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Marine Corps Amphibious Combat Vehicle (ACV): Background and Issues for Congress

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Summary

On January 6, 2011, after spending approximately $3 billion in developmental funding, the Marine Corps cancelled the Expeditionary Fighting Vehicle (EFV) program due to poor reliability demonstrated during operational testing and excessive cost growth. Because the EFV was intended to replace the 40-year-old Amphibious Assault Vehicle (AAV), the Pentagon pledged to move quickly to develop a "more affordable and sustainable" vehicle to replace the EFV. The Amphibious Combat Vehicle (ACV) is intended to replace the AAV, incorporating some EFV capabilities but in a more practical and cost-efficient manner. In concert with the ACV, the Marines were developing the Marine Personnel Carrier (MPC) to serve as a survivable and mobile platform to transport Marines when ashore. The MPC was not intended to be amphibious like an AAV, EFV, or the ACV but instead would be required to have a swim capability for inland waterways such as rivers, lakes, and other water obstacles such as shore-to-shore operations in the littorals. Both vehicles were intended to play central roles in future Marine amphibious operations. On June 14, 2013, Marine leadership put the MPC program "on ice" due to budgetary pressures but suggested the program might be resurrected some 10 years down the road when budgetary resources might be more favorable.

In what was described as a "drastic shift," the Marines decided to "resurrect" the MPC in March 2014. The Marines designated the MPC as ACV Increment 1.1 and planned to acquire about 200 vehicles. The Marines also plan to develop ACV Increment 1.2, a tracked, fully amphibious version, and at the time planned to acquire about 470 vehicles and fund an ongoing high water speed study. Although ACV Increment 1.1 is to have a swim capability, another mode of transport (ship or aircraft) would be required to get the vehicles from ship to shore. The Marines are reportedly exploring the possibility of developing a high water speed ACV 2.0, which could accompany tanks and light armored vehicles into combat.

On November 5, 2014, the Marines released a draft Request for Proposal (RFP) for ACV Increment 1.1. On November 24, 2015, the Marine Corps awarded BAE Systems and SAIC contracts to develop ACV 1.1 prototypes for evaluation. BAE's contract was for $103.8 million and SAIC's for $121.5 million, and each company was to build 16 prototypes to be tested over the next two years. Both BAE and SAIC delivered their prototypes early, and Engineering and Manufacturing Development (EMD) testing began mid- March 2017. In early December 2017, the Marines reportedly sent the ACV 1.1 down select request for proposals to BAE and Science Applications International Corporation (SAIC).

On June 19, 2018, the Marine Corps selected BAE Systems to produce the ACV. Reportedly, the initial contract—valued at $ 198 million—will be for low-rate production of 30 vehicles to be delivered by the autumn of 2019. Eventually, 204 vehicles are to be delivered under the ACV 1.1 phase of the project. BAE will also produce the ACV 1.2 variant and, all told, the entire ACV 1.1 and 1.2 project is expected to deliver 700 vehicles, and, if all options are exercised, the total contract will reportedly be worth $1.2 billion.

A potential issue for Congress is how the possible adoption of the Expeditionary Advance Base Operations operational concept could affect the ACV 1.1 program.

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Background

U.S. Code, Title 10, Section 5063, United States Marine Corps: Composition and Functions, dated October 1, 1986, states the following:

> The Marine Corps will be organized, trained and equipped to provide an amphibious and land operations capability to seize advanced naval bases and to conduct naval land campaigns.

In this regard, the Marines are required by law to have the necessary equipment to conduct amphibious operations and land operations. The ACV and MPC were considered integral systems by the Department of Defense (DOD) and Marine Corps to meet this legal requirement, as well as providing critical capabilities to execute the nation's military strategy.

On January 6, 2011, after spending approximately $3 billion in developmental funding, the Marine Corps—with "encouragement" from DOD—cancelled the Expeditionary Fighting Vehicle (EFV) program. The EFV was intended to replace the 40-year-old Amphibious Assault Vehicle (AAV), which currently transports Marines from ships to shore under hostile conditions. The Marine Corps cancelled the EFV due to excessive cost growth and poor performance in operational testing. Recognizing the need to replace the AAV, the Pentagon pledged to move quickly to develop a "more affordable and sustainable" vehicle to take the place of the EFV. The Amphibious Combat Vehicle (ACV) is intended to replace the AAV, incorporating some EFV capabilities but in a more practical and cost-efficient manner.

