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ACQUISITION,
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FOR: UNDER SECRETARY OF DEFENSE (AT&L)

FROM: Mr. Gary R. Bliss, Director, PARCA

SUBJECT: Root Cause Analysis of the Expeditionary Combat Support System Program

Purpose. This memorandum summarizes Performance Assessments and Root Cause Analyses (PARCA)'s root cause analysis of the Air Force's (AF) Expeditionary Combat Support System (ECSS) program, which was canceled by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) per an Acquisition Decision Memorandum (ADM) dated December 11, 2012, following the AF's cancellation recommendation on November 14, 2012. Specifically addressed are the following questions posed by Senators John McCain and Carl Levin in their December 5, 2012, letter to then-Secretary of Defense Leon Panetta: "What are the root causes of the failure of the ECSS program, and why did it take so long for senior management to recognize these problems and cancel the program?"

The Weapon Systems Acquisition Reform Act (WSARA) of 2009 provided seven specific underlying causes to consider when analyzing the root causes of cost, schedule, and performance shortcomings of a program and an eighth general category termed "any other matters." The ECSS program suffered from as many as six of the specific causes specified in WSARA. While multiple issues detrimentally impacted the program, this analysis aims to identify the root causes for failure of the program (i.e., causes that are by themselves determinative) and distinguish such root causes from the many symptoms or consequences arising therefrom.

ROOT CAUSES

Inception issue: unrealistic performance expectations. From the outset, ECSS was touted as "a new global vision for transforming logistics." It was portrayed as a program that would provide "end-to-end logistics transformation," replace "more than 420 aging systems," and serve "over 250,000 end users."¹ According to the AF Acquisition Incident Review Team, ECSS was conservatively estimated to be 28 times larger than any Enterprise Resource Planning (ERP) system previously and/or currently in development, as measured by its number of interfaces.

When ECSS was conceived in 2004, the Department of Defense (DoD)'s transformation strategy included promoting "evolutionary acquisition with spiral development (EA/SD)" as a

¹ ECSS was consistent with the Administration's approach to transform how the Department acquires new systems. President Bush, during the 2000 presidential campaign, advocated a "revolution" in weapon system acquisition "that would skip a generation of technology."

preferred acquisition strategy.² Ronald O'Rourke of Congressional Research Service identified three potentially significant issues posed by EA/SD: (1) ambiguous initial program description; (2) lack of well-defined benchmarks; and (3) funding projections potentially more volatile. PARCA's assessment is that the first two of these issues are principal root causes of the ECSS program's cost and schedule growth and ultimately its cancellation. That ECSS had an "ambiguous initial program description," which led to the most fundamental root cause of program failure:

The Air Force did not adequately understand, define and document its current "as-is" business processes, nor did it internally understand and define the new "to-be" business processes it sought to implement across its enterprise.

In PARCA's view, the most important tenant guiding an ERP implementation is the principle that you are not buying merely a software application or new IT system; the critical product being procured is a new set of business processes for managing your enterprise. It is thus essential to describe and understand your "as-is" business processes, not so that those can be instantiated into the new system, but rather so that the value-added and non-value added elements of the "as-is" process can be determined and serve as the basis for the desired "to-be" architecture. Developing the "as-is" and desired "to-be" process maps is admittedly a difficult, costly, and labor intensive task, but it is essential for successful implementation. For a program on the scale of ECSS, implementation was extremely complex because, unlike the purchase of a new weapon system whose use can be compelled by introducing it to the field and retiring the legacy version, the "as-is" business processes conducted by the AF logistics enterprise must continue to function throughout the transition to the "to-be" state, otherwise mission failure will occur. Although there is ample evidence that the need for and scale of Business Process Re-engineering (BPR) required for ECSS was recognized by program management and AF senior leaders, the most fundamental source of failure was the inability to adequately define the "as-is" and "to-be" business processes at a scale at which they could be implemented effectively.

Execution issue: poor performance by Government or contractor personnel responsible for program management. Of the problems encountered by ECSS, the most profound problem was the inception issue described above.³ Nevertheless, there were crucial shortcomings related to effective program management of ECSS that contributed to its failure. Briefly, these included:

- The earliest and most consequential program management failure was the decision to delegate the leading role in requirements development, translation, and allocation to the System Integrator (SI) contractor. Delegating the custom solution to the SI was described by the Deputy Director of Cost Assessment and Program Evaluation (CAPE) as one of the "perverse incentives for contractor performance," in the February 18, 2011, Independent Cost Estimate (ICE) of ECSS Increment 1. In addition, CAPE's ICE cites, "[A] track record

² The governing version of DoD Instruction 5000.2 (May 12, 2003) describes spiral development as a variation of evolutionary acquisition in which "a desired capability is identified, but the end-state requirements are not known at program initiation... requirements for future increments depend on feedback from users and technology maturation."

