U.S. GOVERNMENT ACCOUNTABILITY OFFICE

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Congressional Committees

Status of Efforts to Initiate an Amphibious Combat Vehicle Program

In 2011, following the expenditure of $3.7 billion and a 2007 breach of a statutory cost threshold,[1] the Department of Defense (DOD) canceled the Marine Corps' Expeditionary Fighting Vehicle acquisition program due to concerns regarding its affordability. The Amphibious Combat Vehicle (ACV) is a potential, but not yet initiated, successor program to the Expeditionary Fighting Vehicle, intended to transport troops from ship to shore and use the sea as space to maneuver, while improving land performance in survivability, mobility, and lethality.

The National Defense Authorization Act for Fiscal Year 2014 mandated us to review and report annually to the congressional defense committees on the ACV program until 2018.[2] This is the first of the mandated GAO reports. It discusses (1) the current status of the ACV acquisition effort, and (2) the extent to which the ACV acquisition approach is consistent with acquisition best practices. To accomplish our objectives, we spoke with program officials, reviewed program documents, risks analyses and mitigation plans, cost and schedule benchmarks, and related program materials. We also reviewed past GAO work on acquisition best practices to use in assessing the ACV acquisition approach and develop a plan for future assessments.

We conducted this performance audit from January 2014 to April 2014 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.

[1]Section 2433 of title 10 of the United States Code, commonly referred to as Nunn-McCurdy, requires DOD to notify Congress whenever a major defense acquisition program's unit cost experiences cost growth that exceeds certain thresholds. This is commonly referred to as a Nunn-McCurdy breach. Significant breaches occur when the program acquisition unit cost or procurement unit cost increases by at least 15 percent over the current baseline estimate or at least 30 percent over the original estimate. For critical breaches, when these unit costs increase at least 25 percent over the current baseline estimate or at least 50 percent over the original, DOD is required to take additional steps, including conducting an in-depth review of the program. Programs with critical breaches must be terminated unless the Secretary of Defense certifies to certain facts related to the program and takes other actions, including restructuring the program. 10 U.S.C. § 2433a.

[2]Pub. L. No. 113-66 § 251 (2013).

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Results in Brief

The ACV effort has not yet reached Milestone A—the decision point in DOD's acquisition process that generally authorizes assessment of potential technologies for an eventual acquisition program. At this point, Marine Corps officials are weighing the cost and technological feasibility of their required capabilities. In November 2011, the Marines Corps began an Analysis of Alternatives (AOA)—a key first step in the acquisition process intended to assess alternative weapon system solutions for addressing a validated need—to identify an affordable alternative to the canceled Expeditionary Fighting Vehicle. Following completion of that study in mid-2012, the Marine Corps Commandant directed the program to perform a second study to assess the feasibility and affordability of a variant capable of higher water speed. This second analysis has been completed, but no formal decisions have been made regarding whether to commence an acquisition program or what path it will take, if initiated. Program officials suggest that development of a high water speed technology may prove unaffordable at this time.

It is too early to determine whether the ACV acquisition will follow acquisition best practices. An Initial Capabilities Document (ICD) that provides the performance requirements of a new amphibious vehicle has been approved. Both an ICD and an AOA are required documents for this stage of a potential acquisition program. AOAs can vary in quality, which can affect how they help position a program for success. While many factors can affect cost and schedule outcomes, we have found that programs that had a limited assessment of alternatives tended to have poorer outcomes than those that had more robust AOAs.[3] At this point, it is too early to assess the ACV AOA. Once decisions are made for the ACV program on whether to move toward program initiation with the existing AOA, revise or supplement it, or replace it entirely, we will assess the relevant completed AOA.

Background

Since 1972, the primary platform for transporting Marines from ship to shore under hostile conditions has been the Assault Amphibious Vehicle (AAV). Although planned upgrades for the AAV will bolster force protection, survivability, and mobility, enabling the vehicle to remain in service through at least 2030, the Marines report that the AAV has become increasingly difficult to operate, maintain, and sustain. As weapons technology and threat capabilities have evolved over the past four decades, the AAV is viewed as having capability shortfalls in the areas of water and land mobility, lethality, protection, and network capability. In addition, the AAV's need to be deployed and recovered from within sight of the shore may represent a significant survivability issue not only for the vehicle's occupants but also for naval amphibious forces that support it.