In concert with the ACV, the Marines were developing the Marine Personnel Carrier (MPC) to serve as a survivable and mobile platform to transport Marines when ashore. At present, the Marines do not have a wheeled armored fighting vehicle that can operate as a dedicated infantry carrier with Marine maneuver forces inland. The MPC was not intended to be amphibious like an AAV, EFV, or the ACV but instead would be required to have a swim[1] capability for inland waterways such as rivers, lakes, and other water obstacles such as shore-to-shore operations in the littorals. Because of a perceived amphibious "redundancy," some have questioned the need for both the ACV and MPC. In June 2013, citing budgetary pressures, the Marines reportedly put the MPC program "on ice" and suggested that it might not be resurrected for about 10 years.[2] Although some have questioned why the Marines cannot simply "adopt" a U.S. Army personnel carrier, Marine requirements for a personnel carrier reflect the need for this vehicle to be compatible with amphibious assault craft, as well as to have an enhanced amphibious capability, which is not necessarily an Army requirement.

With the Marines involved in decades-long land conflicts in Iraq and Afghanistan and proliferating anti-access technologies such as guided missiles, some analysts questioned whether the Marines would ever again be called on to conduct a large-scale amphibious assault operation. In response to these questions and the perceived need to examine the post-Iraq and Afghanistan Marine Corps, the Department of the Navy and DOD studied the requirement to conduct large-scale amphibious operations and in early 2012 released a strategic vision for how amphibious operations will be conducted in the future. The primary assertion of this study is that the Marine Corps' and Navy's amphibious capabilities serve a central role in the defense of the global interests of a maritime nation. The need to maintain an amphibious assault capability is viewed by

[1] An *amphibious capability* generally refers to a vehicle's ability to debark from a ship offshore at a considerable distance and then move under fire to shore. A *swim capability* refers to a vehicle's ability to traverse limited water obstacles such as streams, rivers, and smaller bodies of inland water.

[2] Lee Hudson, "Marines Put Marine Personnel Carrier on Shelf Due to Budget Constraints," *InsideDefense*, June 14, 2013.

Marine Corps leadership as establishing the requirement for the ACV and MPC (as discussed in greater detail below).

Significance for Congress

Congress is responsible for authorizing and appropriating funds for all weapon systems programs, including the ACV. In its oversight role, Congress could be concerned about how the ACV enables the Marines to conduct not only amphibious operations but also operations ashore. Another possible congressional concern is to what extent a robust amphibious assault capability is a necessary component of U.S. national security. Cost is another issue of interest to Congress.

The Marines' Justification for the ACV and MPC

ACV

At present, the Marines use the AAV-7A1 series amphibious assault vehicle to move Marines from ship to shore. The Marines have used the AAV since 1971 and expect to continue to use it until replaced by the ACV or a similar vehicle. Over the years, the Marines have claimed the AAV has become increasingly difficult to operate, maintain, and sustain. As weapons technology and threat capabilities have evolved since the early 1970s, the AAV—despite upgrades—is viewed as having capabilities shortfalls in the areas of water and land mobility performance, lethality, protection, and network capability. The AAV's two-mile ship-to-shore range is viewed by many as a significant survivability issue not only for the vehicle itself but also for naval amphibious forces.

MPC

Although the AAV has some armor protection and can operate inland to a limited extent, it is not intended for use as an infantry combat vehicle. The Marines do have the LAV-25, Light Armored Vehicle-25, an eight-wheeled armored vehicle that carries a crew of three and six additional Marines. The LAV-25 is armed with a 25 mm chain gun and a 7.62 mm machine gun but is not fully amphibious as it cannot cross a surf zone and would get to the beach via some type of connector such as the Landing Craft, Air Cushioned (LCAC). The LAV-25 has been in service since 1983. According to the Marine Program Executive Office (PEO) Land Systems, the LAV is not employed as an armored personnel carrier and usually carries a four-person Marine scout/reconnaissance team in addition to its crew.[3] In this regard, the MPC was viewed as necessary by Marine leadership for the transport and enhanced armor protection of Marine infantry forces.

[3] Program Executive Office (PEO) Land Systems Marine Personnel Carrier Fact Sheet, 2010.