³ A program impaired by unrealistic performance expectations and an ambiguous program description might nevertheless be salvaged through astute program management that, in particular, divides the effort into manageable pieces of content. As will be discussed below, ECSS tried, but failed, to do so.

of poor system integrator contractor productivity, with weak government program management” as a remaining future concern.⁴

- A related shortcoming was the failure to consistently apply the original acquisition strategy that specified that a commercial-off-the-shelf (COTS)-based ERP software system would be procured and implemented with minimal redesign and maximal reliance on process optimization through BPR.⁵ The failure to sustain the original strategy resulted from the AF’s failure to adequately map the “as-is” and “to-be” business processes described above. In the absence of such a mapping, it was simply easier during the development process to accede to desires of technical experts (i.e., Government logistics functionals charged with describing process needs and corresponding reports, interfaces, conversions, and extension requirements and SI counterparts charged with responding to such requirements), rather than draw a hard-line on software redesign. A lesson applicable to future ERPs is that leadership needs to unambiguously communicate and enforce the principle that BPR is strongly preferred over software modifications, not only at the program management office (PMO) level but at senior levels within the acquisition and functional chains.
- A third execution issue related to poor program management was the failure to adequately collect and assess performance metrics on ECSS, particularly from 2007 – 2009. TAB 1 provides additional details and evidence related to this issue. As discussed above, ECSS suffered from as many as six of the WSARA-specified causes, each of which deleteriously impacted the program. However, PARCA’s assessment is that the determinative root causes are those described above; other issues can more appropriately be characterized as symptoms and consequences of these root causes, as detailed in TAB 2.

BEYOND ROOT CAUSES: DoD DECISION-MAKING

Why did it take so long for senior management to recognize these problems and cancel the program? Any proposed explanation of why it took “so long” to recognize problems and cancel any program is naturally subjective in an environment as complex as DoD acquisition, in which there are multiple decision-makers, stakeholders, and interests and expectations and requirements. In considering factors that led to the decisions to twice restructure (2009, 2011) and ultimately cancel (2012) ECSS, PARCA found it useful to consider the program’s chronology in terms of the broadly categorized timeframes shown in TAB 3.

There were three key decision points at which cancellation of ECSS was seriously considered (Restructure 1 in September 2009; Restructure 2 in October 2010; and alternatives development in 2012, which resulted in cancellation). Another possible key decision point was

⁴ A possible cause of the SI’s poor performance was lack of personnel with ORACLE experience: documentation from May 10, 2010 (5 years after program initiation), cites lack of “ORACLE program management and technical types” at CSC as a program risk and indicates that 66 ORACLE experienced personnel were added since September, 2009.

⁵ That this COTS-based strategy failed is perplexing not because it is unusual (indeed, many ERP implementations in the public and private sector have failed to sustain such a strategy), but instead because from the outset ECSS key leaders emphasized in briefings and articles the necessity of applying a COTS-based solution and robust Change Management effort, and AF senior acquisition and logistics leadership spoke out strongly in favor of adopting large-scale BPR to implement ECSS.

early in the program, when the AF became aware that the cost of integrating the original three software products proposed by ORACLE was significantly higher than anticipated.

The full motivation of decision-makers at these points is difficult to reconstruct now – over-optimism, a preference for the status quo, and justifying program continuation based on accrued sunk costs all seem to have played a part – but, the fact is decisions were reached to restructure the program in September 2009 and again in October 2010. During both restructures, improvements were made that resulted in better defined content broken up into more manageably-sized efforts. It is apparent that decision-makers from the Program Manager to the Defense Acquisition Executive exerted best efforts to make meaningful changes to enhance execution prospects and provide functionality that to this day remains required to modernize AF logistics and financial business processes. The “long” timeframe that preceded the ultimate decision to cancel ECSS was to some extent necessitated by the need to collect and evaluate execution metrics on the restructured program.

