



# The Marines' Expeditionary Fighting Vehicle (EFV): Background and Issues for Congress

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## Summary

The Expeditionary Fighting Vehicle (EFV) is an armored amphibious vehicle program that originated two decades ago to replace the 1970s-era Amphibious Assault Vehicle (AAV). Like current AAVs, the EFV is designed to roll off a Navy amphibious assault ship, move under its own power to the beach, and cross the beach and operate inland. The EFV has experienced a variety of developmental difficulties, resulting in significant program delays and cost growth. The EFV is currently in its second systems design and development (SDD) phase attempting to improve the EFV's overall poor reliability and performance that it demonstrated during its 2006 operational assessment. If the EFV passes the current SDD in early 2011, it is expected to begin initial production if DOD has not cancelled the program and if it is fully funded.

The improvised explosive device (IED) threat that has plagued operations in Iraq and Afghanistan was not envisioned in 1988 when the EFV program was initiated. The EFV's low ground clearance and flat bottom make it particularly vulnerable to IEDs; this has raised congressional concern that the EFV, as currently designed, would provide inadequate protection to transported Marines. Another change to the battlefield is the proliferation of longer-ranged, shore-based, anti-ship cruise missiles (ASCMs) which put the Navy's amphibious ships disembarking EFVs at their 25-mile operating limit vulnerable to attack.

These battlefield evolutions, as well as the EFV's program delays and rising costs, and the decision to acquire only 573 vehicles (the original requirement was 1,025) have resulted in many defense experts and officials questioning the need for the EFV. Although some question the EFV's relevance, the Government Accountability Office (GAO) reported that the EFV passed its December 2008 Critical Design Review (CDR) and, with 94% of the system's design models releasable, that EFV's critical technologies were mature and its design is stable. The EFV is currently undergoing operational testing, and the Marines should receive the final two prototypes by October 2010 with testing scheduled to run through late January 2011. If the EFV is cancelled, there are possible alternative solutions, including upgrading current AAVs as well as exploring the adaptability of candidate vehicles being considered under the Marine Personnel Carrier (MPC) program for amphibious assault operations. The DOD, the Navy, and the Marines are currently conducting separate studies examining Marine Corps roles and missions, force structure, and equipment, and the results could have a significant impact on the future of the EFV.

Congress has expressed its concern over the EFV's vulnerability to IEDs during a number of hearings. The House and Senate Armed Services Committees have recommended fully funding the President's FY2011 EFV budget request of \$242.8 million for Research, Technology, Development, and Evaluation (RDT&E) funds. The Senate Appropriations Defense Subcommittee has recommended providing funding to cancel the EFV program. The subcommittee recommended cutting \$204 million from the FY2011 \$243 million budget request and added \$185 million to cancel the program. If the EFV program is continued, it will require \$866.7 million in research and development and \$10.226 billion in procurement funding for a total of \$11.163 billion to complete the program and field 573 EFVs. Each EFV is expected to cost about \$24 million apiece.

Potential issues for congressional consideration include the vulnerability of the Navy's amphibious fleet and EFVs, the potential ramifications if the EFV fails its second round of operational testing, and what role to take in ongoing Marine Corps studies that could be used to determine the fate of the EFV program. This report will be updated as conditions warrant.

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## Background

The Marine Corps is responsible for the conduct of amphibious operations in support of the full spectrum of U.S. national security objectives. If the Marines need armored fighting vehicles in the early stages of an amphibious landing, these vehicles must either be transported by landing craft with limited protection against enemy fire, or the armored vehicle must come ashore under its own power.<sup>1</sup> Like current AAVs, the EFV is designed to roll off a Navy amphibious assault ship, move under its own power to the beach, and cross the beach and operate inland. The EFV is designed to be launched 25 miles off shore (the AAV can be launched only 2 miles from shore) permitting the fleet to operate “over the horizon,” where it theoretically would be less vulnerable to enemy fire. There are concerns that the 25-mile over the horizon operating capability may no longer provide the protection to the fleet that it once did. One example is the 2006 Hezbollah C-802 cruise missile attack against an Israeli ship where two missiles were fired, with one hitting the Israeli warship, which was about 10 miles from shore, and the second missile striking an Egyptian ship 36 miles from shore.<sup>2</sup> Concerns also have been raised that, when ashore, the flat-bottomed EFV may be excessively vulnerable to improvised explosive devices (IEDs).

