

GAO

Report to the Subcommittee on Air and  
Land Forces, Committee on Armed  
Services, House of Representatives

---

March 2010

# DEFENSE ACQUISITIONS

## Opportunities Exist to Position Army's Ground Force Modernization Efforts for Success



| Report Documentation Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                                     |                                                           | Form Approved<br>OMB No. 0704-0188                  |                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------------------------|-----------------------------------------------------------|-----------------------------------------------------|---------------------------------|
| Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. |                                    |                                     |                                                           |                                                     |                                 |
| 1. REPORT DATE<br><b>MAR 2010</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    | 2. REPORT TYPE                      |                                                           | 3. DATES COVERED<br><b>00-00-2010 to 00-00-2010</b> |                                 |
| 4. TITLE AND SUBTITLE<br><b>Defense Acquisitions: Opportunities Exist to Position Army's Ground Force Modernization Efforts for Success</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |                                     |                                                           | 5a. CONTRACT NUMBER                                 |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                           | 5b. GRANT NUMBER                                    |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                           | 5c. PROGRAM ELEMENT NUMBER                          |                                 |
| 6. AUTHOR(S)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |                                     |                                                           | 5d. PROJECT NUMBER                                  |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                           | 5e. TASK NUMBER                                     |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                           | 5f. WORK UNIT NUMBER                                |                                 |
| 7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)<br><b>U.S. Government Accountability Office, 441 G Street NW, Washington, DC, 20548</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                    |                                     |                                                           | 8. PERFORMING ORGANIZATION REPORT NUMBER            |                                 |
| 9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |                                     |                                                           | 10. SPONSOR/MONITOR'S ACRONYM(S)                    |                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     |                                                           | 11. SPONSOR/MONITOR'S REPORT NUMBER(S)              |                                 |
| 12. DISTRIBUTION/AVAILABILITY STATEMENT<br><b>Approved for public release; distribution unlimited</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                    |                                     |                                                           |                                                     |                                 |
| 13. SUPPLEMENTARY NOTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                    |                                     |                                                           |                                                     |                                 |
| 14. ABSTRACT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    |                                     |                                                           |                                                     |                                 |
| 15. SUBJECT TERMS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |                                     |                                                           |                                                     |                                 |
| 16. SECURITY CLASSIFICATION OF:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    |                                     | 17. LIMITATION OF ABSTRACT<br><b>Same as Report (SAR)</b> | 18. NUMBER OF PAGES<br><b>38</b>                    | 19a. NAME OF RESPONSIBLE PERSON |
| a. REPORT<br><b>unclassified</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | b. ABSTRACT<br><b>unclassified</b> | c. THIS PAGE<br><b>unclassified</b> |                                                           |                                                     |                                 |



Highlights of [GAO-10-406](#), a report to the Subcommittee on Air and Land Forces, Committee on Armed Services, House of Representatives

## Why GAO Did This Study

Since 2003, the Future Combat System (FCS) program has been the centerpiece of the Army's efforts to transition to a lighter, more agile, and more capable combat force. In 2009, however, concerns over the program's performance led to the Secretary of Defense's decision to significantly restructure and ultimately cancel the program. As a result, the Army has outlined a new approach to ground force modernization. This report (1) outlines the Army's preliminary post-FCS plans and (2) identifies the challenges and opportunities the Department of Defense (DOD) and the Army must address as they proceed with Army ground force modernization efforts. To meet these objectives, GAO reviewed key documents, performed analyses, visited test facilities where the Army evaluated FCS equipment, and interviewed DOD and Army officials.

## What GAO Recommends

GAO recommends that the Secretary of Defense instruct the Army to correct the identified maturity and reliability issues prior to either fielding equipment or approving additional system procurement. GAO also recommends that the Secretary direct the Army to submit a comprehensive report to the Congress on its modernization investment, contracting, and management strategies. DOD concurred with GAO's recommendations.

## DEFENSE ACQUISITIONS

### Opportunities Exist to Position Army's Ground Force Modernization Efforts for Success

## What GAO Found

With DOD having canceled the FCS acquisition program, the Army has moved away from FCS as the centerpiece of ground force modernization. Although the Army is still refining its post-FCS plans, it has already taken a number of actions to comply with DOD directions and define new modernization initiatives. For instance, the Army has terminated FCS vehicle development and is preparing for a new ground combat vehicle program. Also, Army officials convened a special task force to refine future force concepts and formulate an expedited fielding strategy. The Army also announced preliminary plans for new acquisition programs.

With ground force modernization efforts at an early stage, DOD and the Army face the challenge of setting the emerging modernization efforts on the best possible footing by buying the right capabilities at the best value. They have an opportunity to position these efforts for success by effectively implementing the enhanced body of acquisition legislation and DOD policy reforms as well as lessons learned from the FCS program, including lessons that underscore the use of knowledge-based acquisition and disciplined contracting strategies. Preliminary plans suggest that the Army is moving in that direction, including expectations to begin future developments with mature technologies and utilizing competitive prototyping. However, DOD recently approved, with a number of restrictions, low-rate initial production of the first increment of FCS spinout equipment, such as new radios and sensors, despite having acknowledged that the systems were immature, unreliable, and not performing as required. The restrictions include required DOD reviews of Army progress toward improving the systems' maturity and reliability. The spin out equipment was being developed within the FCS program, and the decision to approve production reflects DOD and Army emphasis on providing new capabilities quickly to combat units. However, this decision runs the risk of delivering unacceptable equipment to the warfighter and trading off acquisition principles whose validity has been so recently underscored.

Detailed plans for most of the Army's new modernization efforts are still being developed and may not be available until at least later in fiscal year 2010. That will be a limiting factor as the Congress considers the Army's fiscal year 2011 budget request for these modernization efforts.

View [GAO-10-406](#) or key components.  
For more information, contact Michael J. Sullivan at (202) 512-4841 or [sullivanm@gao.gov](mailto:sullivanm@gao.gov).

---

# Contents

---

|               |                                                                                                                     |          |
|---------------|---------------------------------------------------------------------------------------------------------------------|----------|
| <b>Letter</b> |                                                                                                                     | <b>1</b> |
|               | Background                                                                                                          | 2        |
|               | In Implementing DOD Direction, the Army Is Moving Away from Many of Its FCS Approaches                              | 5        |
|               | Acquisition Direction and FCS Lessons Learned Offer Opportunities to Increase the Likelihood of Successful Outcomes | 10       |
|               | Conclusions                                                                                                         | 23       |
|               | Recommendations for Executive Action                                                                                | 24       |
|               | Agency Comments and Our Evaluation                                                                                  | 24       |

---

|                   |                              |           |
|-------------------|------------------------------|-----------|
| <b>Appendix I</b> | <b>Scope and Methodology</b> | <b>27</b> |
|-------------------|------------------------------|-----------|

---

|                    |                                                |           |
|--------------------|------------------------------------------------|-----------|
| <b>Appendix II</b> | <b>Comments from the Department of Defense</b> | <b>29</b> |
|--------------------|------------------------------------------------|-----------|