The termination decision on ECSS, as for any major acquisition program, had far-reaching consequences, not only for the AF’s unmet requirements, but also for private sector participants. It was thus critical to allow adequate time to obtain compelling data that future costs of ECSS would exceed the value of expected benefits, not only to enable the best decision within the Department, but also to ensure a fact-based rationale for termination was provided to Congress and the public.

SUMMARY

As noted at the beginning of this memorandum, projects such as the ECSS program are inherently more about business process re-engineering than they are about technology implementations, and it is the former that is by far more challenging. The private sector has found precisely the same thing: costly so-called Enterprise Resource Planning (ERP) implementations in the 1990s were cited in many business publications as being two thirds unsuccessful. So these are difficult challenges for any enterprise – public or private – to meet.

Starting off without a clear understanding of the business processes, both current and future, while ceding to a third party the job of clarifying these processes, was a crucial shortcoming at the ECSS program’s inception. This, combined with failing to enforce the implied business strategy, as well as failing to create metrics to status the project, ensured that success was unobtainable. PARCA notes that the Navy, with important differences in almost all these dimensions, was successful in implementing an ERP across its enterprise in the same time period. Its project was not without flaws, but it was built on three earlier pilot projects from which the Navy evolved a business model that it could live with.

Attachments:
As stated

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Attachment 1: INADEQUATE PERFORMANCE METRICS

A critical management shortcoming of the AF's ECSS program was the failure to collect adequate metrics to measure performance and track risks. This was largely a consequence of the ineffectiveness of the integrated master schedule (IMS) to reflect an accurate picture of the project's prospective task assignments and completions going forward. This was especially true prior to the program restructuring resulting from the October 31, 2010, Declaration of a Critical Change. It is speculative whether collecting such metrics might have enabled management intervention that could have produced acceptable outcomes; however, failure to collect such metrics clearly made it much more difficult to assess the program's execution status, and it correspondingly increased the time it took for senior management to recognize and respond to problems (particularly prior to 2011). The February 18, 2011, CAPE ICE stated that a continuing concern in the future was "limited reporting of contractor cost information and poor government visibility into actual contractor performance." PMO documentation from January 5, 2011, indicates that prior to July 2010, the IMS provided "poor visibility of external dependencies...manual integration/poor reliability...and lacking critical path awareness." The poor application of Earned Value Management (EVM) on the SI contract is, at least in part, an explanation for poor visibility into contractor performance.⁶ Although properly implementing EVM certainly does not ensure that program management will be effective, it provides a framework to enforce rigorous up-front planning and continuous monitoring of execution metrics throughout the program.

Other evidence that adequate metrics were not in place through 2009 includes PMO documentation from January 5, 2011, stating that prior to October 2009, metrics were "not integrated, missing objective trending," had "inadequate drill-down, and no critical path." Further evidence that metrics and cost tracking were inadequate through 2009 is provided in the December 23, 2009, ADM, which directed the AF to "place cost and software data reporting (CSDR) requirements on the existing contract with the ECSS SI." Finally, the considerable improvement in metrics collection and analysis resulting from the October 31, 2010, Critical Change restructure of the program is striking: a variety of execution metrics and contractor actual costs were collected and tracked in accordance with direction in the February 18, 2011, ADM that authorized additional funding for the program. By September 2011, it was clear from these metrics that the restructured program was still unable to meet execution benchmarks. A new set of alternatives was then developed and considered, culminating in the AF's recommendation to terminate ECSS in November 2012.

⁶ The original August 31, 2005, ADM approving ECSS MS A included the following statement by the Milestone Decision Authority: "I approve the application of Earned Value Management on this Firm-Fixed Price ECSS MS A Phase contract. The EVM will be tailored to the specific requirements of the ECSS Systems Integration efforts." However, EVM was ineffectively applied early in the program (with the budgeted cost of work performed equal to the actual cost of work performed in every period) and eventually was removed as a contract requirement based on the following explanation in program office documentation dated December 15, 2010, that "the program evaluated the usefulness of EVM and determined it to be ineffective for FFP contract – terminated SI EVM requirement."

Attachment 2: SYMPTOMS AND CONSEQUENCES

PARCA considers the following problem areas to be symptoms and consequences of the determinative root causes. These problem areas are important for at least two reasons: (1) they represent missed opportunities (signals) to recognize that the program had significant deficiencies that needed to be addressed; and (2) many individuals involved with ECSS and knowledgeable about its history consider some of these problem areas to be causes of program failure.