## The EFV Program

### What Is the EFV?<sup>3</sup>

The EFV is an armored, fully tracked infantry combat vehicle operated by a three-person crew that can carry 17 combat-equipped Marines. It is to be a self-deploying, high-speed amphibious vehicle capable of transporting Marines from ships to objectives inland and aims to have the speed, maneuvering capabilities, fire power, and protection to operate with main battle tanks on land. It is intended to have a 20-knot speed in the water and a 345-mile range ashore with a 45-kilometer-per-hour speed on hard-surfaced roads. The EFV is to be designed to have modular armor and expanded mine blast protection and mount a 30mm high-velocity cannon in a stabilized turret. The EFV is also supposed to be able to communicate in joint networks and operate as part of a joint land force. There are to be two EFV variants. The EFV-P1 will carry a Marine rifle squad and its equipment and provide direct fire support during combat operations. The EFV-C1 variant provides command and control capabilities for commanders and their staffs.

### Program Structure

The EFV is described as the Marines' number one priority ground weapon system acquisition program and is the only Acquisition Category (ACAT) 1D program managed by the Marine Corps.<sup>4</sup> The Marine Corps EFV Program Office is collocated with the EFV's prime contractor—

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<sup>1</sup> Unless otherwise noted, information in this section is taken from Sydney J. Freedberg, “Future Corps,” *National Journal*, May 10, 2008.

<sup>2</sup> David Eshel, “INS Hanit Suffers Iranian Missile Attack,” *Defense Update*, July 17, 2006.

<sup>3</sup> Information in this section is from the 2008 United States Marine Corps Concepts & Programs Handbook, pp. 112-113; General Dynamics Land Systems Briefing: EFV Program, February 2008; and Marine Corps Tactical Systems Support Activity EFV Fact Sheet.

<sup>4</sup> Marine Corps Tactical Systems Support Activity EFV Fact Sheet. The 12<sup>th</sup> Edition of the *Defense Acquisition* (continued...)

General Dynamics—in Woodbridge, VA, and the Marines claim that collocation—the first of its kind for a major weapon system—has greatly reduced government contractor design costs and streamlined the program decision-making process.

## **Program History<sup>5</sup>**

In 1988, Acquisition and Program Decision Memorandums were signed by defense officials to initiate the Concept Exploration/Definition Phase (CE/D)<sup>6</sup> of what was then known as the Advanced Amphibious Assault Vehicle (AAAV) program. In 1995, the program entered into the Program Definition and Risk Reduction (PDRR) phase,<sup>7</sup> where it was considered by many to be a “model defense acquisition program,” winning two DOD awards for successful cost and technology management. In June 1996, a contract was awarded to General Dynamics Land Systems to begin full-scale engineering development of their design. Based on the aforementioned early success of the program, the Marine Corps awarded a cost-plus contract to General Dynamics in July 2001 for the Systems Development and Demonstration (SDD) phase of the program. General Dynamics and the Marines envisioned that the SDD phase would be completed by October 2003, a schedule that some say “proved too ambitious.”<sup>8</sup> In 2003, the Marines renamed the program the Expeditionary Fighting Vehicle (EFV) program.

## **Problems During the SDD Phase**

In 2006, the Government Accountability Office (GAO) reported that:

The program did not allow enough time to demonstrate maturity of the EFV design during SDD. The original SDD schedule of about three years proved too short to conduct all necessary planning and to incorporate the results of tests into design changes. Specifically,

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*University Glossary*, July 2005, defines an ACAT 1D program as a Major Defense Acquisition Program (MDAP), which is estimated by the Under Secretary of Defense (Acquisition, Technology, and Logistics) (USD[AT&L]) to require the eventual expenditure for Research, Development, Test, and Evaluation (RDT&E) of more than \$365 million (FY2000 constant dollars) or a procurement of more than \$2.19 billion (FY2000 constant dollars).

<sup>5</sup> United States House of Representatives, Committee on Oversight and Government Reform, Majority Staff, “The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable,” April 29, 2008; “Military Vehicle Forecast: Expeditionary Fighting Vehicle,” Z Forecast International, June 2007, pp. 4-5; United States Government Accountability Office (GAO) Report to Congressional Committees, “Defense Acquisitions; The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks,” GAO-06-349, May 2006, pp. 6-7.

<sup>6</sup> The Concept Exploration/Definition (CE/D) Phase of the Defense Systems Acquisition Process (now called the Concept Refinement [CR] Phase) is governed by Department of Defense (DOD) Directive 5000.1, “The Defense Acquisition System.” Activities during the CE/D phase, which normally lasts one to two years, include exploring material alternatives to satisfy mission needs; identification of high-risk areas; identifying most promising system concepts; developing a proposed acquisition strategy; and developing initial cost, schedule, and performance objectives.

