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## The Expeditionary Fighting Vehicle: Over Budget, Behind Schedule, and Unreliable

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## **THE EXPEDITIONARY FIGHTING VEHICLE: Over Budget, Behind Schedule, and Unreliable**

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PREPARED FOR  
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## EXECUTIVE SUMMARY

On March 31, 2008, the Government Accountability Office (GAO) released a report assessing the management of major weapons acquisition programs by the Department of Defense. The report found widespread problems in the Department's acquisition practices, with the result that nearly all of the most important and costly projects "continue to cost significantly more, take longer to produce, and deliver less than was promised."<sup>1</sup>

This report examines in detail one of the acquisition programs identified in the GAO report: the Marine Corps' Expeditionary Fighting Vehicle (EFV). The report is based on a review of over 55,000 pages of documents provided by the Department of Defense and the project's lead contractor. The documents show that a series of mistakes have increased costs by billions of dollars and delayed production by years.

The key problems occurred in the process of "System Development and Demonstration" (SDD), which began in December 2000 and has cost the taxpayer \$1.2 billion. This acquisition process was so poorly managed by Marine Corps officials and the prime contractor, General Dynamics, that the Defense Department announced in June 2007 that the entire vehicle development and demonstration phase needs to be repeated. The additional cost to the taxpayer will be nearly \$1 billion and the additional delay will extend the SDD process from its scheduled completion date in 2003 to 2011.

As conceived by the Marine Corps, the EFV, an amphibious tank, is supposed to be able to transport up to 18 combat-ready Marines at high speeds on both land and sea, have advanced communications capabilities, provide increased armored protection against rocket-propelled grenades and improvised explosive devices, and deliver lethal firepower up to 2,000 meters. The procurement process started in 1996 when the Marine Corps awarded a contract to General Dynamics to begin developing the vehicle. In its early "Program Definition & Risk Reduction" phase, the EFV program was a model defense acquisition program. The program won two awards from the Department of Defense for its successful management of costs and technology.

Based on these early successes, the Marine Corps awarded a cost-plus contract to General Dynamics in July 2001 to lead the EFV project through the subsequent system development and demonstration phase. The SDD contract with General Dynamics envisioned that developing and demonstrating the EFV would cost \$712 million and be completed by October 2003. After three contract modifications, the date of completion was delayed until December 2006 and the costs were increased by over 50% to \$1.2 billion.

During the SDD phase, Defense Department auditors and GAO warned repeatedly of problems, including the lack of effective oversight. At one point, auditors called the project a "paper dream," reporting that "management does not have a handle on reality" and "[t]here seems to be

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<sup>1</sup> U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapon Programs* (Mar. 2008) (GAO-08-467SP).

no one steering the ship.” These concerns, however, were largely ignored and the project proceeded using a costly “test-fix-test” process under which the contractor would fix problems after they were discovered rather than anticipating them through a comprehensive design process. Marine Corps officials were so satisfied with General Dynamics’s performance that they gave General Dynamics over \$60 million in bonuses, including \$25.6 million in bonuses for a “very good” job in being on schedule and under cost.

A crucial milestone for the EFV occurred in 2006, when the EFV was subject to an “Operational Assessment.” According to an internal report of the operational assessment, the vehicles experienced multiple problems and failed to pass the milestone. The problems identified during the operational assessment included:

- **Frequent Breakdowns.** The EFVs had “very low vehicle reliability” and could operate only 4.5 hours between breakdowns. During the tests, the demonstration vehicles experienced 645 “Unscheduled Maintenance Actions” and required over three hours of corrective maintenance for every hour in operation.
- **Failure to Complete Tests.** The EFVs completed only two of eleven amphibious tests, only one of ten gunnery tests, and none of the land mobility tests. During the land mobility test, “[t]he turret basket floor bent and a turret support stanchion broke ... suggesting the turret structure might not be sufficiently robust to survive the forces generated during cross-country movement.”
- **Excessive Weight.** Because the EFVs weighed too much, the vehicles could get “on plane” during high-speed water travel only if armor was removed from the vehicles and the Marines on board left vital equipment behind.
- **Excessive Noise and Limited Visibility.** During the test, the vehicles were so loud that “[e]mbarked Marines wore foam earplugs and earmuffs ... which made voice communications difficult and ineffective.” There was also “poor crew visibility during water operations,” with the driver’s thermal sight “periodically washed out by water spray.”
- **Other Problems.** The vehicle’s weapons system failed in the tests, with the ammunition feed jamming and crews “unable to identify armored vehicle targets.” The hydraulic system leaked. And the exhaust system generated a “significant thermal signature,” contrary to the requirement that the EFV be designed to minimize detection.