In response to the perceived need for new and better capabilities, the Marine Corps began development of the Expeditionary Fighting Vehicle (EFV) in 2000. We reported on the EFV program in 2006 and 2010.[4] According to plans, the EFV would travel at higher water speeds,

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[3]GAO, *Defense Acquisitions: Many Analyses of Alternatives Have Not Provided a Robust Assessment of Weapon System Options*, GAO-09-665 (Washington, D.C.: Sept. 24, 2009).

[4]GAO, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks*, GAO-06-349 (Washington, D.C.: May 1, 2006); and

Government Operations: Expeditionary Fighting Vehicle (EFV) Program Faces Cost, Schedule and Performance Risks, GAO-10-758R (Washington, D.C.: July 2, 2010).

which would have allowed transporting ships to launch the EFV further from shore. However, following a critical breach of the Nunn-McCurdy statutory cost threshold in 2007, that program was restructured and subsequently, in 2011, terminated. DOD authorized the Marine Corps to seek a new solution, emphasizing the need for cost-effectiveness and requiring the establishment of cost targets. The Marine Corps was granted flexibility in tailoring the acquisition approach to achieve those goals. In the mean time, while the Marine Corps pursues the proposed new development, it has planned upgrades to the AAV to improve force protection and platform survivability.

In the last several years, Congress and DOD have put in place new defense acquisition policy provisions that replace risk with knowledge—placing greater emphasis on front-end planning and establishing sound business cases for starting programs. For example, the Weapon Systems Acquisition Reform Act of 2009 requires programs to invest more time and resources in the front end of the acquisition process, and DOD's Better Buying Power initiatives advise that affordability should be based on the anticipated available level of future budgets, which are in line with a knowledge-based acquisition approach. As a result, DOD's current acquisition policy and guidance reflect a knowledge-based acquisition framework in line with acquisition best practices GAO has been identifying since the late 1990s.

A knowledge-based acquisition framework involves achieving the right knowledge at the right time—enabling leadership to make informed decisions about when and how best to move into various acquisition phases. In essence, knowledge supplants risk over time. Our best practices work has demonstrated that this building of knowledge consists of information that should be gathered at three critical points over the course of a program.

- **Knowledge point 1: Resources and requirements match.** Achieving a high level of technology maturity and preliminary system design backed by robust systems engineering by the start of system development is an important indicator of whether this match has been made. This means that the technologies needed to meet essential product requirements have been demonstrated to work in their intended environment. In addition, the developer has completed a preliminary design of the product that shows the design is feasible. If the above conditions are met, a solid business case is established at this point.

- **Knowledge point 2: Product design is stable.** This point occurs when a program determines that a product's design will meet customer requirements, as well as cost, schedule, and reliability targets. A best practice is to achieve design stability at the system-level critical design review, usually held midway through system development. Completion of at least 90 percent of engineering drawings at this point provides tangible evidence that the product's design is stable, and a prototype demonstration shows that the design is capable of meeting performance requirements.

- **Knowledge point 3: Manufacturing processes are mature.** This point is achieved when it has been demonstrated that the developer can manufacture the product within cost, schedule, and quality targets. A best practice is to ensure that all critical manufacturing processes are in statistical control—that is, they are repeatable, sustainable, and capable of consistently producing parts within the product's quality tolerances and standards—at the start of production.

The Marines Corps Is Considering Significant Decisions Regarding the Potential Acquisition Path for a Future ACV

The ACV has not reached Milestone A—the DOD decision point that would generally authorize the Marine Corps to assess potential technologies for an eventual acquisition program. Marine Corps officials are weighing the cost and technological feasibility of their required set of capabilities.