<sup>7</sup> The Program Definition and Risk Reduction (PDRR) Phase normally lasts two to four years. Activities during this phase include defining key design characteristics and expected capabilities and demonstrating that technologies can be incorporated into systems designs. Prototype systems are developed during this phase.

<sup>8</sup> United States House of Representatives, Committee on Oversight and Government Reform, Majority Staff, “The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable,” April 29, 2008, p. 2.

the original schedule did not allow adequate time for testing, evaluating the results, fixing the problems, and retesting to make certain that problems are fixed before moving forward.<sup>9</sup>

Because of these and other difficulties, the EFV program was “rebaselined”<sup>10</sup> in November 2002, adding an additional year to the program schedule, and then rebaselined again in March 2003, also adding another year to the program schedule.<sup>11</sup> In December 2004, EFV prototypes experienced major failures of the hull electronics unit (HEU), the vehicle’s main computer system.<sup>12</sup> These failures caused the water-mode vehicle steering to freeze, making the vehicle non-responsive. The EFV also experienced significant problems in September and October 2004 with the bow flap—a folding panel extended forward to generate additional hydrodynamic lift as the EFV moves through the water.<sup>13</sup> The EFV experienced a myriad of hydraulics system failures, leaks, and pressure problems during testing that contributed to low reliability ratings. Because of reliability problems, the originally required 70-hour mean time between operational mission failure (MTBOMF) rate for the EFV was reduced by the Marines to 43.5 hours. Because of these demonstrated failures and related concerns about a lack of program management and oversight, the program was rebaselined for a third time in March 2005, this time adding an additional two years to the extra two years added during the previous rebaselining.

## **2006 Operational Assessment<sup>14</sup>**

In 2006, the EFV was subject to an Operational Assessment—a series of tests to demonstrate that it could meet performance requirements—that, if successfully completed, would permit the program to move into the production phase. During this assessment, the EFV experienced numerous critical failures and, because of repeated breakdowns, the EFV failed to meet reliability requirements and failed the assessment. For example, during the test, the vehicles were able to operate for only 4.5 hours between breakdowns and required about 3.4 hours of corrective maintenance for every 1 hour of operation—a maintenance burden that evaluators said would “wear out a unit under realistic combat operations.” Poor reliability also resulted in 117 Operational Mission Failures and 645 Unscheduled Maintenance Actions during testing. The EFV’s low reliability resulted in the EFV completing 2 out of 11 attempted amphibious tests, 1 out of 10 gunnery tests, and none of the 3 scheduled land mobility tests. The EFV prototypes tested were approximately 1,900 pounds too heavy to achieve the desired high water speed and,

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<sup>9</sup> United States Government Accountability Office (GAO) Report to Congressional Committees, “Defense Acquisitions; The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks,” GAO-06-349, May 2006, p. 13.

<sup>10</sup> Rebaselining means that a program’s milestones, timelines, and costs are modified; in most cases increasing the length and cost of the program.

<sup>11</sup> *Ibid.*, pp. 8-9. DOD has been known to rebase programs—change the program’s estimated cost and schedule so they are a more accurate reflection of how the program is progressing—in instances where a troubled program shows potential for improvement.

<sup>12</sup> United States House of Representatives, Committee on Oversight and Government Reform, Majority Staff, “The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable,” April 29, 2008, p. 4.

<sup>13</sup> Information in this section is from United States Government Accountability Office (GAO) Report to Congressional Committees, “Defense Acquisitions; The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks,” GAO-06-349, May 2006, pp. 16-18.

<sup>14</sup> Information in this section is from United States House of Representatives, Committee on Oversight and Government Reform, Majority Staff, “The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable,” April 29, 2008, pp. 7-10.

in some circumstances, could not accommodate equipment needed by Marines for special climatic conditions. Evaluators also noted significant problems in terms of limited visibility, excessive noise, and difficulty in reloading the EFV's main gun.