The poor performance of the demonstration vehicles caused major and expensive reversals in the Department’s procurement strategy. The decision to repeat the SDD phase will increase costs to the taxpayer by nearly \$1 billion or more and delay completion of the demonstration phase until 2011 at the earliest. In 2000, the Defense Department estimated that it would be able to acquire 1,025 EFVs at a total cost of \$8.4 billion. According to the revised estimates, the Department will be able to acquire only 593 vehicles at a total cost of \$13.2 billion. On a per-vehicle basis, the EFV costs have increased 168% while the production deadline has slipped eight years.

## I. BACKGROUND

In 1996, the Marine Corps awarded a contract to General Dynamics to begin developing an amphibious tank which was eventually named the “Expeditionary Fighting Vehicle” or EFV. The EFV would replace the Marine Corps’ Vietnam-era fleet of “Amphibious Assault Vehicles.”

The Marine Corps envisioned that the EFV would have a broader range and greater fighting capabilities than its predecessor. The new vehicle would be able to transport up to 18 combat-ready Marines at high speeds on both land and sea, have advanced communications capabilities, provide increased armored protection against rocket-propelled grenades and improvised explosive devices, and deliver lethal firepower up to 2,000 meters.<sup>2</sup> The project became a major acquisition for the Marine Corps. According to a recent estimate, the EFV will consume 23% of the Marine Corps’ research and development budget from 2009 to 2014.<sup>3</sup> In 2009 alone, the EFV comprises 30% of the Marine Corps’ research and development budget request.<sup>4</sup>

By December 2000, the program had successfully completed the so-called “Program Definition & Risk Reduction” phase of the acquisition. This phase of the EFV program was so successful that it was cited as a model defense acquisition program. In 1998, the Department of Defense awarded the program the Department’s David Packard Excellence in Acquisition Award “for achieving significant reductions in total ownership cost through the implementation of cost as an independent variable, integrated product and process development, and virtual prototyping.”<sup>5</sup> In 2000, the EFV program won a Defense Standardization Program award for accomplishments relating to the development of a new medium caliber gun system, which “reduced costs, development time, and risk.”<sup>6</sup>

Based on the program’s early successes, the Marine Corps awarded a cost-plus contract to General Dynamics in July 2001 to lead the EFV project through the “System Development and Demonstration” (SDD) phase.<sup>7</sup> This contract had a ceiling cost of \$712 million.<sup>8</sup> During the SDD phase, which was originally scheduled to be completed by October 2003, the Marine Corps and the contractor were supposed to ensure that the various components of the EFV were successfully integrated and would conduct extensive testing on prototype vehicles.<sup>9</sup> At the

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<sup>2</sup> Marine Corps Combat Development Command, Operational Requirements Document for the Advance Amphibious Assault Vehicle (Undated; est. 1995-1997).

<sup>3</sup> E-mail from Paul Francis, Director of Acquisition, U.S. Government Accountability Office, to House Oversight Committee Staff (Apr. 23, 2008).

<sup>4</sup> *Id.*

<sup>5</sup> Department of Defense, *Press Release: Secretary Cohen Presents Packard Awards* (May 5, 1998) (online at [www.defenselink.mil/releases/release.aspx?releaseid=1666](http://www.defenselink.mil/releases/release.aspx?releaseid=1666)).

<sup>6</sup> Department of Defense, *Press Release: Defense Standardization Program Awards for 1999 Presented* (July 27, 2000) (online at [www.defenselink.mil/releases/release.aspx?releaseid=2537](http://www.defenselink.mil/releases/release.aspx?releaseid=2537)).