In November 2011, the Marine Corps initiated an AOA—a key first step in the acquisition process intended to assess alternative weapon system solutions for addressing a validated need—with the objective of identifying an affordable alternative with sufficient water speed to transit the required ship-to-shore distances in a realistic threat scenario, the capability to provide protected mobility and command and control, and sufficient capability ashore to travel in a modern combat environment. Guidance suggested that alternatives should include the EFV, at least one system not capable of high water speed travel, and at least one that would require an amphibious "connector craft" for transit from ship to shore. According to program documents, the final alternatives included

- the current AAV with a service life extension program, which would improve underbelly protection;
- an improved AAV, which would add capability to the weapon system, increase range over land, and provide weight growth margin;
- the EFV;
- two new development ACV concepts without high water speed capability; and
- a combat vehicle that would rely on another amphibious vehicle, such as the Landing Craft Air Cushion and Landing Craft Utility, to get ashore.

After the AOA efforts were completed in summer 2012, but before the analysis was finalized, the Marine Corps Commandant directed the program to thoroughly evaluate critical requirements, particularly water speed, to ensure there was a match between the desired capabilities and the likely funding available. The Marine Corps then initiated a second analysis specifically to evaluate the contributions of high water speed and the feasibility of building an affordable, survivable amphibious high water speed vehicle. Program officials stated that this affordability analysis has been completed and was recently briefed to the Commandant. Based on this analysis, the Marine Corps is in the process of revising its approach to the program.

Program officials have given some indication of the direction the program may take. Early indications are that, in the near term, current technology and budget resources will not be adequate to attain the desired high water speed of the ACV while still providing other desired capabilities. According to Navy officials, although completed, the AOA may require a supplement at a minimum or at the most, be replaced, depending on the capabilities that the Marine Corps determines it requires. Regardless, the Marine Corps will continue upgrades to the AAV, while the direction forward is reevaluated, according to DOD officials.

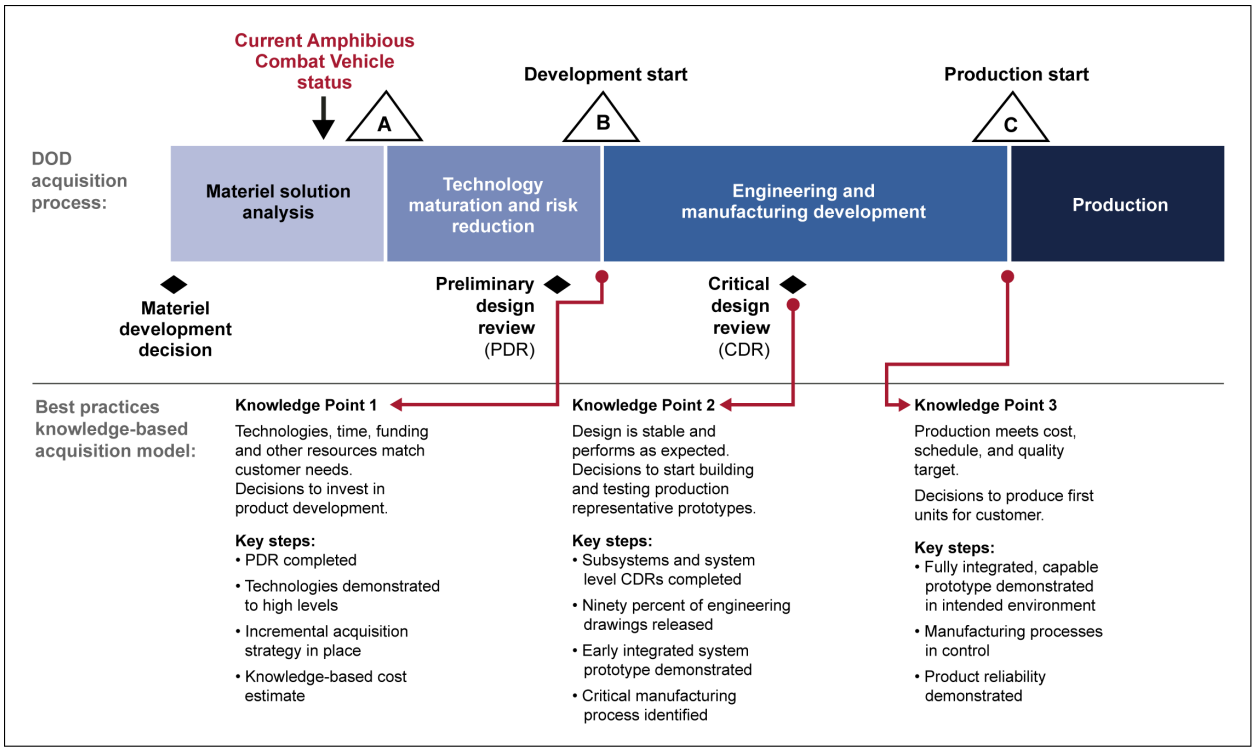
It Is Too Early to Determine Whether ACV Acquisition Will Follow Best Practices