## **EFV Redesign**

In the aftermath of 2006 Operational Assessment, the Marines "went back to the drawing board."<sup>15</sup> In February 2007, the EFV program office issued a "sources sought" notice, requesting information from industry leaders on "tracked combat vehicles that can provide an alternative design concept of the EFV"—a perceived vote of no confidence in General Dynamics by the Marines. Also that month, the Navy formally advised Congress that the EFV program would incur a cost breach, requiring program recertification under the Nunn-McCurdy Act (10 U.S.C. 2433).<sup>16</sup> Finally, in late February 2007, the Navy announced that it would have to relax EFV performance and reliability requirements in order for the program to continue. In March 2007, the Marines modified the original SDD contract and awarded General Dynamics an additional \$143.5 million to redesign the EFV.<sup>17</sup> In what has been termed "the largest program setback," the Marines decided in June 2007 to repeat the entire SDD phase, meaning that instead of the original completion date of 2003, the SDD phase—if successful—will now be completed in 2011, eight years behind the original schedule.<sup>18</sup> In August 2008, the Marines and General Dynamics signed an SDD II contract, and work on seven new EFV prototypes was projected to begin in January 2009.<sup>19</sup> These new prototypes were to include, *inter alia*, rewired electronics to better protect against sea water, a rebuilt and strengthened gun turret to improve ammunition feed to the main gun, and the addition of trim tabs to make the EFV more stable in the water. The new EFVs are scheduled to be built at the U.S. military's joint tank production facility at Lima, OH.

## **Critical Design Review and Additional Prototypes<sup>20</sup>**

The General Accountability Office (GAO) notes that the EFV passed its December 2008 Critical Design Review (CDR) and, with 94% of the system's design models releasable, that EFV's critical technologies were mature and its design is stable. Because the EFV's design has been stabilized, a number of critical manufacturing processes can be established. Because the EFV passed the CDR, the go-ahead was given for the production of the seven new prototypes. These new prototypes are expected to include almost 400 engineering design improvements to improve

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<sup>15</sup> Information in this section is from "Military Vehicle Forecast: Expeditionary Fighting Vehicle," Z Forecast International, June 2007, p. 5.

<sup>16</sup> The Nunn-McCurdy Act (10 U.S.C. 2433) requires that Congress be notified when a major defense acquisition program incurs a cost increase of at least 15%. If the increase is 25% or greater, the Secretary of Defense must certify that the program is essential to national security and that new cost estimates are reasonable, that the program is properly managed, and that there are no feasible alternatives to the system in question.

<sup>17</sup> United States House of Representatives, Committee on Oversight and Government Reform, Majority Staff, "The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable," April 29, 2008, p. 10.

<sup>18</sup> *Ibid.*

<sup>19</sup> Information in this section is from Kris Osborn, "USMC to Build 7 New EFV Prototypes," *Defense News*, October 9, 2008.

<sup>20</sup> Information in this section is taken from Daniel Wasserbly, "USMC Receives EFV Prototype Boost," *Jane's Defence Weekly*, March 4, 2009, p. 10; Bettina H. Chavanne, "EFV Redesign Makes Tracks," *Aviation Week*, March 6, 2009; and United States Government Accountability Office (GAO), *Defense Acquisitions: Assessments of Selected Weapons Programs*, GAO-09-326SP March 2009, pp. 77-78.

vehicle reliability.<sup>21</sup> It is likely that many of these engineering design improvements will add weight to the EFV. One potential change that could help reduce EFV weight could be incorporating a lighter-weight linked track that the Army is currently researching, which could reduce EFV weight by 800 pounds.<sup>22</sup>

## **Current EFV Testing<sup>23</sup>**

The Marines have reportedly received four personnel carrier EFV prototypes and one command and control variant and are taking them through developmental testing at the Amphibious Assault Test Branch at Camp Pendleton, CA. The Marines should receive the final two prototypes by October 2010 and then testing is scheduled to run through late January 2011. Each vehicle is slated to receive about 500 hours of reliability testing. Marine officials report that so far, “we’ve had no real significant surprises, either good or bad, about the performance of the vehicle.”<sup>24</sup>

## **Solutions for EFV IED Vulnerability**

As previously noted, there is a great deal of concern that the flat-bottomed EFV would be overly vulnerable to IEDs detonated under the vehicle. The lack of a V-shaped hull, which can mitigate underbelly IED explosions, is a long-standing concern of some in Congress. The Marines contend that the EFV would have to be totally redesigned at great cost to incorporate a V-shaped hull.<sup>25</sup> The Marines suggest that installing an add-on underbelly armor appliqué after the EFV comes ashore will provide necessary protection. Marine officials also suggest that IEDs would not be a big concern during the initial stages of an operation and the EFV’s mobility would provide protection from IEDs.<sup>26</sup> It might be argued, however, that the Marines are assuming away the EFV’s vulnerabilities by suggesting that the enemy would not employ IEDs against Marine forces coming ashore and that the EFV could “out run” IEDs—something that has eluded smaller and faster combat vehicles in Iraq and Afghanistan.