<sup>7</sup> Direct Reporting Program Manager Advanced Amphibious Assault, U.S. Marine Corps, *Program Highlights* (online at [www.efv.usmc.mil/highlights\\_text.asp](http://www.efv.usmc.mil/highlights_text.asp)) (accessed Apr. 28, 2008).

<sup>8</sup> Briefing by David Heebner, President, General Dynamics Land Systems, to House Oversight Committee Staff (June 12, 2007).

<sup>9</sup> U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

completion of this phase, known as “Milestone C” in the Department’s acquisition management framework, the vehicle was supposed to pass an “Operational Assessment” and be ready to go into the final “production” phase of the acquisition.<sup>10</sup>

In 2001, when the Marine Corps awarded the SDD contract, the Marine Corps estimated that it would cost the taxpayer \$8.7 billion to acquire 1,025 EFVs, a cost of \$8.5 million per vehicle. The Marine Corps estimated that “Initial Operational Capability,” the date when the Corps could begin using the EFV in operations, would be in September 2006.<sup>11</sup>

## II. THE SYSTEM DEVELOPMENT AND DEMONSTRATION PHASE

The July 2001 SDD contract envisioned that the system development and demonstration phase would be completed by October 2003.<sup>12</sup> This schedule proved too ambitious. In November 2002, March 2003, and again in March 2005, the Marine Corps extended the completion date for system development and demonstration through March 2007.<sup>13</sup> At the same time, the Corps increased the total program acquisition costs over time from \$8.7 billion to \$12.6 billion.<sup>14</sup> Ultimately, General Dynamics was paid \$1.2 billion just under the SDD contract.<sup>15</sup>

From its early days, the SDD phase of the EFV acquisition was plagued with problems. The problems identified by Defense Department auditors included an unrealistic schedule that rushed construction and testing, the use of a risky “test-fix-test” demonstration process, poor management and oversight, and a failure to correct problems identified by auditors. Despite these problems, General Dynamics was regularly awarded millions of dollars in award fees for good performance during the development and demonstration phase of the project.

### A. Failure to Set a Realistic Schedule

Under the best practices recommended by the Department of Defense and GAO, the schedule for a program in system development and demonstration is divided into two phases: (1) “system integration,” in which the product’s design is stabilized; and (2) “system demonstration,” in which the program builds full-scale prototypes to demonstrate that the product meets

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<sup>10</sup> *Id.*; See Department of Defense Instruction 5000.2, *Operation of the Defense Acquisition System* (May 12, 2003) (online at <https://akss.dau.mil/dag/DoD5002/Subject.asp>).

<sup>11</sup> U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>12</sup> *Id.*

<sup>13</sup> *Id.*

<sup>14</sup> *Id.*

<sup>15</sup> *Expeditionary Fighting Vehicle Program: Award Fee Percentage Information Congressional Request* (Feb. 22, 2007).

requirements, works reliably, and can be manufactured at an acceptable cost.<sup>16</sup> The passage between these two phases is marked by “critical design review,” in which the program determines that the design is sufficiently mature that the product can move into the “system demonstration” phase. GAO recommends that a program have completed at least 90% of engineering drawings and conducted prototype or variant testing prior to the critical design review.<sup>17</sup>

The EFV program did not follow these best practices. Instead, the program initiated critical design review in January 2001, just one month after it had entered the SDD phase. According to GAO, the accelerated schedule “did not allow adequate time for testing, evaluating the results, fixing the problems, and retesting to make sure that problems are fixed before moving forward.”<sup>18</sup>

As early as 2002, Defense Department auditors expressed concerns about the decision to accelerate the system development schedule. In 2002, the Marine Corps asked auditors with the Air Force Software Technology Support Center to conduct an assessment of the contract. In December 2002, the auditors warned: “[M]anagement does not have a handle on reality, particularly with the unrealistic schedules.”<sup>19</sup> The auditors reported that the schedule proposed by the Marine Corps was “described by some individuals as a paper dream that everyone accepts but has only a casual resemblance of reality.”<sup>20</sup>

