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The Honorable William LaPlante USD(A&S)
1010 Defense Pentagon
Washington, DC 20301-1010

Subj: Outcome-based Metrics that Work to Build a Product that Works; F-35 Block 4

Dear USD LaPlante:

Last week, Lockheed Martin reported that another slip to F-35 TR-3 software acceptance was likely. Rep. Wittman warned the delayed TR-3 rollout will create further scheduling issues in the Block 4 upgrade. You then ordered a Technical Baseline Review (TBR) of the Block 4 upgrade to provide recommendations on improvements related to the modernization schedule, development infrastructure, software tools, and workforce capacity. Please refine the scope of the TBR to include an assessment of the use, sufficiency and effectiveness of outcome-based metrics.

Historically, outcome-based software metrics have been insufficient and ineffective. Unless the program starts to use the right outcome-based metrics, it will continue to lack situational awareness of schedule, technical, and cost performance.

I have been reporting the lack of outcome-based metrics for F-35 software blocks since 2011. Excerpts from my letters to Sen. McCain, Rep. Norcross, Rep. Smith, and Gen. Schmidt follow.

Letters on the lack of outcome-based metrics in the F-35 program		
Recipient, Date	Subject	Excerpts
McCain, 11/5/16 (with reference to 2011)	Cost Overruns and Delays on the F-35 Program and Need for Acquisition Reform	Five years ago, I reported similar conditions to you...subject: "Cost Controls on the F-35 and the Need for Acquisition Reform of EVM," dated 10/25/11reiterated recommended acquisition reforms regarding EVM, cited the continuing slips in development of Blocks 2F and 3F software as well as other F-35 functional requirements, and have recommended that you request the GAO to determine the accuracy of Lockheed's monthly EVM reports.
Norcross, 4/18/21	Subj: Questions for Subcommittee Hearing on F-35 Issues on April 22	Please ask questions to address recent GAO findings and recommendations...GAO has repeatedly reported on the failures of F-35 Block 4 software development. In the report, GAO-21-226, F-35 JSF, DOD Needs to Update, Schedule, and Improve Data on Software Development, GAO concluded that after 3 years of effort, the F-35 program continues to have issues with effectively implementing the C2D2 (Agile) approach to develop and deliver Block 4 capabilities. <ul style="list-style-type: none">• Contractor continues to deliver capabilities late• Remaining schedule contains significant risk and is not achievable based on the pace of past performance

		<ul style="list-style-type: none"> • Program is likely to continue falling short of its expectations, and the warfighter will have to wait longer for the promised capabilities • Block 4 metrics for software quality, performance, cost, schedule provide limited insight into aspects of software development quality under the Agile software development approach. • Current metrics do not include the number of planned features and the number of completed features for each software increment, which would provide insight into progress against the planned schedule and help ensure that all capabilities are delivered as planned in the first increment of each software drop.
Smith, 7/14/21	Repeated Request for GAO Assessment of F-35 Block 4 Modernization Incentive/Award Fees	<p>Yesterday, GAO issued its latest report, GAO-21-105282 <i>F-35 JSF Cost and Schedule Risks in Modernization Program Echo Long-Standing Challenges</i>. The report repeated earlier findings that “program officials acknowledged that they are not collecting all the metrics they need to better understand program risks and make more informed management decisions, but are taking steps to do so.” Per GAO, the metrics “provide further insight into the quality and performance of software development.”</p> <p>Metrics that provide insight into the quality and performance of software development should...be the basis for determining incentive or award fees.</p>
Schmidt, 8/14/23	Block 4 Issues, Outcome-Based Metrics, and Systems Engineering Transformation	<p>Unfortunately, there has been no effective progress towards defining and institutionalizing technical performance/outcome-based metrics or on providing accurate status and situational awareness of program execution for proactive resolution of issues impacting cost, schedule, and technical achievement of program objectives. Your program still does not provide “expected costs... in its annual Block 4 reports to Congress.”</p> <p>Today’s GAO report on defense software acquisitions recommends the use of outcome-based metrics to track whether software development is achieving desired outcomes, including capability delivered. My previous letters to you discussed the systemic absence of outcome-based metrics in EVMS. Please act on my recommendation (July 17 letter) to amend the NDAA for FY 2024, Section 815.</p> <p>The GAO report is <i>DEFENSE SOFTWARE ACQUISITIONS Changes to Requirements, Oversight, and Tools Needed for Weapon Programs</i>, GAO-23-105867, July 2023. GAO found that existing policies and guidance do not support DOD oversight of non-software pathway weapon programs using Agile. Without the use of outcome-based metrics and continually assessing the value of what was delivered against user needs, a program using Agile software development might deliver capabilities and features that are not essential to the customer and that could contribute to schedule and cost overruns.</p>

Following a review of the TBR assessments and recommendations, please take corrective actions to improve F-35 program management and, more broadly, the defense industrial base (DIB) ecosystem.