Desired Operational Capabilities

ACV[4]

The Marines' 2011 Request for Information (RFI)[5] to industry provides an overview of the operational requirements for the ACV. These requirements include the following:

- The proposed vehicle must be able to self-deploy from amphibious shipping and deliver a reinforced Marine infantry squad (17 Marines) from a launch distance at or beyond 12 miles with a speed of not less than 8 knots in seas with 1-foot significant wave height and must be able to operate in seas up to 3-foot significant wave height.
- The vehicle must be able to maneuver with the mechanized task force for sustained operations ashore in all types of terrain. The vehicle's road and cross-country speed as well as its range should be greater than or equal to the M-1A1.
- The vehicle's protection characteristics should be able to protect against direct and indirect fire and mines and improvised explosive device (IED) threats.
- The vehicle should be able to accommodate command and control (C2) systems that permit it to operate both at sea and on land. The vehicle, at a minimum, should have a stabilized machine gun in order to engage enemy infantry and light vehicles.

MPC[6]

The Marine Corps' 2011 Request for Information (RFI)[7] to industry provided an overview of the operational requirements for the MPC. These requirements included the following:

- The vehicle must accommodate nine Marines and two crew members and have a "robust tactical swim capability (shore-to-shore [not designed to embark from an amphibious ship]) and be capable of operating at 6 knots in a fully developed sea."[8]
- The vehicle must be able to operate on land with M-1A1s in mechanized task forces across the Marine Corps' mission profile.

[4] Unless otherwise noted, information in this section is taken from the Amphibious Vehicle Request for Information (RFI) issued by the Marine Corps Systems Command on February 11, 2011.

[5] The Federal Acquisition Regulation defines an RFI as "a document used to obtain price, delivery, other market information, or capabilities for planning purposes when the Government does not **presently** intend to issue a solicitation. [FAR 15.202(e)]."

[6] Unless otherwise noted, information in this section is taken from Annex A: Marine Personnel Carrier (MPC) Family of Vehicles (FOV) Requirements Set to the Marine Personnel Carrier Request for Information (RFI), February 17, 2011.

[7] The Federal Acquisition Regulation defines an RFI as "a document used to obtain price, delivery, other market information, or capabilities for planning purposes when the Government does not **presently** intend to issue a solicitation. [FAR 15.202(e)]."

[8] Annex A: Marine Personnel Carrier (MPC) Family of Vehicles (FOV) Requirements Set to the Marine Personnel Carrier Request for Information (RFI), February 17, 2011.

- The vehicle shall provide protection for the occupants from the blasts, fragments, and incapacitating effects of attack from kinetic threats, indirect fire, and improvised explosive devices and mines.
- The vehicle shall be capable of firing existing Marine anti-structure and anti-armor missiles and should be able to accommodate existing command and control (C2) systems.

Expeditionary Advance Base Operations (EABO)

Defense officials have noted the Marine Corps is "not currently organized, trained and equipped to face a peer adversary in the year 2025"[9] and enemies with advanced air and shore defense will make amphibious operations even riskier. To counter this, the Navy is developing the Expeditionary Advance Base Operations (EABO) operational concept to address these concerns. EABO is described as follows:

> Expeditionary Advance Base Operations is a naval operational concept that anticipates the requirements of the next paradigm of US Joint expeditionary operations. The concept is adversary based, cost informed and advantage focused. EABO calls for an alternative, difficult to target forward basing infrastructure that will enable US naval and joint forces to create a more resilient forward based posture to persist, partner and operate within range of adversary long range precision fires. The alternative forward posture enabled by Expeditionary Advance Bases (EABs) is designed to mitigate the growing threat posed by the abundant quantity, expanded range and enhanced precision of potential adversary weaponry--particularly ballistic and cruise missiles designed to attack critical joint fixed forward infrastructure and large platforms. EABs provide a dispersed and largely mobile forward basing infrastructure that enables a persistent alternative force capability set that is similarly designed to be difficult to target and inherently resilient. The resilient, reduced signature infrastructure of EABs, combined with naval forces designed and structured to persist and operate within the arc of adversary anti-access/aerial denial (A2AD) capabilities enables naval commanders to conduct Expeditionary Advance Base Operations to support Joint Force Maritime Component Commander (JFMCC), and Fleet Commanders in the fight for sea control, by exploiting the opportunities afforded by key maritime terrain, particularly in close and confined seas. EABO advances, sustains and maintains the naval and joint sensor, shooter and sustainment capabilities of dispersed forces to leverage the decisive massed capabilities of the larger joint force with enhanced situational awareness, augmented fires and logistical support. The EABO Concept enables US naval forces to exercise 21st Century naval operational art, meet new enemy A2AD threats with new capabilities and operate and thrive in and around close and confined seas.[10]

In terms of Marine Corps amphibious assault operations, the adoption of EABO could reportedly result in "an entirely different approach to amphibious assaults as well as new weapon systems."[11] Noting that "missiles can now hit ships and landing craft while they are hundreds of miles from shore, making it far too dangerous for Marines to storm a beach with current capabilities,"[12] Marine officials are reportedly exploring ways to create temporary "bubbles" where Marines can

[9] Jeff Schogol, "The Next Fight: The Commandant is Pushing the Corps to be Ready for a Violent, Violent Fight," *Marine Corps Times,* September 18, 2017.

