlog?
- The extent to which award/incentive fee criteria are used that are dependent on:
 - a. Achieving the goals and features of each software iteration and increment in the Product Roadmap (or backlog) on a timely basis and
 - b. Reducing the total open deficiencies in the technical debt, especially Type I or critical deficiencies.

Proposed Revisions to Adaptive Acquisition Framework (AAF)

Neither DoDI 5000.87 nor the other acquisition policies and guides in the AAF cover the use of incentive or award fees to “acquire products...that satisfy user needs with measurable and timely improvements to mission capability, material readiness, and operational support, at a fair and reasonable price” (DoD Directive 5000.01).

Consequently, please consider the following remedy.

Revise DoDI 5000.02, “Operation of the AAF,” to add award/incentive fee criteria that are dependent on:

- a. Achieving the goals and features of each software iteration and increment in the Product Roadmap (or backlog) on a timely basis and
- b. Reducing the total open deficiencies

Excerpts from Letter to USD Kausner, Subject: Revision to Letter dated August 10, Further Refined Amendment to NDAA to Assess Agile Practices on F-35 Block 4 Software Development, dated Sept. 15, 2021

Address the product backlog in addition to the technical debt, as follows.

1. Specify the Software Engineering Institute (SEI) as the preferred FFRDC.
2. Request SEI to assess the following when Agile practices are used on the F-35 program and other programs to acquire SW that is embedded in weapon systems and other military-unique hardware systems:
 - Does the contractor maintain traceability in requirements decomposition from the source requirement (e.g., feature) to lower-level requirements (e.g., user story) as well as from the road map to the prioritized backlog?
 - Are metrics identified and tracked that are used to impact decision making? Do the metrics allow traceability from the road map through releases and items in the product backlog?
 - The extent to which award/incentive fee criteria are used that are dependent on:

- a. Achieving the goals and features of each software iteration and increment in the Product Roadmap (or backlog) on a timely basis and
- b. Reducing the total open deficiencies



Paul Solomon

CC:

USD Gregory Kausner

Andrew Hunter, Center for Strategic and International Studies

Anthony Capaccio, Bloomberg News

Michael LaForgia, NYT