---

|                     |                                              |           |
|---------------------|----------------------------------------------|-----------|
| <b>Appendix III</b> | <b>GAO Contact and Staff Acknowledgments</b> | <b>32</b> |
|---------------------|----------------------------------------------|-----------|

---

|                             |  |           |
|-----------------------------|--|-----------|
| <b>Related GAO Products</b> |  | <b>33</b> |
|-----------------------------|--|-----------|

---

|               |                                                                             |    |
|---------------|-----------------------------------------------------------------------------|----|
| <b>Tables</b> |                                                                             |    |
|               | Table 1: Comparison of Controls Used in Best Practices Model and DOD Policy | 12 |
|               | Table 2: Acquisition Reforms and Their Potential Impact                     | 14 |

---

|                |                                                      |   |
|----------------|------------------------------------------------------|---|
| <b>Figures</b> |                                                      |   |
|                | Figure 1: FCS Acquisition Program (2003 versus 2009) | 3 |
|                | Figure 2: Increment 1 Systems                        | 7 |

---

## **Abbreviations**

|      |                                 |
|------|---------------------------------|
| DOD  | Department of Defense           |
| FCS  | Future Combat System            |
| GCV  | Ground Combat Vehicle           |
| LSI  | lead systems integrator         |
| MRAP | Mine Resistant Ambush Protected |

This is a work of the U.S. government and is not subject to copyright protection in the United States. The published product may be reproduced and distributed in its entirety without further permission from GAO. However, because this work may contain copyrighted images or other material, permission from the copyright holder may be necessary if you wish to reproduce this material separately.



United States Government Accountability Office  
Washington, DC 20548

March 15, 2010

The Honorable Adam Smith  
Chairman  
The Honorable Roscoe Bartlett  
Ranking Member  
Subcommittee on Air and Land Forces  
Committee on Armed Services  
House of Representatives

Since 2003, the Future Combat System (FCS) program has been at the center of the Army's efforts to modernize by replacing existing combat systems with a family of manned and unmanned vehicles and systems linked by an advanced information network. However, the Army started FCS without determining whether the concept could be successfully developed with existing resources. Specifically, the Army had not established firm system-level requirements, mature technologies, a realistic cost estimate, or an acquisition strategy wherein knowledge drives schedule. In our March 2009 report, we concluded that the Army would be challenged to demonstrate the knowledge necessary to warrant an unqualified commitment to FCS at a congressionally mandated 2009 milestone review.<sup>1,2</sup>

In April 2009, the Secretary of Defense proposed restructuring the FCS program to lower risk and address more near-term needs shortly before FCS was to undergo the congressionally mandated review to determine its future. The Secretary of Defense's recommendations served as a preemptive "no-go" decision for this review, and the FCS acquisition program was subsequently canceled in June 2009. As a result, the Army has outlined a new approach to modernizing its ground forces. To understand the Army's new approach to modernization, you asked us to

---

<sup>1</sup>GAO, *Defense Acquisitions: Decisions Needed to Shape Army's Combat Systems for the Future*, [GAO-09-288](#) (Washington, D.C.: Mar. 12, 2009).

<sup>2</sup>The John Warner National Defense Authorization Act for Fiscal Year 2007, Pub. L. No. 109-364, § 214 (2006), required the Secretary of Defense to perform a milestone (go/no-go) review of the FCS acquisition program no later than 120 days after the preliminary design review to determine whether (1) the warfighter's needs are valid and can best be met with the concept of the program; (2) the concept of the program can be developed and produced within existing resources; and (3) the program should continue as currently structured, continue in restructured form, or be terminated.

---

(1) outline the Army's preliminary post-FCS plans and (2) identify the challenges and opportunities the Department of Defense (DOD) and the Army will need to address as they proceed with ground force modernization efforts.

In conducting our work, we met with Army and DOD officials responsible for carrying out the FCS cancellation and formulating new approaches for Army modernization. We reviewed the revised overarching Army concept document and the preliminary plans for emerging acquisition programs and assessed those against the earlier FCS concept. We assessed the Army's preliminary modernization plans against lessons learned from the FCS program, acquisition best practices, and the latest acquisition policy. In addition, we drew from our body of past work on weapon system acquisition practices and conducted our own analyses of recent policy changes and acquisition reform legislation. We conducted this performance audit from March 2009 to March 2010 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives. Appendix I further discusses our scope and methodology.

---

## Background

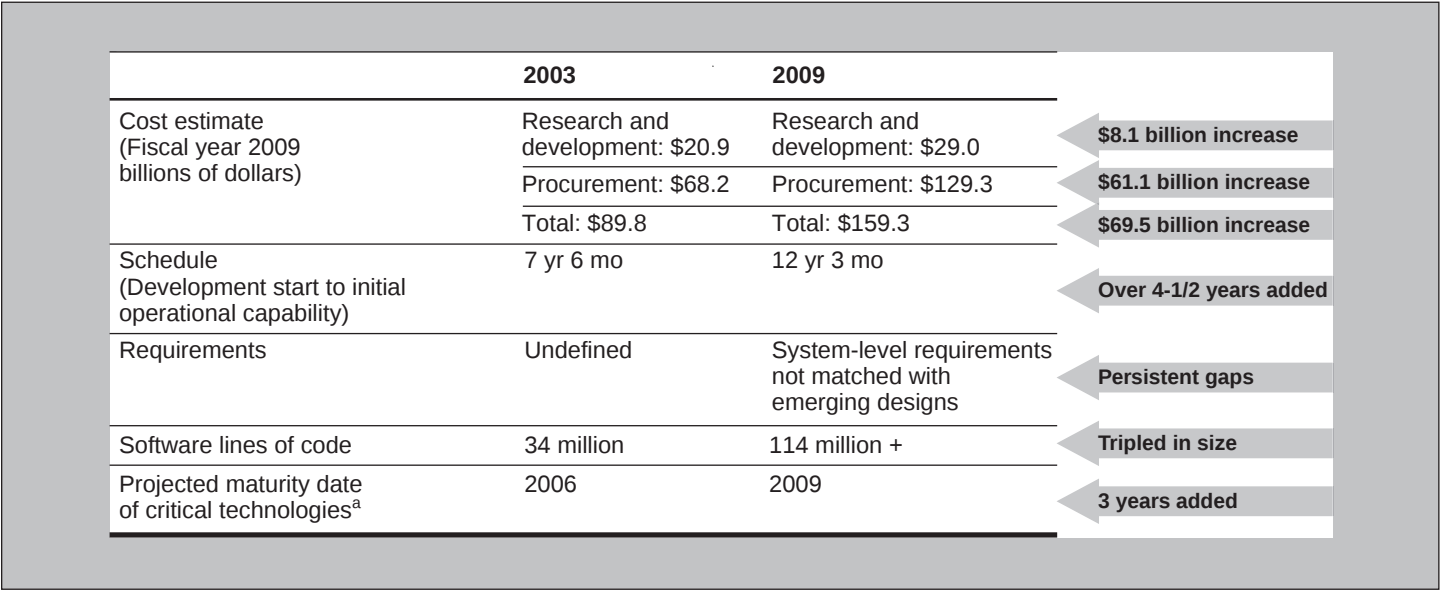
Since it started development in 2003, FCS was at the center of the Army's efforts to modernize into a lighter, more agile, and more capable combat force. The FCS concept involved replacing existing combat systems with a family of manned and unmanned vehicles and systems linked by an advanced information network. The Army anticipated that the FCS systems, along with the soldier and enabling complementary systems, would work together in a system of systems wherein the whole provided greater capability than the sum of the individual parts. The Army expected to develop this equipment in 10 years, procure it over 13 years, and field it to 15 FCS-unique brigades—about one-third of the active force at that time. The Army also had planned to spin out selected FCS technologies and systems to current Army forces throughout the system development and demonstration phase. In 2006, the Army established the Army Evaluation Task Force to use, evaluate, and train with these FCS spinout capabilities.

