



September 21, 2015

Congressional Committees

Department of Defense’s Waiver of Competitive Prototyping Requirement for the Air Force’s F-15 Eagle Passive/Active Warning and Survivability System (EPAWSS) Program

The Weapon Systems Acquisition Reform Act of 2009, as amended (WSARA), requires the Secretary of Defense to modify guidance to ensure that the acquisition strategy for each major defense acquisition program provides for competitive prototypes before Milestone B approval—which authorizes entry into system development—unless the Milestone Decision Authority waives the requirement.¹ Competitive prototyping, which involves commercial, government, or academic sources producing early prototypes of weapon systems or critical subsystems, can help Department of Defense (DOD) programs reduce technical risk, refine requirements, validate designs and cost estimates, and evaluate manufacturing processes prior to making major commitments of resources. It can also help reduce the time it takes to field a system, and as a result, reduce its acquisition cost. WSARA states that the Milestone Decision Authority may waive the competitive prototyping requirement only on the basis that (1) the cost of producing competitive prototypes exceeds the expected life-cycle benefits (in constant dollars) of producing such prototypes, including the benefits of improved performance and increased technological and design maturity that may be achieved through competitive prototyping; or (2) but for such a waiver, DOD would be unable to meet critical national security objectives.

WSARA also provides that when a Milestone Decision Authority authorizes a waiver of the competitive prototyping requirement on the basis of what WSARA describes as “excessive cost,” the Milestone Decision Authority is required to submit notification of the waiver, together with the rationale, to the Comptroller General of the United States at the same time it is submitted to the congressional defense committees. WSARA further provides that no later than 60 days after receipt of a notification of a waiver, we are to review the rationale for the waiver and submit a written assessment of that rationale to the congressional defense committees.²

¹Pub. L. No. 111-23, § 203(a), as amended by the Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111-383, § 813. DOD modified its guidance related to the operation of its acquisition system through Directive-Type Memorandum (DTM) 09-027, “Implementation of Weapon Systems Acquisition Reform Act of 2009,” (Dec. 4, 2009, incorporating Change 4, Jan. 11, 2013). DOD issued an Interim Instruction 5000.02, “Operation of the Defense Acquisition System,” on November 25, 2013 which incorporated and cancelled DTM 09-027. DOD reissued the interim Instruction to update DOD policy on January 7, 2015. A major defense acquisition program is a program identified by DOD with a dollar value for all increments estimated to require eventual total expenditure for research, development, test, and evaluation of more than \$480 million, or for procurement of more than \$2.79 billion, in fiscal year 2014 constant dollars. The Milestone Decision Authority for major defense acquisition programs is the Under Secretary of Defense for Acquisition, Technology, and Logistics; the head of a DOD component; or, if delegated, the component acquisition executive.

²Pub. L. No. 111-23, § 203(b)(1) & (2).

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On June 24, 2015, we received notice from DOD that it had waived the competitive prototyping requirement for the Air Force's F-15 Eagle Passive/Active Warning and Survivability System (EPAWSS) program. The F-15 Eagle is a fighter aircraft designed to permit the Air Force to gain and maintain air supremacy over the battlefield. Its current tactical electronic warfare system was fielded with the aircraft starting in the 1970s. EPAWSS is intended to replace and upgrade the electronic warfare system on fielded F-15C/E aircraft. It is expected to improve the aircraft's internal self-protection electronic warfare systems, thereby enhancing the F-15's ability to detect, identify, locate, deny, degrade, disrupt, and defeat air and ground threats to the aircraft. EPAWSS consists of four major subsystems. These include the radar warning receiver, the electronic countermeasure processor, the countermeasure dispenser system, and the fiber-optic towed decoy. These capabilities will be fielded in two phases or increments. The program received approval to enter technology development in August 2015.

In this report, we assess DOD's rationale for waiving the competitive prototyping requirement for the EPAWSS program and the analysis used to support it. To conduct our assessment, we compared the rationale in the waiver to the WSARA requirement to determine the extent to which the waiver is consistent with the statute. In addition, we reviewed the Air Force's cost-benefit analysis, which provides the data and assumptions on which the waiver is based, the EPAWSS acquisition strategy, and other relevant documentation. We did not independently verify the Air Force's data on cost and benefits. We also submitted written questions to EPAWSS program officials to clarify information in program documentation, as necessary.