When you appeared before the SASC as nominee for Undersecretary of Defense for Acquisition and Sustainment, you responded to Advance Policy Questions (APQ) regarding EVM, systems engineering (SE) and iterative development approaches including minimum viable capabilities (MVC) and digital engineering (DE). Excerpts from the APQ statement follow.

APQs at SASC Nomination Hearing	
Question	Answer
40. What is your opinion on the merits of DOD incorporating iterative development approaches centered on fielding MVCs ?	Best practices in software development focus on rapidly fielding a MVC to get into the hands of users to accelerate learning, capture feedback, and use the insights to shape requirements, design, and strategies. If confirmed, I would seek to promote the DoD’s use of this leading industry practice.
41. To what extent do you believe DOD has broadly implemented commercial best practice agile development approaches adequately for software and hardware systems?	DoD is still in the early stages of effectively implementing agile and modern software approaches with progress in software intensive systems that can be leveraged for application to more of our hardware systems. If confirmed, software acquisition will be a high priority.
51. If confirmed, what steps would you take, if any, to require contractors to report valid measures of cost, schedule, and technical performance for all acquisition pathways ?	If confirmed, I will work across the Department and with the industrial base— current and emerging—to validate, improve, or establish appropriate metrics across the acquisition pathways.
52. If confirmed, what steps would you take, if any, to require contractors that employ the DOD DE Strategy to maintain valid information in the digital authoritative data source (ASoT, Authoritative Source of Truth) that is sufficient for program managers to make informed and timely decisions to manage cost, schedule, performance, and risk ?	If confirmed, I would seek to engage with our industry partners and Service representatives to better understand how they are currently employing DE and how we can work in partnership to better collaborate within and outside of the Department.... A combination of strong data, tool and modeling standards and environments, training of our Acquisition Corps, and proper contract and data rights guidance are foundational to enabling successful adoption of DE to feed the right cost, schedule, performance and risk data to our acquisition decision makers.

Additional information and recommendations are in my white paper, “*Integrating the Embedded Software Path, Model-Based SE, MOSA, and DE with Program Management,*” January 17, 2024, (IPM).

The TBR is one leg in a confluence of events including the NDAA for FY 2024, DoD policies, and oversight actions during the last twelve years. Your answers to the APQs and commitments are also applicable to Rep. Wittman’s objectives, as follows:

- Pentagon needs to change its mindset to put an earlier focus on software in program development.

- “In today’s world ... software needs to be at the forefront, then hardware needs to follow that.”
- The Air Force and the Joint Program Office to closely track the software process and upgrades.”

The confluence discussed above leads to the fork in the road discussed in the white paper, *EVM: “When you come to a fork in the road...”* 1/11/2024 (*Fork*). The previously cited white paper (*IPM*) also includes specific recommendations to support your commitments when confirmed.

The NDAA for FY 2024 requires the Secretary of Defense to designate all Block 4 and Technical Refresh–3 elements of the F–35 aircraft acquisition program, collectively, as a single major subprogram of the F–35 aircraft acquisition program. That is the last component of the confluence. Please ensure that your acquisition reforms and F-35 corrective actions are implemented in the new major subprogram.

The path to effective Integrated Program Management should bypass compliance with the EIA-748 EVMS guidelines. Program managers can obtain early warning of developing trends without the use of EVM. Per the *GAO Cost Estimating Guide*, “Typically, schedule variances are followed by cost variances and management tends to respond to schedule delays by adding more resources or authorizing overtime.” All stakeholders will benefit when program managers use the schedule and outcome-based metrics to get “early warning of developing trends—both problems and opportunities—allowing them to focus on the most critical issues.”

The bottom line, **“Use Outcome-based Metrics that Work to Build a Product that Works”** (not a SOW).



Paul J. Solomon

CC:

Hon. Robert J. Wittman, HASC

Hon. Donald Norcross, HASC

Hon. Adam Smith, HASC

Hon. Heidi Shyu, (USD(R&E))

Hon. Andrew Hunter, AF Asst. Sec. for AT&L

Anthony Capaccio, Bloomberg News

Stephen Losey, Defense News