The Army used a management approach for FCS that centered on a lead system integrator (LSI) to provide significant management services to help the Army define and develop FCS and reach across traditional Army

mission areas. Army officials have stated that they did not believe the Army had the resources or flexibility to use its traditional acquisition process to field a program as complex as FCS under the aggressive timeline established by the then-Army Chief of Staff.

As we have reported in the past, the FCS program was immature and unable to meet DOD’s own standards for technology and design from the start (see the list of related GAO products at the end of this report). Although adjustments were made, such as adding time and reducing requirements, vehicle weights and software code grew, key network systems were delayed, and technologies took longer to mature than anticipated (see fig. 1). By 2009, after an investment of 6 years and an estimated \$18 billion, the viability of the FCS concept was still unknown. As such, in our 2009 report, we concluded that the maturity of the development efforts was insufficient and the program could not be developed and produced within existing resources.

Figure 1: FCS Acquisition Program (2003 versus 2009)



Sources: DOD (data); GAO (analysis and presentation).  
<sup>a</sup>For FCS, the Army projected maturity based on a Technology Readiness Level 6, which is a representative model or prototype that has been tested in a relevant environment but requires additional work for the appropriate form, fit, and function. Based on our best practices work, technologies that have reached Technology Readiness Level 7, which is a prototype demonstrated in a realistic environment, are mature.

---

In April 2009, the Secretary of Defense proposed a significant restructuring of the FCS program in order to address more near-term combat needs and incorporate a role for the Mine Resistant Ambush Protected (MRAP) vehicles being used in today's conflicts. The Secretary noted significant concerns that the FCS program's vehicle designs—where greater information awareness was expected to compensate for less armor and result in lower weight and higher fuel efficiency—did not adequately reflect the lessons of counterinsurgency and close-quarters combat operations in Iraq and Afghanistan. As such, the Secretary recommended

- accelerating fielding of ready-to-go systems and capabilities to all combat brigades;
- canceling the vehicle component of the FCS program, reevaluating the requirements, technology, and approach, and relaunching the Army's vehicle modernization program; and
- addressing fee structure and other concerns with current FCS contracting arrangements.

Subsequently, in June 2009, DOD issued an acquisition decision memorandum that canceled the FCS acquisition program, terminated manned ground vehicle development efforts, and laid out plans for follow-on Army brigade combat team modernization efforts. DOD directed the Army to transition to an Army-wide modernization plan consisting of a number of integrated acquisition programs, including one to develop ground combat vehicles (GCV). The memorandum also instructed the Army to transition away from an LSI management approach.

In recent months, the Army has been defining its ground force modernization efforts per the Secretary's decisions and the June 2009 acquisition decision memorandum. Although the details are not yet complete, the Army took several actions through the end of calendar year 2009. It stopped all development work on the FCS manned ground vehicles—including the non-line-of-sight cannon—in the summer of 2009 and recently terminated development of the Class IV unmanned aerial vehicle and the countermine and transport variants of the Multifunction Utility/Logistics and Equipment unmanned ground vehicle. For the time being, the Army is continuing selected development work under the existing FCS development contract, primarily residual FCS system and network development. In October 2009, the Army negotiated a modification to the existing contract that clarified the development work needed for the brigade combat team modernization efforts.

---

## In Implementing DOD Direction, the Army Is Moving Away from Many of Its FCS Approaches

The Army is implementing DOD direction and redefining its overall modernization strategy as a result of the Secretary of Defense's decision to significantly restructure the FCS program. It established a key task force to refine its future force concepts and modernization plans and has moved away from FCS as the centerpiece of ground force modernization. Additionally, the Army is transitioning from the FCS long-term acquisition orientation to a shorter-term approach that biennially develops and fields new increments of capability within capability packages. It now has one approved acquisition program that will produce and field the initial increment of the FCS spinout equipment, as well as preliminary plans for two other acquisition programs that will define and develop follow-on increments and develop a new GCV. The Army also plans to continue network development for all the combat brigades and to develop and field upgrades to other existing equipment.

---

## The Army Has Established a New Operational Concept

In response to the Secretary's recommendation to restructure FCS, the Army established a Training and Doctrine Command-based task force to reexamine current force capability gaps, make resource-informed recommendations on how to fill them, and provide elements of planning for future force modernization.<sup>3</sup> Through that process, the task force found that some assumptions were no longer valid, such as reliance on networking for survivability, which essentially meant trading heavy armor for better information or situational awareness. The Army acknowledges that this is not the best trade for the way it now has to fight. As a result of the task force's analysis, the Army is implementing a new operational concept and brigade combat team modernization strategy that will update all Army combat brigades for full-spectrum operations. That is a significant contrast to the FCS approach that would have created 15 new FCS-unique brigades.

The task force developed a concept of continual modernization of ready-to-go capabilities through biennial deliveries of capability packages. In addition to select FCS systems, these capability packages could also include materiel and nonmateriel items developed outside the FCS program. The concept also included plans to reallocate assets, divest older technologies, and incrementally modernize the Army's information network. The Army expects to field the first capability package in fiscal

---

<sup>3</sup>The Training and Doctrine Command is the Army organization that designs, develops, and integrates capabilities, concepts, and doctrine.

---

years 2011 through 2012, followed by additional capability packages delivered in 2-year increments. The Army plans to align capability package fielding with an established equipment reset and training process in order to provide these systems to deploying units. A network effort, to include more advanced hardware, software, and radios, will be included in each capability package. The Army's near-term plan is to define, develop, produce, and field capabilities to some of the Army's combat brigades, and the long-term plan is to field those capabilities to all remaining combat brigades. The Army has specified that the new capabilities will be tested and their performance validated before they are deployed in the capability packages.

---

## The Army Has Started a Series of Development and Fielding Efforts

In recent months, the Army has been defining its ground force modernization efforts per the Secretary's decisions and the specifics of the June 2009 acquisition decision memorandum. The Army has one approved acquisition program as well as preliminary plans for starting two other acquisition programs, integrating network capabilities across the Army's combat brigade structure, and upgrading and fielding existing ground force capabilities.