Inception issue: unrealistic baseline estimates for cost or schedule performance. ECSS was a pre-Milestone (MS) B program, so it did not have a formal Acquisition Program Baseline. As such, one could reasonably argue that the baseline estimates were not unrealistic, because there was no official cost or schedule baseline. On the other hand, the earliest formal cost and schedule estimate—the MS A Service Cost Position (SCP) conducted in 2005—served as a significant basis for program expectations until a subsequent SCP in 2009 (for a planned MS B only for Increment 1) and the CAPE ICE following the Critical Change in February 2011. The MS A SCP, which was for all four increments of the program, was by the PMO's own account (December 15, 2010) “high risk – so briefed – and approved.” (Describing a cost estimate as “high risk” can be considered synonymous with “best case” or, more pejoratively, “low ball,” i.e., one should expect actual costs will exceed the estimate). Accepting significant risks in cost and schedule estimates was not unusual within the Department during that period, consistent with the Department's philosophy that transformation would ultimately save money and provide better equipment to Warfighters. Also, prior to the WSARA-levied requirements that increased the emphasis on MS A estimates, it was typical that a MS A estimate was coarse and/or quickly done, with the expectation that more fidelity would be available for the MS B estimate used to baseline the program.

ERP programs in both the public and private sector are notoriously difficult to estimate, particularly at the outset when the scope of the program is large and requirements are still poorly understood and defined. In addition, techniques and procedures for estimating such programs were in their infancy (arguably still are), and cost estimators have been driven to create and develop unique parametric cost estimating relationships that are different from typical DoD weapon system programs. It is possible that the 2005 MS A SCP was as good an estimate as could be expected, based on the knowledge at that time. PARCA's assessment, however, is that the estimate was most likely overly optimistic, particularly in its failure to recognize the custom coding likely to be required, the significant costs of Change Management/BPR, and the failure to recognize the costs and challenges associated with importing data from legacy systems.

Inception issue: immature technologies or excessive manufacturing or integration risk. An inception risk that yielded an unexpected integration issue emerged immediately after award of the first contract to ORACLE in October 2005. AF personnel and documents indicate that the award to ORACLE was based on an understanding that the original three software products proposed either already were or could easily be integrated by ORACLE. During execution, this integration issue surfaced and became a source of unexpected additional effort. According to sources familiar with deliberations at that time, the AF engaged in internal discussions whether to terminate and re-compete the contract but ultimately decided to continue the awarded contract.

Inception issue: other matters. Numerous interviewees familiar with ECSS cite the inappropriateness of the Firm-Fixed Price (FFP) contract vehicle as a contributing factor to poor program execution. According to PMO documentation from January 5, 2011, the Department mandated use of the FFP option using the Enterprise Software Initiative Blanket Purchase Agreement. A FFP contract vehicle is appropriate when the Government can very accurately define its requirements and desired product and the contractor is able to accurately estimate its costs; a FFP contract was not appropriate for ECSS because of its extremely large scope, poorly defined requirements, and potential for significant change requests (each of which exposes the Government to renegotiation risk). Multiple contract changes, necessitated by the large amount of software customization that arose as ECSS departed from its COTS-based strategy, effectively created conditions in which the contractor was reimbursed for all costs, without the Government obtaining the insights into contractor performance necessary for effective program management. Poor program management execution occurred in part because an inappropriate contract vehicle was used that did not provide adequate visibility into the SI's performance.

Execution issue: unanticipated design, engineering, manufacturing, or technology integration issues arising during program performance. Like virtually all programs, ECSS experienced unanticipated additions in scope that had significant impacts on cost and schedule. However, none of these additions is considered to have contributed to program failure or even to program shortcomings. The unanticipated (or inaccurately estimated) expense that was the largest source of estimated cost growth was related to importing and cleansing data from legacy systems that ECSS was designed to replace (estimated by the 2009 MS B SCP as \$544 million above the MS A SCP). However, this expense was for a future effort that was not incurred prior to program cancellation, and PARCA thus does not consider it relevant to program failure.