[10] From Innovation Industry Day Announcement - Marine Corps Warfighting Laboratory - EABO 2019, February 2, 2018, https://www.fbo.gov/index?s=opportunity&mode=form&id=5ad0e3a3809bf73ddeda57b1bd32aaf1&tab=core&_cview=1.

[11] Eugene K. Chow, "How Marines are Rethinking the Art of the Amphibious Assault for the Next Big War," *The National Interest,* February 19, 2018.

[12] Ibid.

get ashore. In response to these challenges, current and planned weapons systems might need to be modified to accommodate EABO operational concepts.

Past Programmatic Activities

2013 Decision to "Shelve" the MPC

As previously noted, in June 2013, citing budgetary pressures, the Marines reportedly put the MPC program "on ice" and suggested it might not be resurrected for about 10 years.[13] At the time of the decision, the Marines' acquisition priorities were refocused to the ACV as well as the Joint Light Tactical Vehicle (JLTV).[14] Although the Marines refocused budgetary resources to the ACV, difficulties in developing an affordable high water speed capability for the ACV continued to confront Marine leadership.[15]

MPC Becomes ACV 1.1[16]

In what was described as a "drastic shift," the Marines decided in March 2014 to "resurrect" the MPC and designate it as ACV Increment 1.1 and initially acquire about 200 vehicles. The Marines also plan to develop ACV Increment 1.2, a tracked version, and to acquire about 470 vehicles and fund an ongoing high water speed study. Although ACV Increment 1.1 will have a swim capability, a connector will be required to get the vehicles from ship to shore.

Plans called for ACV Increment 1.1 to enter the acquisition cycle at Milestone B (Engineering and Manufacturing Development) in FY2016, award prototype contracts leading to a down select to one vendor in FY2018, and enter low-rate initial production.

Marines Release Request for Information (RFI) for ACV Increment 1.1[17]

On April 23, 2014, the Marines released an RFI for ACV Increment 1.1. Some of the required capabilities included the following:

> ... operate in a significant wave height of two feet and sufficient reserve buoyancy to enable safe operations; a high level of survivability and force protection; operate in four to six feet plunging surf with ship-to-shore operations and launch from amphibious ships as an objective; land mobility, operate on 30 percent improved surfaces and 70 percent unimproved surfaces; ability to integrate a .50 calibre remote weapon station (RWS) with

[13] Lee Hudson, "Marines Put Marine Personnel Carrier on Shelf Due to Budget Constraints," *Inside Defense*, June 14, 2013.

[14] For information on the JLTV, see CRS Report RS22942, *Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress*, by Andrew Feickert.

[15] Christopher J. Castelli, "General: Marine Corps Could Shelve Development of High-Speed ACV," *Inside Defense,* October 25, 2013, and Jason Sherman, "Marine Corps Dials Back ACV, Capability, Defers High Water Speed Plans," *Inside Defense,* March 25, 2014.

[16] Information in this section is taken from Department of Defense Fiscal Year (FY) 2015 Budget Estimates, Navy, Justification Book, Volume 2, Research, Development, Test & Evaluation, Navy, Budget Activity 4, March 2014, pp. 417-421, and Lee Hudson, "Marine Corps Drastically Shifts Ground Vehicle Modernization Strategy," *Inside Defense,* March 14, 2014.

[17] Lee Hudson, "Marines Release Amphib Vehicle RFI, Seek Accelerated Schedule," *Inside Defense,* April 25, 2014.