It is too early to determine whether the ACV acquisition will follow acquisition best practices. Thus far, an ICD, which provides the performance requirements of a new amphibious vehicle, has been approved. Both an ICD and an AOA are required documents for this stage of a potential acquisition program.

AOAs can vary in quality, which can affect how they help position a program for success. In September 2009, we concluded that many AOAs do not effectively consider a broad range of alternatives for addressing a need or assess technical and other risks associated with each alternative.[5] Without a sufficient comparison of alternatives and focus on technical and other risks, AOAs may identify solutions that are not feasible and decision makers may approve programs based on limited knowledge. While many factors can affect cost and schedule outcomes, we have found that programs that had a limited assessment of alternatives tended to have poorer outcomes than those that had more robust AOAs. At this point, it is too early to assess the ACV AOA against these standards. As decisions are made for the ACV program on whether to move toward initiation with the existing AOA, revise or supplement it, or replace it entirely, we will assess the relevant completed AOA for robustness.

Assuming the program progresses, we will continue to assess and report its performance as mandated in the National Defense Authorization Act for Fiscal Year 2014 (the act). Figure 1 illustrates the acquisition process and where the ACV effort currently stands, and it identifies the best practices criteria that the program should meet as it progresses. This is a similar approach to that we have used in assessing the presidential helicopter program that is also early in development.[6] We will use this as a template for future reviews of the program.

Figure 1: Alignment of DOD's Acquisition Process and Best Practices



Source: GAO analysis of DOD's acquisition process and GAO's best practices.

[5]GAO-09-665

[6]GAO, *Defense Acquisitions: Application of Lessons Learned and Best Practices in the Presidential Helicopter Program*, GAO-11-380R (Washington, D.C.: Mar. 25, 2011).

By using this framework, we will address the issues identified in the act. Specifically,

- the extent to which the program is meeting development and procurement cost, schedule, and performance and risk mitigation goals;
- the progress of developmental and operational testing of the vehicle and plans for correcting deficiencies in vehicle performance, operational effectiveness, reliability, suitability, and safety;
- the program procurement plans, production results, and efforts to improve manufacturing efficiency and supplier performance;
- the program's acquisition strategy, including whether it is in compliance with acquisition best practices and DOD's acquisition policy and regulations;
- our assessment of the projected operational and support costs of the vehicle, as well as the affordability of these costs to the Marine Corps; and
- our assessment of the sufficiency and objectivity of the program's ICD (if revised), AOA (if revised), and capabilities development document.

Agency Comments

We are not making recommendations in this report. DOD did not offer any general comments on a draft of this report, but did provide technical comments, which were incorporated where appropriate.

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We are sending copies of this report to interested congressional committees; the Secretary of Defense; the Under Secretary of Defense for Acquisition, Technology, and Logistics; the Secretary of the Navy; and the Commandant of the Marine Corps. This report also is available at no charge on GAO's website at http://www.gao.gov.

Should you or your staff have any questions on the matters covered in this report, 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. Key contributors to this report were Bruce H. Thomas, Assistant Director; Scott Purdy, Analyst-in-Charge; Susan Ditto; Dayna Foster; John Krump; Kenneth E. Patton; and Roxanna Sun.

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