## B. The “Test-Fix-Test” Demonstration Process

One result of the decision to quickly move into the “system demonstration” phase was that the management team and the contractor decided to follow a “test-fix-test” process to demonstrate that the EFV could meet the program’s requirements.<sup>21</sup> Under the “test-fix-test” process, the contractor would fix problems as they were discovered, rather than minimize problems through a comprehensive design process.<sup>22</sup> Both General Dynamics and the Marine Corps have

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<sup>16</sup> U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>17</sup> U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapon Programs* (Mar. 2008) (GAO-08-467SP); U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>18</sup> U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>19</sup> U.S. Air Force Software Technology Support Center, *Final Report: Advanced Amphibious Assault Vehicle Assessment* (Dec. 4, 2002).

<sup>20</sup> *Id.*

<sup>21</sup> Briefing by David Heebner, President, General Dynamics Land Systems, to House Oversight Committee Staff (June 12, 2007).

<sup>22</sup> *Id.*



acknowledged that the “test-fix-test” process is significantly riskier than the best practices recommended by the Department and GAO.<sup>23</sup>

The “test-fix-test” process failed to remedy a series of unexpected design flaws that emerged during the “system demonstration” phase. For example, the program was forced to repeatedly redesign the EFV’s “bow flap,” a crucial part of the vehicle when it is conducting water operations. Although the program thought it had fixed the bow flap’s problems during the earlier program development phase, it never tested the new design. When this new version of the bow flap subsequently bent and cracked during systems development testing, the program was forced to redesign the piece yet again. Similar problems occurred with the hydraulic system and the Hull Electronic Unit.<sup>24</sup>

In interviews with Committee staff, Marine Corps and General Dynamics officials stated that the “test-fix-test” approach was adopted as the best way to meet the program’s schedule after Congress underfunded the SDD phase.<sup>25</sup> According to auditors, however, adopting the “test-fix-test” approach exacerbated the risks the program had already assumed by accelerating the systems development schedule.<sup>26</sup> The cumulative effect of these decisions was to expose the program to unnecessarily high levels of risk for cost increases, schedule delays, and performance problems.<sup>27</sup>

### C. Management and Oversight Problems

The EFV program also experienced significant problems with program management and oversight. From the beginning of the SDD phase, the EFV program lacked the consistent, comprehensive management and oversight necessary to keep the program on track.

A key failure of the EFV’s program management was the lack of coordination among program officials. The EFV project did not have an official acting as the system engineer, the person responsible for ensuring that the different components of the program and the vehicle work together. In 2002, Defense Department auditors expressed concerns that this failure would adversely affect the program, reporting:

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<sup>23</sup> Briefing by Col. John Bryant, EFV Program Manager, to House Armed Services Committee and Oversight Committee Staff (June 14, 2007); Briefing by David Heebner, President, General Dynamics Land Systems, to House Oversight Committee Staff (June 12, 2007).

<sup>24</sup> U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>25</sup> Briefing by David Heebner, President, General Dynamics Land Systems, to House Oversight Committee Staff (June 12, 2007).

<sup>26</sup> U.S. Air Force Software Technology Support Center, *Final Report: Advanced Amphibious Assault Vehicle Assessment* (Dec. 4, 2002); U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapon Programs* (Mar. 2008) (GAO-08-467SP); U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>27</sup> *Id.*

- “[T]here is no overall system engineer or system architect with the authority and responsibility to ensure products meet their allocated and integration requirements.”
- “The lack of an overall systems integrator ... with the authority and responsibility to oversee the entire system development has also resulted in technical and communication breakdowns.”
- “Having both a strong systems engineer and strong systems engineering processes ... will overcome several system issues now facing the program.”<sup>28</sup>

In evaluating the progress in developing software for the EFV, the auditors reported: “There seems to be no one steering the ship technically on either the [government] or [contractor] sides. ... This is not something that a successful program delegates to lower levels within the organizational structure.”<sup>29</sup>

The 2002 audit also concluded that the program was being hurt by inadequate communication between government and contractor personnel. The auditors reported that problems with the system weight, which resulted in a vehicle too heavy to operate as required, was the direct result of the lack of communication and coordination among the government and contract officials.<sup>30</sup>