> growth potential to a dual mount 40 mm/.50 calibre RWS or a 30 mm cannon RWS; carrying capacity to include three crew and 10 embarked troops as the threshold, 13 embarked troops as the objective, carry mission essential equipment and vehicle ammunition; and the ability to integrate a command, control and communications suite provided as government furnished equipment... [18]

The RFI included a requirement for industry to deliver 16 prototype vehicles nine months after contract award in April 2016 at a rate of 4 vehicles per month.[19] The Marines estimated ACV Increment 1.1 would cost about $5 million to $6 million per vehicle, about $10 million less than what the previous ACV version was expected to cost.[20]

Marines Release Draft Request for Proposal (RFP) for ACV Increment 1.1[21]

On November 5, 2014, the Marines reportedly released a draft RFP for ACV Increment 1.1. The Marines were looking for information from industry regarding program milestones, delivery schedules, and where in the program cost savings could be achieved. Plans were for two companies to build 16 prototype vehicles each for testing. Companies who competed for the two contracts included BAE Systems, General Dynamics Land Systems (GDLS), Lockheed Martin, and Scientific Applications International Corporation (SAIC).[22]

Additional Details on 2015 ACV 1.1 RFP[23]

Under the provisions of the RFP, the ACV 1.1 was envisioned as an eight-wheeled vehicle capable of carrying 10 Marines and a crew of 3 that would cost between $4 million to $7.5 million per copy—a change from the RFI estimate of $5 million to $6 million per vehicle. In terms of mobility, the ACV 1.1 would need to be able to travel at least 3 nautical miles from ship to shore, negotiate waves up to at least 2 feet, travel 5 to 6 knots in calm seas, and be able to keep up with the M-1 Abrams tank once ashore.

Proposals were due in April 2016 and the Marines reportedly planned to award two EMD contracts for 16 vehicles each to be delivered in November 2016. In 2018, the Marines would then down select to one vendor and start full production.

ACV 1.1 Fielding Plan[24]

The Marines reportedly plan to acquire **204** ACV 1.1s, to be allocated as follows:

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[18] Ibid.

[19] Ibid.

[20] Lee Hudson, "Next-Generation Amphibious Vehicle Estimated to Cost $5-$6M Per Copy," *Inside Defense,* June 27, 2014.

[21] Information in this section is taken from Megan Eckstein, "Marines Expect ACV RFP in Spring; Will Choose 2 Winners for Prototype Production, Testing," *Defense Daily,* September 29, 2014, and Lee Hudson, "Marines Release Next-Gen Amphibious Vehicle Draft Request for Proposal," *Inside Defense,* November 6, 2014.

[22] Megan Eckstein, "Marines Expect ACV RFP in Spring; Will Choose 2 Winners for Prototype Production, Testing," *Defense Daily,* September 29, 2014.

[23] Information in this section is taken from Joe Gould, "Marine Amphibious Vehicle RFP Due in March," *Defense News,* February 16, 2015.

[24] Ibid.

- 1st Marine Expeditionary Force, Camp Pendleton, CA—**67**;
- 2nd Marine Expeditionary Force, Camp Lejeune, NC—**46**;
- 3rd Marine Expeditionary Force, Okinawa, Japan—**21**;
- Assault Amphibian School, Camp Pendleton, CA—**25**;
- Exercise Support Division, Marine Corps Air Ground Combat Center, Twenty Nine Palms, CA—**25**; and
- Program Manager, Quantico, VA, and Amphibious Vehicle Test Branch, Camp Pendleton, CA—**20**.

In April 2016 testimony to the Senate Armed Services Committee, the Deputy Commandant for Combat Development and Integration testified that the Marines' Acquisition Objective for the ACV 1.1 remained at 204 vehicles, which would provide lift for two infantry battalions.[25] Full Operational Capability (FOC) for ACV 1.1 is planned for FY 2020.[26]

Marines Award ACV 1.1 Contracts[27]

On November 24, 2015, the Marine Corps awarded BAE Systems and SAIC contracts to develop ACV 1.1 prototypes for evaluation. BAE's contract was for $103.8 million and SAIC's for $121.5 million, and each company is to build 16 prototypes. The Marines expect to down select to a single vendor in 2018. Initial operational capability (IOC) was expected by the end of 2020, and all ACV 1.1 vehicles are planned to be fielded by summer 2023. Plans are to equip six battalions with ACV 1.1s and 392 existing upgraded AAVs.

Both BAE and SAIC reportedly have a long history related to amphibious vehicles, as BAE built the Marines' original AAV and SAIC has built hundreds of Terrex 1 vehicles used by Singapore, and both companies had Marine Corps contracts to modernize AAVs.

ACV 1.1 is intended to have some amphibious capability but would rely on ship-to-shore connectors. ACV 1.2 is intended to have greater amphibious capability, including greater water speed and the ability to self-deploy from amphibious ships.