## **DOD Questions the Need for EFV**

During an April 17, 2009, address at the Naval War College, Secretary of Defense Gates noted that:

I have also directed the QDR [Quadrennial Defense Review] team to be realistic about the scenarios where direct U.S. military actions would be needed – so we can better gauge our requirements. One of those that will be examined closely is the need for a new capability to get large numbers of troops from ship to shore – in other words, the capability provided by the Marine Expeditionary Fighting Vehicle.... But we have to take a hard look at where it

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<sup>21</sup> Dan Lamothe, “U.S. Marine Corps Struggles to Redesign EFV,” *Defense News*, March 16, 2009.

<sup>22</sup> Chavanne.

<sup>23</sup> Information in this section is taken from Emelie Rutherford, “EFV Program to Start Reliability Tests, Focus on Costs,” *Defense Daily*, August 12, 2010.

<sup>24</sup> Ibid.

<sup>25</sup> Emelie Rutherford, “Murtha, Taylor Concerned About Expeditionary Fighting Vehicle Design,” *Defense Daily* March 16, 2009.

<sup>26</sup> Bettina H. Chavanne, “EFV Redesign Makes Tracks,” *Aviation Week*, March 6, 2009 and Emelie Rutherford, “Murtha, Taylor Concerned About Expeditionary Fighting Vehicle Design,” *Defense Daily*, March 16, 2009.



would be necessary or sensible to launch another major amphibious action again. In the 21<sup>st</sup> century, how much amphibious capability do we need?<sup>27</sup>

While there had been speculation that the EFV might be eliminated by the 2010 Quadrennial Defense Review (QDR), the report contained no recommendations that the EFV be cancelled or that major amphibious operations capabilities were no longer needed.<sup>28</sup>

## Recent and Ongoing EFV-Related Studies

In response to a request by some Members of Congress, the Sustainable Defense Task Force<sup>29</sup> published a report in June 2010, *Debt, Deficits, & Defense: A Way Forward*, that recommends, inter alia, cancelling the EFV program.<sup>30</sup> The task force recommends that cancelling the program would save \$8 billion to \$9 billion between 2011 and 2020 and that the requirement can be met by refurbishing AAV7A1s, the Corps' current amphibious assault vehicle, and an unspecified newly built, updated version of this vehicle.<sup>31</sup>

In response to recommendations from a June 2010 GAO Report,<sup>32</sup> the Navy, in conjunction with DOD, will conduct a review of the business case for the EFV.<sup>33</sup> The results of this business case review, in conjunction with the results of reliability testing, will be used by senior defense officials assessing the overall program. It is not known when this review will be completed.

The Marines are also conducting a force structure review to determine what the Corps will look like post-Afghanistan to include size and types of equipment needed.<sup>34</sup> This review will likely emphasize the Marines returning to their amphibious roots and promises to take a hard look at vehicle requirements. While there was no date indicated for study completion, Marine officials maintain that the results of this study will be part of the FY2013 Program Objective Memorandum (POM).

On August 12, 2010, it was reported that Secretary of Defense Gates had ordered a review of the future role of the Marine Corps, given the "anxiety" that service in Iraq and Afghanistan had turned the Corps into "a second land army."<sup>35</sup> This review is intended to define a 21<sup>st</sup>-century mission for the Marines distinct from the Army. This review will likely directly address the issue

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<sup>27</sup> Transcript, Secretary of Defense Gates Address to the Naval War College at Newport, RI delivered April 17, 2009.

<sup>28</sup> Department of Defense, Quadrennial Defense Review Report, February 2010.

<sup>29</sup> The Sustainable Defense Task Force was formed in response to a request from Rep. Barney Frank (D-MA), working in cooperation with Rep. Walter B. Jones (R-NC), Rep. Ron Paul (R-TX), and Sen. Ron Wyden (D-OR), to explore possible defense budget contributions to deficit reduction efforts that would not compromise the essential security of the United States.

<sup>30</sup> Report of the Sustainable Defense Task Force, "Debit, Deficits, and Defense: A Way Forward," June 11, 2010.

<sup>31</sup> *Ibid.*, p. 23.

<sup>32</sup> GAO-10-758R Defense Acquisitions: Expeditionary Fighting Vehicle (EFV) Program Faces Cost, Schedule, and Performance Risks, June 2010.

<sup>33</sup> Information in this section is from Zachary M. Peterson, "'Navy Department to Examine EFV Business Case Prior to Procurement,'" *InsideDefense.com*, July 12, 2010.

<sup>34</sup> Geoff Fein, "Study Will Examine Future Make-Up of Marine Corps Post-Afghanistan," *Defense Daily*, August 4, 2010.

<sup>35</sup> Information in this section is taken from David S. Cloud, Gates Orders a Review of Marines' Role," *Los Angeles Times*, August 13, 2010.

that critics of the EFV frequently cite: that large amphibious assaults on fortified coastlines have become obsolete because of the changing nature of warfare and long-range, precision weapons.