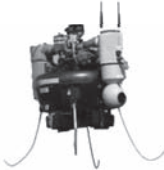
- The first program, Increment 1, is a continuation of previous FCS-related efforts to spin out emerging capabilities and technologies to current forces. Of the Army's post-FCS modernization initiatives, Increment 1, which includes such FCS remnants as unmanned air and ground systems, unattended ground sensors, the non-line-of-sight launch system, and a network integration kit, is the furthest along in the acquisition development cycle (see fig. 2). The network integration kit includes, among other things, the integrated computer system, an initial version of the system-of-systems common operating environment, early models of the Joint Tactical Radio System and waveforms, and a range extension relay.<sup>4</sup> In December 2009, the Army requested and DOD approved, with a number of restrictions, the low-rate initial production of Increment 1 systems that are expected to be fielded in the fiscal year 2011-12 capability package, which will be discussed in more detail later in this report. The Army will be continuing Increment 1 development over the next 2 years while low-rate initial production proceeds. The projected development and production cost to equip nine combat brigades with the Increment 1

---

<sup>4</sup>The system-of-systems common operating environment is the operating environment that serves as middleware between operating systems and software applications.

network and systems, supported by an independent cost estimate, would be about \$3.5 billion.

**Figure 2: Increment 1 Systems**

|                                                                                                                                                                                                                                                                                                                        |                                                              |                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                       | <p><b><i>Small unmanned ground vehicle Block 1</i></b></p>   | <p>Provides enhanced situational awareness and force protection through reduced exposure to hazards during soldier-intensive and/or high-risk functions.</p>                                               |
| <p>Integrated computer</p>  <p>JTRS</p>  <p>Multiband antennas</p>  | <p><b><i>Network integration kit</i></b></p>                 | <p>Provides enhanced communications and situational awareness through radios with multiple software waveforms, connections to unattended sensors, and links to existing networking capabilities.</p>       |
| <p>Detection node</p>  <p>Imaging node</p>                                                                                                       | <p><b><i>Urban unattended ground sensor</i></b></p>          | <p>Provides force protection in an urban setting through a leave-behind, network-enabled reporting system of movement and/or activity in cleared areas.</p>                                                |
|                                                                                                                                                                                                                                     | <p><b><i>Class 1 unmanned aerial vehicle Block 0</i></b></p> | <p>Provides independent, soldier-level aerial reconnaissance, surveillance, and target acquisition capability.</p>                                                                                         |
|                                                                                                                                                                                                                                     | <p><b><i>Non-line-of-sight launch system</i></b></p>         | <p>Provides the ability to precisely attack armored, lightly armored, and stationary or moving targets at extended ranges despite weather/environmental conditions and/or presence of countermeasures.</p> |
|                                                                                                                                                                                                                                     | <p><b><i>Tactical unattended ground sensor</i></b></p>       | <p>Provides enhanced situational awareness, force protection, and early warnings in a tactical setting through cross-cues to sensors and weapon systems.</p>                                               |

Sources: Army (data and photos); GAO (analysis and presentation).

- 
- For the second acquisition program, Increment 2 of brigade combat team modernization, the Army has preliminary plans to mature Increment 1 capabilities—potentially demonstrating full FCS threshold requirements—as well as contribute to further developments of the system-of-systems common operating environment and battle command software, and demonstrate and field additional capabilities. For example, these may include the Armed Robotic Vehicle Assault (Light)—an unmanned ground vehicle configured for security and assault support missions—and the Common Controller, which will provide the dismounted soldier a handheld device capable of controlling, connecting, and providing data transfer from unmanned vehicles and ground sensors. According to Army officials, they are currently working to define the content, cost, and schedule for Increment 2 and are planning a Defense Acquisition Board review in the third quarter of fiscal year 2010 and a low-rate initial production decision for fiscal year 2013.
  - The third acquisition program would develop a new GCV. The Army reviewed current fighting vehicles across the force structure to determine whether to sustain, improve, divest, or pursue new vehicles based on operational value, capability shortfalls, and resource availability. Per DOD direction, the Army also collaborated with the Marine Corps to identify capability gaps related to fighting vehicles. For development of a new GCV, the Army’s preliminary plans indicate the use of an open architecture design to enable incremental improvements in modular armor; network architecture; and subcomponent size, weight, power, and cooling. Preliminary funding and schedule information for the proposed program was recently provided to the defense committees by way of the Fiscal Year 2011 President’s Budget Request. According to a DOD official, in February 2010, DOD made a materiel development decision for the Army’s proposed GCV effort.<sup>5</sup> As a result of that decision, DOD authorized the Army’s release of a request for proposals for GCV technology development. Over the next several months, the Army will be conducting an analysis of alternatives to assess potential materiel solutions for the GCV. The Army expects to follow the analysis with a Milestone A decision review on whether to begin technology

---

<sup>5</sup>A materiel development decision is a review that is the formal entry point into the acquisition process and is mandatory for all programs. A successful materiel development decision may approve entry into the acquisition management system at any point consistent with phase-specific entrance criteria and statutory requirements.

---

development in September 2010.<sup>6</sup> After Milestone A, Army officials are proposing the use of competitive prototyping with multiple contractors—the number of which will depend on available funding—during the technology development phase, which will feature the use of mature technologies and the fabrication and testing of prototype subsystems. A preliminary design review would be used to validate contractor readiness to enter detailed design at Milestone B in fiscal year 2013. The Army’s preliminary plans indicate that the first production vehicles could be delivered in late fiscal year 2017, about 7 years from Milestone A.

- The Army is planning to incrementally develop and field an information network to all of its combat brigades in a decentralized fashion—that is, not as a separate acquisition program. The Army has defined a preliminary network strategy and is in the process of defining what the end state of the network will need to be, as well as how it may build up that network over an undefined period of time. In the near term, the Army is working to establish a common network foundation to build on and to define a common network architecture based on what is currently available and expected to become available in the near future. Current communications, command and control, and networking acquisition programs will continue and will be expected to build on to the current network foundation and architecture over time. Networking capabilities will be expected to meet specific standards and interface requirements. According to Army officials, the ongoing incremental network and software development activities and requirements will be dispersed to these acquisition programs, where they will be considered for further development and possible fielding. The only original FCS network development activities that the Army plans to continue under the FCS development contract are those supporting the network integration kit for Increment 1 and whatever additional networking capabilities may be needed for Increment 2. DOD expects the Army to present network development plans in March 2010.
- The Army has also outlined plans to upgrade existing ground force capabilities and integrate the MRAP vehicle into its forces. The plans include upgrades to the Abrams tank fleet, Paladin cannon, and Stryker vehicles. They also include a role for MRAP vehicles within the

---

<sup>6</sup>Milestone A is the point at which a program enters the technology development phase, Milestone B is entry into the engineering and manufacturing development phase, and Milestone C is entry into the production and deployment phase.

---

brigade combat team structure, in accordance with the Secretary of Defense's April 2009 statement that the Army's vehicle program developed 9 years ago did not include a role for the \$25 billion investment in MRAP being used to "good effect" in today's conflicts. Using the recommendations from the task force, the Army drafted plans to fully integrate MRAP vehicles into 20 combat brigades.