BAE planned to team with Italian manufacturer Iveco (which owns Chrysler and Ferrari). BAE's prototype would accommodate 13 Marines and travel 11.5 miles at about 7 miles per hour (mph) in surf and 65 mph on land. BAE's version would incorporate a V hull design intended to protect passengers from underside blasts and have external fuel tanks for increased safety. BAE intends to produce its prototypes at its York, PA, facility.

SAIC planned to team with Singapore Technology Kinetics to develop its prototype based on an existing design called Terrex. SAIC's version is said to travel 7 mph in water and incorporates a V hull design as well as blast-mitigating seats. It would carry a crew of 3 and can accommodate

[25] Statement of Lieutenant General Robert S. Walsh, Deputy Commandant, Combat Development and Integration & Commanding General, Marine Corps Combat Development Command and Mr. Thomas P. Dee, Deputy Assistant Secretary of the Navy, Expeditionary Programs and Logistics Management before the Subcommittee on Seapower of the Senate Armed Services Committee on Marine Corps Modernization, April 13, 2016, p. 5.

[26] Ibid.

[27] Dan Parsons, "Marine Corps Awards BAE, SAIC $225 Million Amphibious Combat Vehicle Contracts," *Defense Daily,* November 25, 2015; Lee Hudson, "BAE and SAIC Both Win Contracts for USMC Next-Gen Amphib Vehicle," *Inside Defense,* November 24, 2015; Jen Judson, "BAE, SAIC Named as Finalists in Marines ACV Competition," *Defense News,* November 24, 2015; and Lance M. Bacon, "Inside the Amphibious Vehicles that Won the Marines' $225M Contracts," *Marine Corps Times,* January 4, 2016.

11 Marines. SAIC's version plans for a Common Remote Weapons System (CROWS) (.50 calibre machine gun and a 30 mm cannon), which could be operated from inside the vehicle while buttoned up, therefore not exposing crewmen to hostile fire.

General Dynamics Land Systems (GDLS) Protests Contract Awards to the Government Accountability Office (GAO)[28]

On December 7, 2015, it was reported that GDLS would protest the award of the ACV 1.1 contract to BAE and SAIC, claiming the Marines asked for particular capabilities and then evaluated vendors by a different set of standards.

GAO Denies GDLS Protest[29]

On March 15, 2016, GAO denied GDLS's protest, noting that "the Marine Corps' evaluation was reasonable and consistent with the evaluation scheme identified in the solicitation."[30] The Marines reportedly stated that the protest put the ACV 1.1 program about 45 days behind schedule but anticipated the ACV 1.1 would still be fielded on time.[31]

BAE Systems and SAIC Deliver ACV 1.1 Prototypes Early and EMD Testing Begins[32]

BAE and SAIC reportedly delivered their ACV 1.1 prototypes, with BAE delivering its first prototype in December 2016 and SAIC delivering its prototype in February 2017. This early delivery could potentially result in an unspecified incentive fee award for both companies. EMD testing began the week of March 13 and was scheduled to last eight months.

Marine Corps Down Select Final Proposals[33]

In early December 2017, the Marines reportedly sent the ACV 1.1 down select request for proposals to BAE and SAIC. Plans called for operational testing to start in January 2018, with the Marines anticipating announcing a contract winner in June 2018 for the delivery of 204 ACV 1.1s over a four-year period.

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[28] Jen Judson, "General Dynamics Protests ACV Contract Awards to BAE and SAIC," *Defense News,* December 7, 2015, and Dan Parsons, "In ACV Protest, GD Says Marines Corps Kept Requirements Hidden" *Defense Daily,* December 9, 2015.

[29] Jen Judson, "GAO Denies General Dynamics' Amphibious Combat Vehicle Protest," *Defense News,* March 15, 2016, and Lee Hudson, "Following GAO Bid Protest, ACV 1.1 is Delayed but Will be Fielded On Time," *Inside Defense,* July 19, 2016.

[30] Ibid.

[31] Ibid.

[32] Lee Hudson, "BAE Systems, SAIC Will Receive Incentive Fee from Marines for Delivering Amphib Vehicles Early," *Inside Defense,* February 22, 2017 and "Marines Kick Off Next-Generation Amphibious Vehicle EMD Testing," *Inside Defense,* March 21, 2017.

[33] Lee Hudson, "Marine Corps Sends Final Solicitation to BAE, SAIC for Next-Gen Amphib Vehicle," *InsideDefense.com,* December 13, 2017.