With at least three major EFV-related reviews either pending or ongoing, it is possible that a definitive decision on the EFV—independent from ongoing reliability testing—will be made in the next few months that could determine the fate of the program. During an October 2010 Expeditionary Warfare Conference, Marine leaders reportedly stated that if the EFV failed to show adequate improvement during reliability testing, they would cancel the program and “start over.”<sup>36</sup> If the EFV is cancelled, the Marines could also look for an alternative vehicle to transport Marines from ship to shore.

## **Possible EFV Alternatives**

In the event that the EFV program is cancelled or becomes unfunded, there are possible EFV alternatives. Program officials maintain that the AAV could undergo upgrades, indefinitely if need be.<sup>37</sup> Although the AAV is old, officials note that the hulls are solid and that the AAV can be repeatedly upgraded as long as the hulls remain intact. Current AAV upgrade efforts are designed to keep AAVs functioning until 2025. Current upgrade efforts involve improving the AAV's command and control capabilities, and future upgrades will focus on belly armor, special seats to reduce shock, and an external fuel tank to extend range.

While not an amphibious assault vehicle per se, the Marine Personnel Carrier (MPC) program might have applicability as an alternative. The MPC is intended to fill a role between the EFV and the Joint Light Tactical Vehicle (JLTV),<sup>38</sup> much like the Army's Stryker wheeled combat vehicle.<sup>39</sup> One contender for the MPC, which is not expected to be fielded before 2015, is the Italian Supernav 8x8, which might be modified to take on more of an amphibious role. The Supernav is a 24-ton vehicle that can carry 13 Marines and their equipment and can travel up to 500 miles nonstop on land and 40 miles on water. The Marines are reportedly considering additional testing to determine whether the Supernav might be modified for from-ship-to-shore operations, but officials note that this would not be the MPC's primary mission.

## **Program Cost and Funding<sup>40</sup>**

The Marines originally planned to procure 1,025 EFVs at a total cost of \$8.5 billion. According to GAO, as of March 2010, the EFV program will require \$866.7 million in research and development and \$10.226 billion in procurement funding for a total of \$11.163 billion to complete the program and field 573 EFVs.<sup>41</sup> Each EFV is expected to cost about \$24 million

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<sup>36</sup> Cid Standifer, “If EFV Fails, Back to the Drawing Board; Conway: New Stand-Off Doctrine Could Change EFV Requirements,” *InsideDefense.com*, October 11, 2010.

<sup>37</sup> Information in this section is from Cid Standifer, “It's Old, But It's Very Solid: Program Official: AAV Could Survive Well into the Future if Needed,” *InsideDefense.com*, August 2, 2010.

<sup>38</sup> For more information on the JLTV, see CRS Report RS22942, *Joint Light Tactical Vehicle (JLTV): Background and Issues for Congress*, by Andrew Feickert.

<sup>39</sup> Information in this section is taken from Bradley Peniston, “Corps May Consider Italian Personnel Carrier,” *Marine Corps Times*, June 28, 2010, p. 23.

<sup>40</sup> United States House of Representatives, Committee on Oversight and Government Reform, Majority Staff, “The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable,” April 29, 2008, p. 11.

<sup>41</sup> United States Government Accountability Office (GAO), *Defense Acquisitions: Assessments of Selected Weapons* (continued...)

apiece.<sup>42</sup> There are concerns that the high cost of the EFV could consume up to 90% of the Marines' ground equipment budget.<sup>43</sup> The former Commandant of the Marine Corps, General James Conway, reportedly was concerned that with potential future cuts to the defense budget, 573 EFVs might not be affordable.<sup>44</sup>

### **FY2011 EFV Budget Request<sup>45</sup>**

DOD notes that the EFV continues in its systems development phase, with the first EFV scheduled for initial production in FY2012. The Administration's FY2011 EFV budget request is \$242.8 million for Research, Technology, Development, and Evaluation (RDT&E).

### **House Armed Services Committee (HASC) Markup of the FY2011 National Defense Authorization Act (H.R. 5136)<sup>46</sup>**

The HASC recommended fully funding the President's FY2011 EFV budget request. The HASC continued to support development efforts associated with new Marine Corps ground vehicles, including the Expeditionary Fighting Vehicle (EFV). The HASC stated that it "remains concerned about the EFV design incorporating a flat bottom hull that may not be as survivable as an MRAP against an IED threat."

### **Senate Armed Services Committee (SASC) Markup of the FY2011 National Defense Authorization Act (S. 3454)<sup>47</sup>**

The SASC recommended fully funding the President's FY2011 EFV budget request.