---

## Acquisition Direction and FCS Lessons Learned Offer Opportunities to Increase the Likelihood of Successful Outcomes

The challenge facing both DOD and the Army is to set these ground force modernization efforts on the best footing possible by buying the right capabilities at the best value. In many ways, DOD and the Army have set modernization efforts on a positive course by following direction from DOD leadership, and they have an opportunity to reduce risks by adhering to the body of acquisition legislation and policy reforms—which incorporate knowledge-based best practices we identified in our previous work—that have been introduced since FCS started in 2003. The new legislation and policy reforms emphasize a knowledge-based acquisition approach, a cumulative process in which certain knowledge is acquired by key decision points before proceeding. In essence, knowledge supplants risk over time. Additionally, DOD and the Army can further reduce risks by considering lessons learned from problems that emerged during the FCS development effort. Initial indications are that the Army is moving in that direction. These lessons span knowledge-based acquisition practices, incremental development, affordability, contract management, and oversight. However, in the first major acquisition decision for the Army's post-FCS initiatives, DOD and the Army—because they want to support the warfighter quickly—are proceeding with low-rate initial production of one brigade set of Increment 1 systems despite having acknowledged that the systems are immature, are unreliable, and cannot perform as required.

---

## New Acquisition Reforms Point Way to Lower Risk

DOD's body of acquisition policy, which includes reforms introduced since FCS started development in 2003, incorporates nearly all of the knowledge-based practices we identified in our previous work (see table 1). For example, it includes controls to ensure that programs have demonstrated a certain level of technology maturity, design stability, and production maturity before proceeding into the next phase of the acquisition process. As such, if the Army proceeds with preliminary plans for new acquisition programs, then adherence to the acquisition direction in each of its new acquisition efforts provides an opportunity to improve the odds for successful outcomes, reduce risks for follow-on Army ground force modernization efforts, and deliver needed equipment more quickly and at lower costs. Conversely, acquisition efforts that proceed with less

---

technology, design, and manufacturing knowledge than best practices suggest face a higher risk of cost increases and schedule delays.

**Table 1: Comparison of Controls Used in Best Practices Model and DOD Policy**

| Commercial best practices model                                                                                                                                                                                                                                                                                                                                      | May 2003<br>DOD policy | December<br>2008 DOD<br>policy |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--------------------------------|
| <b>Knowledge point 1:</b> Occurs as programs begin the engineering and manufacturing development phase (Milestone B). Match exists between requirements and resources. Technologies needed to meet essential product requirements have been demonstrated to work in their intended environments, and the producer has completed a preliminary design of the product. |                        |                                |
| Demonstrate high technology readiness levels                                                                                                                                                                                                                                                                                                                         | X                      | X                              |
| Ensure product requirements are informed by the systems engineering process                                                                                                                                                                                                                                                                                          | X                      | X                              |
| Establish cost and schedule estimates for product based on knowledge from preliminary design using systems engineering tools                                                                                                                                                                                                                                         |                        | X                              |
| Conduct decision review for program launch                                                                                                                                                                                                                                                                                                                           | X                      | X                              |
| <b>Knowledge point 2:</b> Occurs at the critical design review between integration and demonstration. Design is stable and has been demonstrated through prototype testing. Ninety percent of engineering drawings are releasable to manufacturing organizations.                                                                                                    |                        |                                |
| Complete 90 percent of design drawings                                                                                                                                                                                                                                                                                                                               |                        | <sup>a</sup>                   |
| Complete subsystem and system design reviews                                                                                                                                                                                                                                                                                                                         |                        | X                              |
| Demonstrate with prototype that design meets requirements                                                                                                                                                                                                                                                                                                            | X                      | X                              |
| Obtain stakeholder concurrence that drawings are complete and producible                                                                                                                                                                                                                                                                                             |                        | <sup>b</sup>                   |
| Complete failure modes and effects analysis                                                                                                                                                                                                                                                                                                                          |                        | X                              |
| Identify key system characteristics                                                                                                                                                                                                                                                                                                                                  |                        | X                              |
| Identify critical manufacturing processes                                                                                                                                                                                                                                                                                                                            |                        | X                              |
| Establish reliability targets and growth plan based on demonstrated reliability rates of components and subsystems                                                                                                                                                                                                                                                   |                        | X                              |
| Conduct design review to enter system demonstration                                                                                                                                                                                                                                                                                                                  | X                      | X                              |
| <b>Knowledge point 3:</b> Occurs at low-rate initial production commitment. Product is ready to be manufactured within cost, schedule, and quality targets. All key manufacturing processes are under statistical control and product reliability has been demonstrated.                                                                                             |                        |                                |
| Demonstrate manufacturing processes                                                                                                                                                                                                                                                                                                                                  |                        | X                              |
| Build production-representatives prototypes                                                                                                                                                                                                                                                                                                                          |                        | X                              |
| Test production-representative prototypes to achieve reliability goal                                                                                                                                                                                                                                                                                                |                        | <sup>c</sup>                   |
| Test production-representative prototypes to demonstrate the product in a realistic environment                                                                                                                                                                                                                                                                      |                        | X                              |
| Collect statistical process control data                                                                                                                                                                                                                                                                                                                             |                        | X                              |
| Demonstrate that critical processes are capable and under statistical control                                                                                                                                                                                                                                                                                        |                        | X                              |
| Conduct decision review to begin production                                                                                                                                                                                                                                                                                                                          | X                      | X                              |

Sources: DOD (data); GAO (analysis and presentation).

<sup>a</sup>DOD criteria do not specify the percentage of drawings to be completed at the critical design review.

<sup>b</sup>DOD's revised policy includes the post-critical design review assessment, which is the Milestone Decision Authority's assessment of the program manager's critical design review. However, we could not determine whether stakeholder concurrence was necessary to proceed.

<sup>c</sup>DOD criteria establish reliability goals but do not specify testing on production-representative prototypes.

---

As shown above, the cumulative building of knowledge consists of information that should be gathered at three critical points over the course of a program:

**Knowledge point 1 (at the program launch or Milestone B decision): Establishing a business case that balances requirements with resources.** At this point, a match must be made between the customer's needs and the developer's available resources—technology, engineering, knowledge, time, and funding. A high level of technology maturity, demonstrated via a prototype in its intended environment, indicates whether resources and requirements match. Also, the developer completes a preliminary design of the product that shows that the design is feasible and that requirements are predictable and doable. FCS did not satisfy this criterion when it began in 2003, and by 2009, 6 years into development, the Army still had not satisfied this criterion as emerging designs did not meet requirements, critical technologies were immature, and cost estimates were not realistic.

**Knowledge point 2 (at the critical design review between design integration and demonstration): Gaining design knowledge and reducing integration risk.** At this point, the product design is stable because it has been demonstrated to meet the customer's requirements as well as cost, schedule, and reliability targets. The best practice is to achieve design stability at the system-level critical design review, usually held midway through system development. Completion of at least 90 percent of engineering drawings at this point provides tangible evidence that the product's design is stable, and a prototype demonstration shows that the design is capable of meeting performance requirements.

**Knowledge point 3 (at production commitment or the Milestone C decision): Achieving predictable production.** This point is achieved when it has been demonstrated that the developer can manufacture the product within cost, schedule, and quality targets. The best practice is to ensure that all critical manufacturing processes are in statistical control—that is, they are repeatable, sustainable, and capable of consistently producing parts within the product's quality tolerances and standards—at the start of production.