A more significant unanticipated issue was the ever increasing emphasis on the role of ECSS in meeting the AF's Financial Improvement Audit Readiness (FIAR) requirements. While ECSS functionality was originally designed to support audit readiness, the program originally focused on logistics transformation and its associated benefits (e.g., inventory and supply chain management savings, modernization of business practices, retirement of obsolete legacy systems, etc.). As the timeline for meeting FIAR deadlines decreased, some emphasis within ECSS, understandably, shifted to its role in supporting the AF's efforts to meet FIAR goals. Interviewees indicated there was considerable sentiment among AF and OSD senior leaders to terminate ECSS during the review accompanying its Critical Change in October 2010. During this review, considering the prospects for restructuring ECSS so that it fielded functionality to support the AF's FIAR compliance requirements was not only inevitable, but also prudent. Several AF leaders who participated in such discussions noted that the newly enacted deadlines related to FIAR compliance and the potential for ECSS to support such compliance was a contributing factor in the Service's decision to continue the program in late 2010. Those same participants reported that a major consideration in the ultimate termination decision was the realization that even if ECSS had been restructured again and continued beyond 2012, it would not have been fielded in time to meet FIAR deadlines and the AF would still be required to fund maintenance of legacy systems that ECSS was intended to replace.

It is worth noting that PMO documentation from January 5, 2011, describes two significant elements of content that were "requirements increases" that contributed to ECSS cost growth: (1) a

logistics financial module (LogFins) that was assumed by ECSS in October 2008, from the Defense Enterprise and Accounting Management System (DEAMS); and (2) Product Lifecycle Management, which was included in the MS A SCP, but was “not well defined nor properly costed.” Although the 2009 SCP for a planned MS B attributed \$270 million of cost growth to these requirements, PARCA does not consider this added scope to be a cause of program failure, or even necessarily a deleterious action. Instead, the decision to assume those functions appear to have been carefully weighed based on technical considerations that sought to determine the most appropriate architecture for achieving the required functionality.

Execution issue: other matters. The large scope of the program, the program management team’s failure to divide the effort into manageable pieces of content, and the resulting unremitting shifting of content between increments led to ambiguity about the costs and benefits of the various ECSS program increments. This allowed program proponents to emphasize, to logistics users and senior acquisition officials, extraordinary potential downstream benefits of ECSS without conveying a full appreciation for the costs associated with developing and procuring all of the increments. For example, despite USD(AT&L)’s specific direction to the AF in September 2009 (and again in November, 2010) to limit the scope of ECSS to Increment 1, PMO documentation (January 5, 2011) continued to portray ECSS benefits in terms of the original program scope (originally three, later four increments). PARCA views this as especially pernicious to the decision-making process, because the benefits of Increment 1 amounted to only \$677 million (i.e., only a very small fraction (5 percent) of the projected benefits of the program as originally conceived (\$12.3 billion)). Moreover, at this point, the latest cost estimate (2009 SCP for a planned MS B) covered only Increment 1; there was no existing cost estimate for the subsequent three increments which were to account for 95 percent of the benefits.

Attachment 3: ECSS PROGRAM CHRONOLOGY

- 2005 – 2007: Aborted program start due to two un-sustained protests. Significant events: MS A approval ADM signed August 31, 2005; COTS contract award to ORACLE in October 2005, followed by protest which was denied February 2006; SI contract award to CSC in September 2006, followed by protest which was denied March 2007.
- 2007 – 2009: Development and refinement of requirements and blueprinting led by SI, with limited Government visibility as a result of poor program management, inappropriate FFP contracting vehicle, and inadequate metrics and execution oversight.
- 2009 – 2010: First program restructure and subsequent execution, during which the program was restructured from three to four increments (which were better defined than at MS A). Most importantly, the September 28, 2009, ADM specifically directed the AF to limit “activities to those required to support a MS B decision for Increment 1 and to develop the associated Acquisition Program Baseline...” and also directed that “Increments 2 and beyond will be separate acquisition programs.”
- October 2010 – December 2011: Second program restructure (Critical Change) and subsequent execution, during which Increment 1 was restructured from three to four “Pilots” and detailed “Enterprise Metrics” were established and monitored. Of note, the November 30, 2010, ADM directed that the AF “shall immediately cease activities for ECSS Release 2 and beyond.” Because Increment 1 content was split into Pilots A – D, it is apparent this guidance reiterated the September 28, 2009, direction to limit activities to Increment 1.
- 2012: AF and OSD developed and considered alternatives to meet ECSS goals of logistics transformation and supporting FIAR compliance; ultimately the AF recommended, and USD(AT&L) approved, cancelling the ECSS program and modifying, modernizing, and sustaining existing legacy systems to meet AF requirements.