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Programs, GAO-10-388SP, March 2010, p 61.

<sup>42</sup> Ibid.

<sup>43</sup> Zachary M. Peterson, "Navy Department to Examine EFV Business Case Prior to Procurement," *InsideDefense.com*, July 12, 2010.

<sup>44</sup> Emelie Rutherford, "Conway: Marines May Not Have Money for 573 Expeditionary Fighting Vehicles," *Defense Daily*, August 25, 2010.

<sup>45</sup> United States Department of Defense, Fiscal Year 2011 Budget Request, Program Acquisition Costs by Weapons System, February 2010, p. 3-9.

<sup>46</sup> Information in this section is from HASC Summary, H.R. 5136, National Defense Authorization Act Markup, May 19, 2010.

<sup>47</sup> Information in this section is from U.S. Senate Armed Services Committee Press Release, "Senate Armed Services Committee Completes Markup of National Defense Authorization Act for Fiscal Year 2011," May 28, 2010.

## **Senate Appropriations Defense Subcommittee Markup of the FY2011 Department of Defense Appropriations Bill<sup>48</sup>**

The Senate Appropriations Defense Subcommittee has reportedly recommended providing funding to cancel the EFV program. The subcommittee recommended cutting \$204 million from the FY2011 \$243 million budget request and added \$185 million to cancel the program, resulting in an overall decrease of \$20.5 million. Marine officials said that the termination fees provided by Congress would cover costs of ending the program, including paying off vendors, closing facilities, and shifting workers to other positions. Marine officials suggested that technology developed for the EFV program could be used in other programs if the EFV is cancelled. According to reports the subcommittee noted that:

After the investment of nearly \$2,900,000,000 in research and development funds over more than two decades, the Committee believes that further investment in the Expeditionary Fighting Vehicle is not warranted if improved performance of the new prototypes cannot be demonstrated. The Committee further notes that if the program is successful in demonstrating improved performance, the program would likely continue to face challenges in the areas of cost, schedule, weight, and other factors.

The recommendation provides \$38,765,000 for the Expeditionary Fighting Vehicle, an amount sufficient to carry the program through vehicle acceptance and reliability growth testing. The recommendation also provides \$183,500,000 for estimated termination costs should the program be cancelled. The Committee directs the Secretary of the Navy to provide regular updates to the congressional defense committees during the course of reliability growth testing in order to inform further deliberations on the program.<sup>49</sup>

It is not known if the House Appropriations Defense Subcommittee has made similar recommendations as committee markup deliberations have not been made public.

## **Potential Issues for Congress**

### **Amphibious Fleet and EFV Vulnerabilities**

Some analysts contend that the operational environment has changed so significantly since the EFV's inception that both the fleet and the EFV face greater risks than anticipated.<sup>50</sup> The Navy and the Marines envision that future conflicts will require a "persistent presence in littoral areas" characterized by land-based anti-ship cruise missiles, mines, and small, fast suicide boats. Twenty years ago, when the EFV was conceived, some defense officials suggested that the fleet could operate 25 to 30 miles from shore, debarking EFVs for amphibious operations. However, with the advent of these new enemy weapons and tactics, this is no longer possible. Instead, in order to

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<sup>48</sup> Information in this section is taken from Cid Standifer, "Senate Appropriators Add Funds to Terminate EFV," *InsideDefense.com*, September 16, 2010, and a draft copy of S.Rept. 111-295, Department of Defense Appropriations Bill, 2011, dated September 16, 2010, which was obtained from *InsideDefense.com* on September 17, 2010.

<sup>49</sup> From a draft copy of S.Rept. 111-295, Department of Defense Appropriations Bill, 2011, dated September 16, 2010, which was obtained from *InsideDefense.com* on September 17, 2010, p. 172.

<sup>50</sup> Department of the Navy, "A Cooperative Strategy for 21<sup>st</sup> Century Seapower," October 2007, and Sydney J. Freedberg, "Future Corps," *National Journal*, May 10, 2008.

sufficiently protect the large amphibious ships that transport Marines and EFVs, it has been suggested that the fleet might need to operate at least 100 miles from shore—beyond the EFV's range. If there are new developments in enemy weapons and tactics between now and 2025—when the EFV is scheduled to reach full operational capability—the vulnerability to the fleet could increase further.

Another potential issue is the EFV's vulnerability to IEDs. Some in Congress are concerned that the flat-bottomed EFV, with a 16-inch ground clearance, would be highly vulnerable to IEDs that detonate under vehicles.<sup>51</sup> The Marines contend that a "V" shaped hull on the EFV to better protect it from IED blasts would force a total redesign of the EFV. Instead, the Marines propose that once ashore, armor could be applied to the underside of the EFV, a solution that has met with congressional skepticism.