In recent years, a number of specific changes have been made to DOD acquisition policies. Further policy changes should be incorporated as a result of the Weapon System Acquisition Reform Act of 2009. These changes, if implemented properly, allow programs to achieve knowledge at the right times by ensuring that any critical technologies to be included

in the weapon system are mature and ready for integration. The changes provide support to program managers to keep requirements reasonable and to keep changes at a minimum. The prototyping provisions included in these changes call for developmental prototypes beginning very early in the program. With FCS, the Army did not follow knowledge-based acquisition practices, but reforms introduced since FCS's start in 2003 incorporate nearly all of the knowledge-based practices we identified in our previous work. For example, the reforms include controls to ensure that programs have demonstrated a certain level of technology maturity, design stability, and production maturity before they proceed to the next phase of the acquisition process. If the Army adheres to these acquisition practices, it has an opportunity to increase the likelihood of successful outcomes for follow-on Army ground force modernization efforts. Conversely, acquisition efforts that deviate from knowledge-based practices face a higher risk of cost increases and schedule delays. Table 2 lists some of those acquisition reforms and their potential impact.

**Table 2: Acquisition Reforms and Their Potential Impact**

| Acquisition reform              | Description                                                                                                                                                                                                                                                                                                                                                                                                                              | Potential impact                                                                                                                                                                                                                                                 |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Configuration steering boards   | New annual or event-driven program reviews of all requirements and significant technical configuration changes with the potential to affect cost and schedule.                                                                                                                                                                                                                                                                           | Moderating requirements, proposing options, or both to reduce costs improves affordability and executability by ensuring that requirements do not exceed resources, speeds up delivery of the capability, and prevents reductions in purchased quantities.       |
| Cost estimation                 | Added requirement for independent cost estimates simultaneous with DOD component estimates at Milestone A, Milestone B, full-rate production, and other points dictated by statute. Review and concurrence of estimates, estimate choice, and confidence level required by the Director of Cost Analysis and Program Evaluation. A report on DOD's progress in improving estimate accuracy and compliance with policies is due annually. | A reliable cost estimate helps ensure that the program's projected funding needs are adequate to execute the program. We have found independent estimates to be more reliable than DOD component estimates.                                                      |
| Decision points and assessments | Decision points throughout the acquisition cycle:<br>Materiel development decision<br>Preliminary design review—required before Milestone B<br>Post-preliminary design review assessment<br>Critical design review<br>Post-critical design review assessment.                                                                                                                                                                            | Decision points to assess progress and determine whether to continue, change direction, or terminate efforts based on risks, affordability, program trade-offs, acquisition strategy updates, and the development of exit criteria for the next phase or effort. |

| Acquisition reform       | Description                                                                                                                                                                                                                                                                                    | Potential impact                                                                                                                                                                                                                                                                                                                                                     |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Competitive prototyping  | New requirement for competing prototypes prior to, or through, Milestone B and related provisions in the technology development and acquisition strategies.                                                                                                                                    | Technology demonstrated via prototypes provides a stronger basis for analyzing and refining requirements, ensuring more knowledgeable initial cost estimates, and making an appropriate match between requirements and available resources could improve the accuracy and predictability of cost and schedule estimates at program initiation.                       |
| Statutory certifications | New statutory certifications at Milestone A and B that necessitate development of critical knowledge (cost and schedule estimates, funding availability, justification of duplicated capabilities, and demonstration of technology) to proceed to the next iteration in the acquisition cycle. | Requiring these demonstrations of knowledge could increase program stability and predictability and reduce acquisition cycle time. Further, eliminating programs with inadequate technology and questionable affordability, funding, viability, and sustainability early in the acquisition cycle could prevent DOD from unnecessarily expending valuable resources. |
| Systems engineering      | More robust technical approach to developing and maintaining a capability, including key technical risks, processes, resources, metrics, and applicable performance incentives.                                                                                                                | Improved systems engineering can help ensure that a product's requirements are achievable and designable, given available resources, by defining and balancing system performance, cost, schedule, and risk.                                                                                                                                                         |

Sources: DOD Acquisition Policy and 2009 Weapon Systems Acquisition Reform Act (data); GAO (analysis and presentation).

There are initial indications that DOD and the Army are moving forward to implement the acquisition policy reforms as they proceed with ground force modernization, including the Secretary of Defense's statement about the ground vehicle modernization program—to “get the acquisition right, even at the cost of delay.” In addition, DOD anticipates that the GCV program will comply with DOD acquisition policy in terms of utilizing competitive system or subsystem prototypes. According to a DOD official, DOD made a materiel development decision for the GCV in February 2010, and the Army is proposing to conduct a preliminary design review on GCV before Milestone B. Additionally, a configuration steering board is planned in 2010 to address reliability and military utility of infantry brigade systems.

## Lessons Learned from FCS Can Foster a Smoother Acquisition Strategy Moving Forward

The Army has the opportunity to reduce risks by incorporating lessons learned from the FCS development effort. These key lessons span several areas: knowledge-based acquisition principles, incremental development, affordability, contract management, oversight, and incentive fee structure. Considering these lessons give the Army an opportunity to reduce risks by utilizing the things that worked well on the FCS program, while avoiding the acquisition pitfalls that plagued the program.

---

## Always Follow Principles of Knowledge-Based Acquisition

**Lesson:** The Army did not position the FCS program for success because it did not establish a knowledge-based acquisition approach—a strategy consistent with DOD policy and best acquisition practices—to develop FCS. The Army started the FCS program in 2003 before defining what the systems were going to be required to do and how they were going to interact. It moved ahead without determining whether the FCS concept could be developed in accordance with a sound business case. Specifically, at the FCS program’s start, the Army had not established firm system-level requirements, mature technologies, a realistic cost estimate, or an acquisition strategy wherein knowledge drives schedule. By 2009, the Army still had not shown that emerging FCS system designs could meet requirements, that critical technologies were at minimally acceptable maturity levels, and that the acquisition strategy was executable within estimated resources.

**Actions being taken:** In the first major acquisition decision for the Army’s post-FCS initiatives, DOD and the Army—because they want to support the warfighter quickly—are proceeding with low-rate initial production of Increment 1 systems despite having acknowledged that systems are immature, are unreliable, and cannot perform as required. In December 2009, the Under Secretary of Defense for Acquisition, Technology and Logistics approved low-rate initial production of Increment 1 equipment for one infantry brigade but noted that there is an aggressive risk reduction plan to grow and demonstrate the network maturity and reliability to support continued Increment 1 production and fielding. In the associated acquisition decision memorandum, the Under Secretary acknowledged the risks of pursuing Increment 1 production, including early network immaturity; lack of a clear operational perspective of the early network’s value; and large reliability shortfalls of the network, systems, and sensors. The Under Secretary also said that he was aware of the importance of fielding systems to the current warfighter and that the flexibility to deploy components as available would allow DOD to “best support” the Secretary of Defense’s direction to “win the wars we are in.” Because of that, the Under Secretary specified that a number of actions be taken over the next year or more and directed the Army to work toward having all components for the program fielded as soon as possible and to deploy components of the program as they are ready. However, the Under Secretary did not specify the necessary improvements that the Army needed to make or that those improvements are a prerequisite for approving additional production lots of Increment 1.

