OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE
3015 DEFENSE PENTAGON
WASHINGTON, DC 20301-3015

ACQUISITION

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MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY AND LOGISTICS

SUBJECT: PARCA Root Cause Analysis for the Joint Strike fighter (JSF) Program

This memorandum summarizes PARCA's root cause analysis of the cost growth which triggered the Nunn-McCurdy breach described by the Joint Strike fighter (JSF) Program in its December 2009 SAR. That SAR reported an increase in Program Acquisition Unit Cost (PAUC) of 57% compared to the original APB. From a purely computational point of view, the production PAUC growth is due to recognizing the consequences of programmatic or technical changes that drive cost and the more conservative estimating framework selected as the basis for the estimate in 2009. The decision by DoD to adopt this more conservative set of estimating assumptions is the proximate cause of the breach occurring at this time.

Our analysis only addresses the cost growth identified in the SAR although we recognize that the latest OSD CAPE estimate for the restructured program may be significantly greater than the SAR estimate. Our root causes fall into two large categories: flawed programmatic and technological assumptions at program inception; and a series of execution actions which hindered the overall government/contractor management's ability to address the problems as they were encountered. Additionally, modest changes, such as putting the Electro-Optical Tracking System on all JSF aircraft, have caused some cost growth.

Issues with program inception and their consequences. Unrealistic baseline estimates for cost and schedule are root causes of the subsequent growth. The Milestone B cost estimate was too low because the estimated airframe weights were too low, the escalation rates used were incorrect, and the acquisition strategy was incorrectly modeled in the cost model. These factors accounted for 23 points of the PAUC cost growth. Additionally, a very aggressive and concurrent development schedule was assumed in order to meet externally mandated IOC dates and to reduce acquisition cycle time.

Moreover, excessive optimism at MS B about the weight estimate and weight control led directly to a major redesign. That optimism could have been tempered by our experience with developing both the AV-8B (which demonstrated the challenges associated with STOVL) and the F-111 (which demonstrated the challenges posed by the integration of multiservice requirements). The need for a redesign had three consequences. First, both the materials and production processes and the assembly and tooling concepts had to be changed to produce more weight efficient structures. Second, the need for a redesign combined with pressure to contain cost growth and stay on schedule resulted in the loss of most of the affordability initiatives assumed in the MS B estimate. Finally, all of the major development milestones were delayed

by several years. These factors accounted for 26 points of the PAUC cost growth. In addition, stretches in the production profile have added another 5 points to PAUC.

Other issues in JSF's management and execution. Given that the JSF entered System Design and Development with flawed technological, estimating, and programmatic assumptions, the program was on a path to uncover significant problems. Each of the following factors materially impacted the program's ability to overcome these latent problems as they were incurred.

- After the Oct 2001 contract award, the contractor took many months to properly staff the project which particularly affected early systems engineering and design efforts.
- The JPO, along with other government oversight and the contractor, created an environment in which there was a general intolerance for failing to meet externally-driven schedule goals.
- The award fee, as implemented was ineffective in sending signals to the contractor. As examples, the dollar amount of fee revenue was only weakly influenced by poor contractor performance prior to 2007 and incentives to control production and development costs proved to have marginal effect.
- Systems engineering discipline and procedures appear not to have been rigorously followed as evidenced by problems implementing risk management, technology maturity assessments, and systems engineering integration planning.
- Finally, there was a general reluctance to accept unfavorable information. This slowed down the ability of the contractor and government to recognize and respond to problems.

However, disentangling each of these execution factors' contribution to cost growth – separate from the initial causes – is challenging. We can, for example, identify that the early refusal to entertain any alternative that would hold IOC at risk delayed recognition that weight growth required a redesign. We can also estimate the total cost of this redesign. But, separately computing the additional time and resources required to address this issue due to this IOC fixation is infeasible.

The F-35 is about 17% into its estimated total program acquisition costs, so a 57% PAUC increase is mostly a statement about expected costs in the future. Specific areas of uncertainty in the immediate future include the ability of the contractor to develop and integrate the mission systems on a schedule that supports testing and production, to overcome inevitable problems revealed during testing while maintaining the design stability required for production ramp up, and to minimize the production cost of the aircraft with acceptable impacts on other attributes. PARCA will work with OSD, the Services, the Program Office, and the contractors to assess performance in these areas.

Gary R. Bliss
Director, Performance Assessments and
Root Cause Analyses