Even though the EFV and amphibious ships might well be vulnerable to long-range, precision missile attacks, the question remains how to get Marines safely from ship to shore. Airlifting Marines is another option, but bringing Marines over the shore in helicopters and vertical takeoff and landing aircraft such as the V-22 Osprey will likely be equally as vulnerable to current and next generation shoulder-fired air defense missiles, as well as tactical ground-based systems. While the Marines' 2009 paper *Amphibious Operations in the 21<sup>st</sup> Century* acknowledges the threats of cruise missiles and mines and discusses measures to defeat these threats [page 18], there is little discussion of how ground-based anti-aircraft systems might be used against Marine forces coming ashore on aircraft.<sup>52</sup> In this regard, if the air defense threat is high, using the EFV might be the safest option to bring Marines ashore.

## **What if the EFV Fails Its Second Systems Development and Demonstration (SDD) Phase Attempt?**

In order for the EFV to enter its planned Low Rate Initial Production (LRIP) phase in 2011, it must successfully complete its second attempt at SDD. This testing is currently being conducted and is planned to run through early 2011. The Marines have stated that the new EFV prototypes will achieve 61 hours mean time between operational mission failure (MTBOMF).<sup>53</sup> Despite claims that the second SDD phase is going well and that the design is both stable and mature, it is possible that the EFV may again perform unsatisfactorily in operational testing. If this is the case, it would likely be difficult to justify a third SDD phase, and it would probably not be operationally feasible to reduce the 573 EFV requirement any further to cut program costs. Given this potential scenario, some commentators assert that it would be prudent to examine possible contingencies and alternative vehicles should the EFV perform poorly on upcoming operational tests.

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<sup>51</sup> Emelie Rutherford, "Lawmakers Cite Concerns With Marine Corps EFV Armor Solution," *InsideDefense.com*, January 14, 2008, and Emelie Rutherford, "Marine Corps Proceeds with Expeditionary Fighting Vehicle, Congressional Concern Remains," *Defense Daily*, April 11, 2008.

<sup>52</sup> United States Marine Corps, "Amphibious Operations in the 21<sup>st</sup> Century" March 18, 2009.

<sup>53</sup> United States Government Accountability Office (GAO), *Defense Acquisitions: Assessments of Selected Weapons Programs*, GAO-09-326SP, March 2009, pp. 77-78.

## The EFV and Ongoing Studies

As previously discussed, the Marines, and by implication the EFV, are currently undergoing three reviews that are focusing on the future role of the Corps as well as what it should look like and how it will be equipped. Central to all three studies will likely be the question, will the Marines be required to conduct large, amphibious landings in a hostile environment? This mission has long been the justification for maintaining a Marine Corps. While it is unlikely that this requirement will be dropped, it is possible that it might be scaled back or receive lesser emphasis than in the past. Analyst Dakota L. Wood, from the Center for Strategic and Budgetary Assessments, recently suggested that, given the Navy's amphibious ship numbers and available Marine and Navy aircraft and amphibious assault vehicles:

in a situation serious enough to warrant employing every amphibious ship in the Navy, the Corps would be able to project ashore just six battalions of ground combat power, two of which have limited mobility.... So the key question, then, is whether six battalions—four motorized/mechanized and two foot-mobile—can carry the day in such circumstances.<sup>54</sup>

This analysis suggests that amphibious operations of the present and future will be limited in scale and, therefore, by necessity due to lack of capacity, less likely to be against protagonists with the ability to directly attack incoming Marine forces. If landing operations are likely to be conducted in semi- or non-hostile environments, the need for the EFV might be called into question. If all three studies reach the consensus that large-scale, amphibious operations against a defended coastline or target are impractical and unlikely, it could prove difficult for the Marine Corps to justify its continued investment in the EFV program.

Because of the perceived importance of these three studies, Congress might choose to review the implications of these studies before the Department of Defense takes action on Marine Corps roles and mission, force structure, and possibly the EFV program. Congressional involvement in this process could arguably provide a more objective view, as some believe that the Marines' commitment to the EFV has "painted them into a corner,"<sup>55</sup> while some in DOD who have consistently questioned the need for the EFV appear to be equally committed to ending the program.

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<sup>54</sup> Dakota L. Wood, "Caught on a Lee Shore," *The American Interest Magazine*, September-October 2010 issue.

<sup>55</sup> *Ibid.*, p. 3.