The approval for low-rate initial production is at variance with DOD policy and Army expectations. DOD’s current acquisition policy requires that

---

systems be demonstrated in their intended environments using the selected production-representative articles before the production decision occurs. However, the testing that formed the basis for the Increment 1 production decision included surrogates and non-production-representative systems, including the communications radios. As we have previously noted, testing with surrogates and non-production-representative systems is problematic because it does not conclusively show how well the systems can address current force capability gaps.<sup>7</sup> Furthermore, Increment 1 systems—which are slated for a fiscal year 2011-12 fielding—do not yet meet the Army’s expectations that new capabilities would be tested and their performance validated before they are deployed in a capability package. As noted in 2009 test results, system performance and reliability during testing was marginal at best. For example, the demonstrated reliability of the Class I unmanned aerial vehicle was about 5 hours between failure, compared to a requirement for 23 hours between failure. The Army asserts that Increment 1 systems’ maturity will improve rapidly but admits that it will be a “steep climb” and not a low-risk effort.

While the Under Secretary took current warfighter needs into account in his decision to approve Increment 1 low-rate initial production, it is questionable whether the equipment can meet one of the main principles underpinning knowledge-based acquisition—whether the warfighter needs can best be met with the chosen concept. Test reports from late 2009 showed conclusively that the systems had limited performance, and that this reduced the test unit’s ability to assess and refine tactics, techniques, and procedures associated with employment of the equipment. The Director, Operational Test and Evaluation, recently reported that none of the Increment 1 systems have demonstrated an adequate level of performance to be fielded to units and employed in combat. Specifically, the report noted that reliability is poor and falls short of the level expected of an acquisition system at this stage of development. Shortfalls in meeting reliability requirements may adversely affect Increment 1’s overall operational effectiveness and suitability and may increase life cycle costs. In addition, in its 2009 assessment of the increment’s limited user test—the last test before the production decision was made—the Army’s Test and Evaluation Command indicated that the Increment 1 systems would be challenged to meet warfighter needs. The Evaluation Command concluded that, with the exception of the non-line-of-sight launch system, which had

---

<sup>7</sup>[GAO-09-288](#).

---

Develop the Advanced  
Information Network  
Incrementally as Technology  
Becomes Available

not yet undergone flight testing, all the systems were considered operationally effective and survivable, but with limitations, because they were immature and had entered the test as pre-production representative systems, pre-engineering design models, or both. Additionally, the command noted that these same systems were not operationally suitable because they did not meet required reliability expectations.

**Lesson:** The FCS concept depended heavily on the network to link people, platforms, weapons, and sensors together within the 15 FCS brigades and to help eliminate the “fog of war.”<sup>8</sup> There were significant risks associated with network development, including those related to performance and scalability, architecture, and tests of network performance being performed only after designs for vehicles carrying the network equipment already were set. The network never matured to show that it could deliver expected performance and reliability. Six years into network development efforts, it was still not clear whether the network could be developed, built, and demonstrated as planned.

**Actions being taken:** Under the Army’s revised concept, rather than build a new network all at once and field it only to the unique FCS brigades, the Army’s intent is to develop and field an information network across the Army, building on current communications networks. Full details of the Army’s network strategy are still being developed, including the desired end state, incremental steps to that end state, and its costs. However, the Army anticipates that the new network will be bounded by available funding as well as technology readiness. It also expects, as with capability packages, to field network capability sets on a biennial basis. Network capability sets feature multiple pieces of the network that have been integrated and demonstrated. Near-term goals for the network include starting to connect the individual soldiers, expanding situational awareness to the company level, and expanding interoperability. As the Army envisions the network strategy, it will leverage network investments in systems already procured for ongoing wars, build upon a core set of network-related foundation products, and develop network packages that can be customized in support of current and future force platforms. These packages will include software, computers, and radios.

---

<sup>8</sup>“Fog of war” is the uncertainty and confusion before, during, and after conflict caused by incomplete, inconsistent, late, too much, or too little information.

---

Ensure Affordability with More  
Knowledge and Realism Up  
Front

**Lesson:** The affordability of FCS was always in doubt and, in the end, was a contributing factor to the decision to cancel the program. Ultimately, FCS affordability depended on two factors: the actual cost of the program and the availability of funds. The Army could not provide confident cost estimates for the actual costs of FCS because of the low levels of knowledge within the program. Instead, it indicated a willingness to accept the program's high risks and make trade-offs in requirements for FCS and other programs to accommodate FCS's growing costs. When the Army's predicted costs for FCS rose from \$92 billion in 2003 to \$159 billion by 2009, the Army indicated that it would defer upgrades to current force systems, such as the Abrams Tank and Bradley Fighting Vehicle, to free up funds for FCS. In the end, the competition for funds—within the Army, among Army programs and other DOD programs, and among DOD programs and other federal government needs—was a factor in the decision to end the FCS program. According to a September 2009 letter from the Under Secretary of Defense for Acquisition, Technology and Logistics, the FCS acquisition could not be developed and produced within existing resources. Additionally, the Under Secretary noted that based on an evaluation of the overall priorities for Army modernization, developing and procuring FCS brigades was not fiscally viable given DOD priorities.

**Action being taken:** The Army has not yet fully defined major predictors—content, pace, and costs—for long-term affordability of ground force modernization efforts. It has indicated that work is ongoing to develop priorities and resource plans for fiscal years 2011 through 2015, including fielding capability packages, incrementally improving the network, and establishing a new GCV program. The Army has also indicated that funding will drive capability trades. For example, the content and quantity of capability packages could be decreased or increased depending on available funding. Additionally, the Director of Cost Analysis and Program Evaluation prepared an independent cost assessment for Increment 1. This independent estimate was very close to the Army's cost position for Increment 1 development and production.

In its fiscal year 2011 budget request, the Army asked the Congress to approve funding for further Increment 1 development and production, Increment 2 development, GCV development, and some network development. As we have noted, at this time, detailed plans for these efforts are still being developed and may not be available until at least later in fiscal year 2010 as those plans are solidified and approved.

Transition Away from Industry-  
Led Integration

**Lesson:** In 2003, the Army contracted with an LSI for FCS because of the program's ambitious goals and the Army's belief that it did not have the

---

capacity to manage the program. The Army did not have the expertise to develop the FCS information network or enough people to support the program had it been organized into separate program offices. Through its relationship with the LSI, the Army believed that it found a partner that could help to define and develop FCS and reach across the Army's organizations. In our 2007 report, we pointed out that the close partnerlike relationship between the Army and the LSI posed risks to the Army's effective management and oversight of the FCS program.<sup>9</sup> As a result, the June 2009 acquisition decision memorandum that outlined plans to cancel the FCS program also articulated a desire to move away from industry-led integration activities.