We conducted this performance audit from July 2015 to September 2015 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Results in Brief

DOD's rationale for waiving WSARA's competitive prototyping requirement for the EPAWSS program addresses one of the two bases provided in the statute; namely that the cost of producing competitive prototypes exceeds the expected life-cycle benefits (in constant dollars) of producing the prototypes. DOD's rationale is based largely on the acquisition strategy for the program. According to the waiver, the program is to leverage, to the maximum extent possible, existing, technically mature, non-developmental components, which minimizes the potential risk reduction benefits associated with early prototyping. In the waiver, DOD concluded that the Air Force's cost-benefit analysis was sufficient. We also found that the Air Force's cost-benefit analysis was consistent with key principles in DOD's policy on economic analysis.³ The Air Force's cost-benefit analysis supporting the waiver examined three prototyping scenarios including the system- and subsystem-level prototyping options outlined in WSARA and DOD's implementing guidance. The Air Force concluded these strategies would increase acquisition costs between \$36.3 million and \$116.3 million (in base year 2014 dollars) and add between 21 and 41 months to the program's schedule. The Air Force also estimated that the various prototyping strategies could achieve an estimated \$6.5 million to \$7.2 million (in base year 2014

³DOD Instruction 7041.3, Economic Analysis for Decisionmaking. (Nov. 7, 1995). (Hereinafter cited as DODI 7041.3 (Nov. 7, 1995)). These general principles state that each feasible alternative for meeting an objective must be considered and the costs and benefits associated with each alternative under consideration should be quantified. DODI 7041.3, Encl. 3, paras. E3.1.1 and E3.2.4 (Nov. 7, 1995).

dollars) in life-cycle benefits from reduced system integration risk and improved performance. The independent Air Force Cost Analysis Agency assessed the program office's cost estimate that provided the cost and benefit data for the Air Force's analysis, which helps validate its credibility.

Waiver Rationale Is Consistent with WSARA and the Supporting Analysis Considered a Reasonable Set of Prototyping Alternatives

DOD's rationale for waiving WSARA's competitive prototyping requirement for the EPAWSS program addressed one of the two bases provided for a waiver in the statute, namely that a waiver may be granted if the estimated costs of producing competitive prototypes exceed the expected life-cycle benefits, including the benefits of improved performance and increased technological and design maturity that may be achieved through competitive prototyping.⁴ DOD waived the requirement to competitively prototype the EPAWSS system and its four subsystems because the Air Force determined that the prototyping costs greatly outweighed the benefits.

DOD and the Air Force reached these conclusions, in part, based on market research, early technology readiness assessments, and contractors' demonstrations of key technologies that showed EPAWSS performance requirements could be met with existing, non-developmental technologies. Relying on existing technologies is a key tenet of the program's acquisition strategy and minimizes the potential risk reduction benefits associated with early prototyping. The Air Force's market research found that non-developmental technology already in use in U.S. and foreign military systems could be integrated to satisfy EPAWSS' requirements. The program also performed an early technology readiness assessment to identify and confirm the maturity of the technologies required to meet EPAWSS requirements. The Air Force found that two of the EPAWSS subsystems—the countermeasure dispenser system and the fiber-optic towed decoy—would not benefit from prototyping because they require no further development due to the availability of existing technologies that have been flight proven and used in successful mission operations. For the other two EPAWSS subsystems, the program conducted technology demonstrations that provided some of the same benefits as competitive subsystem prototyping. The program office allowed contractors to demonstrate their candidate subsystems for the radar warning receiver and electronic countermeasure processor in an Air Force research lab that replicated a representative operational environment. These demonstrations, which included independent subject matter expert review, assessed the maturity of the four critical technologies associated with those subsystems. Based on these demonstrations, the Air Force found that the technologies were mature and that hardware and software present in industry can meet EPAWSS requirements. Since the time of the cost benefit analysis, the maturity level of the critical technologies of the selected EPAWSS solution has been reassessed at a lower readiness level due to changes needed to adapt the existing technologies for use on the F-15C/E. The modified technologies will be retested in a relevant environment. This does not change the Air Force's conclusions in the cost-benefit analysis and the program still expects the technologies to be mature prior to beginning engineering and manufacturing development.