#### D. Failure to Correct Program Management Problems

Four years after Defense Department auditors first raised serious concerns about the management of the EFV program, an audit team from the Office of the Assistant Secretary of the Navy for Research, Development and Acquisition issued another critical report. This December 2006 audit found many of the same problems the Air Force auditors reported in 2002. The auditors reported:

- “Oversight of the EFV program is ineffective.”
- “The systems engineering process is inadequate and a major shortcoming of the EFV Program. It is a root cause of ... disarray, uncoordinated design decisions, reliability issues, and the general lack of planning and status monitoring.”
- “Ineffective contract management since SDD award contributed significantly to the lack of positive control and oversight of the Program.”<sup>31</sup>

Timothy Perkins, the lead auditor for the 2002 audit and a participant in the 2006 audit, told Committee staff that the auditors saw little change from 2002 to 2006. According to Mr. Perkins,

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<sup>28</sup> U.S. Air Force Software Technology Support Center, *Final Report: Advanced Amphibious Assault Vehicle Assessment* (Dec. 4, 2002).

<sup>29</sup> *Id.*

<sup>30</sup> *Id.*

<sup>31</sup> Office of the Assistant Secretary of the Navy for Research, Development and Acquisition, *Independent Expert Program Review (IEPR): Final Report for the Expeditionary Fighting Vehicle (EFV)* (Dec. 2006).

the program showed “no improvement” in such key areas as systems engineering and program management.<sup>32</sup>

In 2008, the Defense Contract Management Agency (DCMA) found that significant problems with the program’s management persisted. DCMA’s audit, which focused on General Dynamics’s management controls, found that General Dynamics was neither following nor applying the practices recommended for successful program management known as “Earned Value Management Systems.”<sup>33</sup> According to DCMA, “Key ... processes and procedures are below standard and do not provide the requisite definition and discipline to properly plan and control complex, multibillion dollar weapon systems acquisition programs.”<sup>34</sup> Like the 2002 and 2006 audits, the 2008 audit reported problems with the program’s schedule, management, and oversight. According to DCMA:

- “EFV program was unable to demonstrate a scheduling process that met the minimum requirements of the ... guidelines. ... [Management officials] were unable to demonstrate that they understood, used or maintained any level of the program schedule.”
- “The Government review team found that [management officials] were not able to demonstrate that they had taken direct responsibility for planning and controlling the work in their control accounts.”
- “Work is being performed that has not been authorized in accordance with any processes that enable basic control of scope, time phasing of budgets, and scheduling of resources. The lack of an integrated management system ... allows developing cost, schedule, and performance trends to go undetected.”<sup>35</sup>

DCMA reported that these problems “raise significant concerns” regarding the ability of General Dynamics to perform the contract on time and on budget.<sup>36</sup>

#### **E. Award Fees Paid to General Dynamics**

Despite the critical reports from the auditors and schedule delays and cost overruns, the Marine Corps awarded General Dynamics over \$60 million in fees under the SDD contract through the end of 2007.<sup>37</sup>

Under the SDD contract, the Marine Corps evaluated General Dynamics’s performance every six months to assess the company’s entitlement to bonuses. The Corps awarded General Dynamics

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<sup>32</sup> Interview of Timothy Perkins by House Oversight Committee Staff (Sept. 27, 2007).

<sup>33</sup> Defense Contract Management Agency, Compliance Report for the Expeditionary Fighting Vehicle: General Dynamics Amphibious Systems Company (Jan. 2008) (CTR-2008-002).