Annual Required GAO Report on the ACV Program[34]

In accordance with the provisions of the FY2014 National Defence Authorization Act (P.L. 113-66) Section 251, GAO submitted its annual report to Congress on the ACV program in April 2018. GAO reviewed program cost estimates, updated schedules, and program assessments of test results and production readiness, and compared ACV acquisition efforts to DOD guidance and GAO-identified best practices.[35] GAO found:

> The first version of the Amphibious Combat Vehicle (ACV 1.1) is on track to meet development cost goals with no additional anticipated delays for major acquisition milestones. With regard to costs, the development phase of ACV 1.1 is on pace to not exceed cost goals that were established at the start of development, based on a recent Navy estimate, the ACV program office, and reporting from the contractors.[36]

GAO recommended that the Marine Corps (1) not enter the second year of low rate production for ACV 1.1 until after the contractor has achieved an overall Manufacturing Readiness Level (MRL) of 8 and (2) not enter full-rate production until achieving an overall MRL of 9.[37] DOD partially concurred with this recommendation but noted that it was "reasonable to proceed at lower MRL levels if steps are taken to mitigate risks."[38]

BAE Wins ACV Competition[39]

On June 19, 2018, the Marine Corps selected BAE Systems to produce the ACV. Reportedly, the initial contract—valued at $198 million—will be for low-rate production of 30 vehicles to be delivered by the autumn of 2019. Eventually, 204 vehicles are to be delivered under the ACV 1.1 phase of the project. BAE will also produce the ACV 1.2 variant and, all told, the entire ACV 1.1 and 1.2 project is expected to deliver 700 vehicles, and, if all options are exercised, the total contract will reportedly be worth $1.2 billion.

ACV 1.2 Developments

Ship-to-Shore Requirements for the Next ACV Version[40]

According to reports, the Marines envision that the successor to ACV 1.1—the ACV 1.2—will have a threshold requirement of 12 miles from ship-to-shore. If this threshold can be achieved, it

[34] Government Accountability Office (GAO), Amphibious Combat Vehicle: Program Should Take Steps to Ensure Manufacturing Readiness, GAO-18-364, April 2018.

[35] Ibid. Executive Summary.

[36] Ibid.

[37] Manufacturing Readiness Level (MRL) 8 is defined by GAO as "pilot line capability demonstrated; ready to begin low-rate production," and MRL 9 is defined as "low-rate production demonstrated; capability in place to begin full-rate production."

[38] Ibid.

[39] Matthew Beinart, "Marine Corps ACV Deal with BAE Systems Expected to Total $1.2 Billion, 700 Vehicles," *Defense Daily,* June 20, 2018 and Courtney McBride, "BAE Systems Wins Competition for U.S. Marine Corps' ACV 1.1," *Jane's Defence Weekly,* June 27, 2018, p. 5.

[40] Lee Hudson, "Marines Reveal ACV 1.2 Will Have Threshold Requirement of 12 Miles," *Inside Defense,* March 22, 2016.

could help to reduce the vulnerability of U.S. naval vessels supporting Marine amphibious operations to enemy shore fire.

Options for Arming ACV 1.2[41]

The Naval Surface Warfare Center reportedly issued a Request for Information (RFI) to industry in December 2016 seeking affordable options to upgrade ACV 1.2's lethality from ACV 1.1's Common Remotely Operated Weapon Station (CROW).

ACV 2.0[42]

Reportedly, the Marines plan to develop an ACV 2.0, capable of carrying 10 to 13 Marines plus crew, capable of high water speeds, and deployment from ships far from the coast. ACV 2.0 is planned to be capable of operating on land alongside tanks and light armored vehicles. According to the Marines:

> ACV 2.0 serves as a conceptual placeholder for a future Decision Point (~ 2025, or sooner) at which time knowledge gained in the fielding and employment of the first phase of ACV (1.1 and 1.2), the state of the naval connector strategy, and science & technology work towards a high water speed capable self-deploying vehicle will support an informed decision.[43]

Budgetary Information

Estimates on ACV 1.1 Program Costs[44]

According to GAO's April 2018 Weapon Systems Annual Assessment report, the ACV program requires $1.080 billion to procure 204 ACV 1.1s, including $257.61 million in RDT&E funding (in FY 2018 dollars) to complete ACV 1.1 development.