⁴In the waiver, DOD stated that the cost of competitive prototyping, a single prototype, and critical subsystem prototypes of the EPAWSS program before Milestone B exceeded the expected life-cycle benefits. WSARA provides that whenever a Milestone Decision Authority authorizes a competitive prototyping waiver, the program is still required to produce a prototype prior to Milestone B approval if the expected life-cycle benefits (in constant dollars) of producing such prototype exceed its cost and its production is consistent with achieving critical national security objectives. Pub. L. No. 111-23 § 203(a)(3)(A).

In its waiver, DOD found the Air Force's cost-benefit analysis reasonable and we found that its approach was consistent with general principles in DOD's policy on economic analysis, including consideration of each feasible alternative for meeting an objective and evaluation of its life-cycle costs and benefits. In its cost-benefit analysis, the Air Force developed three prototyping scenarios, including the system- and subsystem-level prototyping options outlined in WSARA and DOD's implementing guidance, and compared the life-cycle cost of each scenario to the potential lifecycle benefits. The Air Force found that the additional costs ranged from \$36.3 million to \$116.3 million with lifecycle benefits of only \$6.5 million to \$7.2 million (all costs in base year 2014 dollars). The scenarios included: (1) competitive prototyping, in which two contractors would build prototype hardware and software, (2) non-competitive hardware and software prototyping involving one contractor, and (3) prototyping of the four critical technologies associated with the radar warning receiver and electronic countermeasure processor by one contractor. Results of the Air Force's cost-benefit analysis are summarized in table 1.

Table 1: Summary of the Air Force's Prototyping Cost-Benefit Analysis for the F-15 Eagle Passive/Active Warning and Survivability System (EPAWSS) Program

Dollars in base year 2014 millions

Prototyping Scenario	Estimated additional acquisition cost	Estimated life-cycle benefits	Estimated delays in initial operational capability
Competitive prototypes of EPAWSS – two contracts	\$116.3	\$7.2	41 months
Prototypes of EPAWSS – one contract	\$38.3	\$7.2	26 months
Prototypes of critical EPAWSS subsystems – one contract	\$36.3	\$6.5	21 months

Source: Air Force cost-benefit analysis in support of the EPAWSS competitive prototype waiver. | GAO-15-800R

The Air Force estimated the costs and time required for each prototyping scenario based in part on historical data from programs it considered to be similar. The costs included the cost of developing and producing prototypes, as well as systems engineering, government program management, and testing costs. In the competitive prototyping scenario, the additional 41 months includes the time needed to revise the acquisition strategy and request for proposal to incorporate prototyping, select the prototype contractors, develop and produce prototype hardware and software, and test the systems. The costs and delays associated with the other two prototyping scenarios were based on similar cost and time factors. The estimated life-cycle cost benefits were largely the same in each prototyping scenario. According to the Air Force cost-benefit analysis, each prototyping scenario could reduce or eliminate the software development and system integration risk associated with adapting potential EPAWSS systems to a challenging threat environment. The program office's cost estimate included \$6.5 million to address that risk, which provided the basis for most or all of the potential life-cycle cost benefits of prototyping. The independent Air Force Cost Analysis Agency assessed the program office's cost estimate that provided the cost and benefit data for the Air Force's analysis, which helps validate its credibility.

Agency Comments and Our Evaluation

We provided a draft of this report to DOD for comment. In response, the Air Force provided technical comments, which we incorporated.

We are sending copies of this report to interested congressional committees, the Secretary of Defense and the Secretary of the Air Force. In addition, the report will be available at no charge on the GAO website at <http://www.gao.gov>.

If you or your staff have any questions, please contact me at (202) 512-4841 or sullivanm@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report were Ron Schwenn, Assistant Director; Pedro Almoguera; Kristine Hassinger; Laura Holliday; and Wendell K. Hudson.

A handwritten signature in black ink, appearing to read 'Michael J. Sullivan', with a stylized, cursive script.

Michael J. Sullivan
Director, Acquisition and Sourcing Management

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