<sup>34</sup> *Id.*

<sup>35</sup> *Id.*

<sup>36</sup> *Id.*

<sup>37</sup> *Expeditionary Fighting Vehicle Program: Award Fee Information Congressional Request* (Feb. 15, 2007); Briefing by Col. John Bryant, EFV Program Manager, to House Oversight Committee Staff (Apr. 10, 2008).

an average of 78% of the award fee available during each period.<sup>38</sup> That amount represents a rating of “good,” meaning that the contractor’s performance “meets contractual requirements.”<sup>39</sup>

The Corps awarded General Dynamics 88% of the fee available for being on schedule and at or under cost.<sup>40</sup> This is a “very good” rating that is supposed to be awarded for performance that “meets contractual requirements and exceeds some to the Government’s benefit.”<sup>41</sup> In total, General Dynamics received \$25.6 million for performing on schedule and under costs.<sup>42</sup> During one period, General Dynamics received 106% of the available bonus for being on cost and schedule.<sup>43</sup> Yet during this same rating period, program officials noted that “[t]he contractor did not meet the contractual delivery date. ... The schedule delivery performance reflects a serious problem.”<sup>44</sup>

The program’s external auditors reported that the award fees were not based on legitimate data. In 2002, the auditors found that the data used to calculate the award fees was “not accurate or predictive.”<sup>45</sup> Four years later, the auditors reported that the practices used by General Dynamics to collect the data used to calculate award fees were “highly inappropriate” and the resulting award fees were “questionable.”<sup>46</sup>

### III. THE 2006 OPERATIONAL ASSESSMENT

A key milestone for the EFV program occurred in 2006, when the EFV was subject to an “Operational Assessment,” a series of tests where the EFV would demonstrate that it could meet its performance requirements. Successful completion of the assessment, also known as “Milestone C,” would have signaled that the EFV was ready to move into the production phase of the acquisition.

During the operational assessment, the EFV experienced multiple, varied, and often critical vehicle failures. Because of the repeated breakdowns, the EFV failed to achieve its reliability requirement and failed the assessment.<sup>47</sup>

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<sup>38</sup> Expeditionary Fighting Vehicle Program: Award Fee Information Congressional Request (Feb. 22, 2007).

<sup>39</sup> Expeditionary Fighting Vehicle Program: Contract Fee for General Dynamics 1995-2006 (undated, est. 2007).

<sup>40</sup> Expeditionary Fighting Vehicle Program: Award Fee Information Congressional Request (Feb. 22, 2007).

<sup>41</sup> Expeditionary Fighting Vehicle Program: Contract Fee for General Dynamics 1995-2006 (undated, est. 2007).

<sup>42</sup> Expeditionary Fighting Vehicle Program: Award Fee Information Congressional Request (Feb. 15, 2007).

<sup>43</sup> Expeditionary Fighting Vehicle Program: Award Fee Information Congressional Request (Feb. 22, 2007).

<sup>44</sup> Live Fire Period 3: Final Assessment (Sept. 20, 2005).

<sup>45</sup> U.S. Air Force Software Technology Support Center, *Final Report: Advanced Amphibious Assault Vehicle Assessment* (Dec. 4, 2002).

<sup>46</sup> Office of the Assistant Secretary of the Navy for Research, Development and Acquisition, *Independent Expert Program Review (IEPR): Final Report for the Expeditionary Fighting Vehicle (EFV)* (Dec. 2006).

<sup>47</sup> Marine Corps Operational Test And Evaluation Activity, Expeditionary Fighting Vehicle Personnel Variant (EFVP): Operational Assessment Independent Assessment Report (Nov. 2006).

## A. Frequent Breakdowns

According to the test evaluators, the operational assessment was “dominated by very low vehicle reliability.” On average, the vehicles could operate only 4.5 hours between breakdowns and required approximately 3.4 hours of corrective maintenance per operating hour. According to the evaluators, the maintenance burden for the EFV “would wear out a unit under realistic combat conditions.”<sup>48</sup>

Other problems with reliability included 117 “Operational Mission Failures” during testing,<sup>49</sup> as well as 645 “Unscheduled Maintenance Actions” that exceeded the capability of the three Marines assigned to perform maintenance during the tests and required the Marine Corps to bring in “‘surge’ maintenance” from the contractor to keep up with the breakdowns.<sup>50</sup>

## B. Failure to Complete Tests

Problems with the EFV’s reliability resulted in the vehicle’s failure to complete many of the tests included in the operational assessment. In total, the prototype EFVs completed only two out of fourteen mission profiles. Specific problems included:

- The program conducted 11 attempts to complete the five amphibious mission tests. Only two of the eleven were completed.
- Only one of ten attempts to complete the gunnery tests was completed without a breakdown. According to the test evaluators, the repeated breakdowns “greatly compromised” the program’s ability to complete the gunnery tests.
- None of the three attempts to conduct the land mobility tests was completed. The test evaluators reported that the tests were aborted after “multiple vehicles suffered mission failures.” The evaluators also reported significant problems with the gun turret: “[t]he turret basket floor bent and a turret support stanchion broke ... suggesting the turret structure might not be sufficiently robust to survive the forces generated during cross-country movement.”
- During the “force-on-force” phase, the EFV-equipped blue force “was unable to conduct one of its two offensive missions because all of the [EFVs] broke down on the way to the objective.”<sup>51</sup>

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<sup>48</sup> Department of Defense, Director of Operational Test & Evaluation, *Expeditionary Fighting Vehicle: Milestone C Operational Assessment DOT&E View* (undated).

<sup>49</sup> *Id.*

<sup>50</sup> Marine Corps Operational Test and Evaluation Activity, *Expeditionary Fighting Vehicle Personnel Variant (EFVP): Operational Assessment Independent Assessment Report* (Nov. 2006).

<sup>51</sup> Department of Defense, Director of Operational Test & Evaluation, *Expeditionary Fighting Vehicle: Milestone C Operational Assessment DOT&E View* (undated).

### C. Excessive Weight

One requirement for the EFV is high speed and mobility in the water. The EFV achieves high speed by going up “on plane” or accelerating until the vehicle moves along the top of the water. The operational assessment revealed that the prototype EFVs weighed too much to get “on plane” with a full load of armor and Marines. The evaluators reported:

- “Approximately 1,900 pounds of armor had to be removed from the EFVPs to enable them to achieve high water speed.”
- “Load excursions that included combat and personal equipment likely to be carried by embarked infantry units proved unsuccessful. Vehicles unable to attain high water speed consistently when carrying the additional weight.”
- “Results indicate that vehicles as tested have insufficient payload margin to support a reinforced rifle squad under some climactic conditions (hot, cool, cold, or wet weather) or combat environments.”
- “[T]he current design will be unable to accommodate the additional weight of equipment likely to be carried by embarked infantry to support sustained combat operations and still attain high water speed.”<sup>52</sup>

### D. Excessive Noise and Limited Visibility

During the operational assessment, the evaluators noted problems with the noise levels, vibration, and sight lines of the EFV. The evaluators reported:

- “Embarked Marines wore foam ear plugs and earmuffs, which they characterized as uncomfortable and which made voice communications difficult and ineffective.”<sup>53</sup>
- “Current whole body vibration levels required that there be a 24-hour break between 12.5-hour land mobility OMPs.”<sup>54</sup>
- “Poor crew visibility during water operations.”<sup>55</sup>
- The driver’s thermal viewer and gunner’s thermal sight “periodically washed out by water spray while at high-water speed.”<sup>56</sup>

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<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> *Id.*

<sup>55</sup> *Id.*

<sup>56</sup> *Id.*

- “The EFVP does not provide the crew an adequate vision capability to effectively support HWS [high water speed] operations at night.”<sup>57</sup>

#### E. Other Problems

Other problems discovered during the operational assessment included frequent failures of the weapons systems and leaks in the vehicle’s hydraulic systems. In addition, the vehicle generated significant heat and noise, contrary to the requirement that the EFV be designed to minimize detection. According to the test evaluators:

- The design and operation of the weapon system and gun turret were substantially flawed. The auditors reported that the ammunition feed system “causes jams and damages rounds”; the weapons are “difficult for the crew to reload during combat operations”; and the “structural integrity of the turret is questionable.”
- “Crews were generally unable to identify armored vehicle targets; it is not clear whether this shortfall is attributable to shortcomings with the thermal imaging sight, to inadequate crew training, or to a combination of both factors.”
- One EFV variant was unable to conduct water operations due to “accident-induced hull damage” incurred while being towed as a result of a hydraulic system leak.”
- “The (temporary) exhaust system on the SDD prototypes ... contributed to a unique and significant thermal signature.”<sup>58</sup>

## IV. REVERSALS IN THE EFV PROCUREMENT STRATEGY

The performance of the EFV in the operational assessment has resulted in serious setbacks for the EFV program. In March 2007, the Marine Corps modified the original SDD contract to award General Dynamics an additional \$143.5 million to redesign the vehicle.<sup>59</sup> The contract modification signaled that the EFV would require major changes before it would meet the requirements of the Marine Corps.