Department of Defense FY2019 Budget Request[45]

The FY2019 presidential budget includes RDT&E and Procurement funding requests in the Base Budget, as well as FY2019 requested quantities. The Marines did not request ACV Overseas Contingency operations (OCO) funding in FY2019.

[41] Lee Hudson, "Government Seeks Affordable Lethality Options for New Amphibious Vehicle," *Inside Defense*, January 6, 2017.

[42] Daniel Goure, "Why the U.S. Marines Amphibious Combat Vehicle Program Works, *The National Interest*, May 2, 2017.

[43] Marine Corps Combat Development Command, https://www.mccdc.marines.mil/Resources/Amphibious-Combat-Vehicle/High-Water-Speed/, accessed September 26, 2018.

[44] U.S. Government Accountability Office (GAO), Weapon Systems Annual Assessment: Knowledge Gaps Pose Risks to Sustaining Recent Positive Trends, GAO-18-360SP, April 2018, p. 78.

[45] Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, Program Acquisition Cost by Weapon System: United States Department of Defense Fiscal Year 2019 Budget Request, February 2018, p. 3-9.

Table 1. FY2019 DOD Budget Request—ACV

Funding Category	Base Budget	Base Budget	OCO Budget	OCO Budget	Total Request	Total Request
	$M	Qty	$M	Qty	$M	Qty
RDT&E	98.2	—	—	—	98.2	—
Procurement	167.5	30	—	—	167.5	30
TOTAL	**265.7**	**30**	—	—	**265.7**	**30**

Source: Office of the Under Secretary of Defense (Comptroller)/Chief Financial Officer, Program Acquisition Cost by Weapon System: United States Department of Defense Fiscal Year 2019 Budget Request, February 2018, p. 3-9.

Notes: $M = U.S. Dollars in Millions; Qty = FY2019 Procurement Quantities.

According to DOD, the FY2019 ACV budget request will

> [f]und ACV 1.1 corrective actions, advanced capability improvements, Operational Test & Evaluation (OT&E) and Live Fire Test & Evaluation (LFT&E) support for the down-selected contractor. Provides the design and development of the new Command and Control (C2) and Recovery variants and to modify the ACV 1.1 Personnel test vehicles into the ACV 1.2 configurations. Procures the Low Rate Initial Production (LRIP) of 30 vehicles, plus procurement of related items such as production support, systems engineering/program management, Engineering Change Orders (ECOs), Government Furnished Equipment (GFE), and integrated logistics support, and Initial Spares, which support the ACV Increment 1.1 program.[46]

FY2019 National Defense Authorization Act (H.R. 5515)[47]

Congress recommended decreasing the Marine's FY2019 ACV RDT&E budget request by $22.099 million due to "project excess concurrency."[48] Congress recommended fully funding the Marine's FY2019 ACV Procurement budget request.[49]

[46] Ibid.

[47] Conference Report 115-874 to Accompany H.R. 5515, John S. McCain National Defense Authorization Act for Fiscal Year 2019, July 25, 2018.

[48] Ibid., p. 731.

[49] Ibid., p. 708.

Department of Defense and Labor, Health and Human Services, and Education Appropriations Act, 2019 (H.R. 6157)[50]

Congress recommended a decrease to the Marine's FY2019 ACV RDT&E budget request of $32.086 million citing, among other things "project excess concurrency." [51] Congress recommended fully funding the Marine's FY2019 ACV Procurement budget request. [52]

Potential Issue for Congress

Expeditionary Advance Base Operations and ACV 1.1and 1.2

If the Navy and Marine Corps decide to adopt Expeditionary Advance Base Operations (EABO) as an operational concept, it could possibly have implications for the ACV 1.1 and ACV 1.2 programs, including the following:

- At the weapon systems level, would EABO require any changes to the vehicles themselves, such as enhanced survivability, lethality, or Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (C4ISR) features?
- If changes are required to facilitate EABO, how would this affect the program's overall acquisition timeline and cost?
- If EABO does not require any technical changes in the ACV 1.1 and ACV 1.2 programs, would the adoption of EABO modify the Marines' current procurement quantities of ACV 1.1s and ACV 1.2s?
- If EABO requires different procurement quantities for the different ACV versions (more or fewer), how might this affect program timelines and program costs?

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Disclaimer

[50] Conference Report 115-952 to Accompany H.R. 6157, Department of Defense and Labor, Health and Human Services, and Education Appropriations Act, 2019, And For Other Purposes, September 13, 2018.

[51] Ibid. p. 401.

[52] Ibid., p. 319.

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