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<sup>57</sup> Marine Corps Operational Test and Evaluation Activity, Expeditionary Fighting Vehicle Personnel Variant (EFVP): Operational Assessment Independent Assessment Report (Nov. 2006).

<sup>58</sup> Department of Defense, Director of Operational Test & Evaluation, *Expeditionary Fighting Vehicle: Milestone C Operational Assessment DOT&E View* (undated).

<sup>59</sup> Briefing by David Heebner, President, General Dynamics Land Systems, to House Oversight Committee Staff (June 12, 2007); Briefing by Col. John Bryant, EFV Program Manager, to House Oversight Committee Staff (Apr. 10, 2008).

An even larger setback occurred in June 2007 when the Marine Corps made the decision to repeat the entire system development and demonstration process.<sup>60</sup> According to the Marine Corps, the Corps is currently negotiating with General Dynamics to award General Dynamics a second system development and demonstration contract in May 2008.<sup>61</sup> The estimated value of this second SDD contract is \$700 to \$800 million.<sup>62</sup> Combined with the costs of the March 2007 redesign contract, the costs of the redesign and new SDD contract will be at least \$843.5 to \$943.5 million.

In addition to the expense of repeating the system development and demonstration phase, the new SDD contract will significantly delay the project. Originally, the first SDD contract required that the development and demonstration process be completed by October 2003.<sup>63</sup> Under the new contract, this process will not be completed until November 2011, eight years behind schedule.<sup>64</sup>

The latest estimate of the overall cost of the EFV program was prepared in December 2007. The original SDD contract envisioned that the Marine Corps would be able to procure 1,025 EFVs at a total cost to the taxpayer of \$8.5 billion.<sup>65</sup> The December 2007 estimate predicts that the cost will increase by over 50% to \$13.2 billion and that at this price, the Corps will be able to afford only 593 EFVs.<sup>66</sup> The per-vehicle price of the EFV is now 168% higher than first estimated.<sup>67</sup>

## V. CONCLUSION

The EFV program started in 1996 as a model acquisition program. But after the program entered its system development and demonstration phase, a multitude of management problems caused expensive cost overruns and long delays. Key factors undermining the acquisition program include a rushed critical design phase, a costly “test-fix-test” demonstration process, and failure to ensure appropriate coordination and oversight. These problems have caused the Marine Corps to make a decision to repeat the system development and demonstration process. The result is a project that is billions of dollars over budget and many years late.

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<sup>60</sup> Letter from Under Secretary of Defense Kenneth J. Kreig to President of the Senate Richard B. Cheney (June 5, 2007).

<sup>61</sup> Briefing by Col. John Bryant, EFV Program Manager, to House Oversight Committee Staff (Apr. 10, 2008).

<sup>62</sup> Telephone Communication from Jason Gerin, Congressional Liaison, U.S. Marine Corps, to House Oversight Committee Staff (Apr. 25, 2008).

<sup>63</sup> U.S. Government Accountability Office, *Defense Acquisitions: The Expeditionary Fighting Vehicle Encountered Difficulties in Design Demonstration and Faces Future Risks* (May 2006) (GAO-06-349).

<sup>64</sup> U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapon Programs* (Mar. 2008) (GAO-08-467SP).

<sup>65</sup> Department of Defense, Selected Acquisition Report (SAR) Summary Tables as of December 31, 2007 (Apr. 4, 2008).

<sup>66</sup> *Id.*

<sup>67</sup> U.S. Government Accountability Office, *Defense Acquisitions: Assessments of Selected Weapon Programs* (Mar. 2008) (GAO-08-467SP).