**Action being taken:** While Army officials have acknowledged the Under Secretary's direction to transition away from reliance on the LSI and affirmed their desire to comply with that direction, the transition will not happen right away. The Army is beginning a deliberate process to transition system engineering and integration activities from the LSI to the government. For example, Army officials stated that the Army will be contracting with the LSI for the procurement of the first three brigade sets of Increment 1 equipment.<sup>10</sup> When these systems move into full-rate production, the Army may be in a better position to contract directly with the original equipment manufacturers and without the assistance of an LSI. According to the Army, the development of Increment 2 may be jointly managed by the LSI and the original equipment manufacturers. Likewise, the first lot of Increment 2 production may be jointly managed by the LSI and the original equipment manufacturers; the other production lots may be managed directly by the original equipment manufacturers.

In September 2009, the Army established the Program Executive Office for Integration to oversee coordination of the three separate but integrated programs and the network development. Roles and responsibilities have not yet been fully defined. According to Army officials, the office will be modeling the various brigade architectures and infrastructures to better understand how they currently function and to facilitate adding capabilities to the brigades. They also expect the office to work with the

---

<sup>9</sup>GAO, *Defense Acquisitions: Role of Lead Systems Integrator on Future Combat Systems Program Poses Oversight Challenges*, [GAO-07-380](#) (Washington, D.C.: June 6, 2007).

<sup>10</sup>The Boeing Company served as the LSI on the FCS contract. According to Army officials, Boeing's role on ground force modernization efforts will be more akin to that of a prime contractor. Consequently, the Army no longer refers to Boeing as an LSI.

---

individual acquisition programs to ensure that the programs are properly integrated with other elements of each capability package and equipment already fielded in the various brigades. As the integration issues are addressed, the individual acquisition programs will be responsible for execution. Additionally, the office will perform system engineering and integration via in-house capabilities and supplemented by federally funded research and development centers or contractors for the capability packages. The Army is also establishing an organization above the program executive office level to integrate ongoing network acquisition efforts to better capture new network technologies, expand technologies in the field so that they work better together, and provide better networking capability to more units. One way that the Army will be doing this is through establishing network standards and interface requirements.

## Improve Oversight

**Lesson:** DOD largely accepted the FCS program and its changes as defined by the Army, even though it varied widely with the best practices embodied in DOD's own acquisition policies. Until late in the FCS program, DOD passed on opportunities to hold the FCS program accountable to more knowledge-based acquisition principles. Despite the fact that the program did not meet the requisite criteria for starting an acquisition program, DOD approved the program's entrance into system development and demonstration in 2003. DOD later reevaluated the decision and decided to hold a follow-on review with a list of action items the program had to complete in order to continue. However, this review never occurred, and the FCS program continued as originally planned. In addition, DOD allowed the Army to use its own cost estimates rather than independent—and often higher—cost estimates when submitting annual budget requests.

**Action being taken:** DOD appears to be more resolute in some of its oversight responsibilities for the emerging post-FCS efforts. For instance, at an October 2009 DOD review, the Army offered preliminary plans for post-FCS efforts. While DOD agreed to schedule an Increment 1 production decision and a GCV materiel development decision, DOD also noted that additional clarity was needed for development and procurement of follow-on items beyond Increment 1, as well as for transition of the integration activities from the current FCS contractors to the Army. DOD noted in its decision memorandum that it requires these plans before it will approve any acquisition strategy for modernization activities other than Increment 1 and GCV development. Additionally, while DOD did not hold the Army accountable to knowledge-based principles when it approved Increment 1 for low-rate production, DOD did limit low-rate initial procurement quantities to one brigade's worth of

---

## Create a Better Incentive and Award Fee Contract Structure

equipment. DOD also required the Army to prepare for two additional reviews in 2010—one review to provide a status report on non-line-of-sight launch system testing and a report detailing the network maturity plan for Increment 1, and another review for examining the results of additional testing performed on Increment 1 systems. Additionally, DOD required the Army to fund Increment 1 acquisition efforts to the cost estimate prepared by the Director, Cost Assessment and Program Evaluation.

**Lesson:** In the near future, the Army will likely be awarding development contracts for the emerging post-FCS programs. As we noted in 2005, DOD award fees do not always link to acquisition outcomes.<sup>11</sup> Additionally, prior defense acquisition contracts, including the FCS contract, have not complied with preferred DOD guidance for structuring incentive and award fees. In 2007, we reported that the Army's contract with the FCS LSI contained fee provisions that did not tie fees to demonstrated performance, and it rewarded the LSI too early in the development process.<sup>12</sup> Specifically, we reported that the Army would be paying 80 percent of the total incentive fee before the LSI conducted the critical design review. We viewed this arrangement as risky because most of a program's cost growth occurs after the critical design review.

**Action being taken:** In April 2009, when the Secretary of Defense announced his plans to significantly change the FCS program, he noted that he was troubled by the terms of the contract, particularly in its very unattractive fee structure that gives the government little leverage to promote cost efficiency. Previously, in an April 2008 memorandum, DOD stated that a more typical fee arrangement would be significantly less than what the Army featured in the FCS contract, and that fees should be based on demonstrated performance to the government. In September 2009, DOD issued another memorandum to the military services, instructing the acquisition officials to (1) be more consistent in applying the department's guidance, (2) be more judicious in their reviews of fees to ensure that they are tied to demonstrated performance, and (3) collect additional fee data. These two memorandums indicate that the department appears focused on achieving more disciplined award and incentive fee practices. In addition, DOD officials have recently stated that they expect future Army contracts for ground force modernization to incorporate a fee structure

---

<sup>11</sup>GAO, *Defense Acquisitions: DOD Has Paid Billions in Award and Incentive Fees Regardless of Outcome*, [GAO-06-66](#) (Washington, D.C.: Dec. 19, 2005).

<sup>12</sup>[GAO-07-380](#).

---

with a “more classic and reasonable” form, in accordance with the Secretary’s direction and the September 2009 memorandum.

In October 2009, the Army negotiated a contract modification for additional development of Increment 1 systems. The Army will soon be contracting for the procurement of those systems. Later, the Army will be awarding contracts for GCV development. At this point, it is unclear how and to what extent the Army will be applying the new fee guidance.

---

## Conclusions

Army and DOD officials made a very difficult decision when they canceled what was the centerpiece of Army modernization—the FCS program. As they transition away from the FCS concept, both the Army and DOD have an opportunity to improve the likely outcomes for the Army’s ground force modernization initiatives by adhering closely to recently enacted acquisition reforms and by seeking to avoid the numerous acquisition pitfalls that plagued FCS. As DOD and the Army proceed, they should keep in mind the Secretary of Defense’s admonition about the new ground vehicle modernization program: “get the acquisition right, even at the cost of delay.” Based on the preliminary plans, we see a number of good features. For example, we applaud the Army’s decision to pursue an incremental acquisition approach for its post-FCS efforts. However, it is vitally important that each of those incremental efforts adheres to knowledge-based acquisition principles and strikes a balance between what is needed, how fast it can be fielded, and how much it will cost. Moreover, the acquisition community needs to be held accountable for expected results, and DOD and the Army must not be willing to accept whatever results are delivered regardless of military utility.

We are concerned that in their desire for speedy delivery of emerging equipment to our warfighters in the field, DOD and the Army did not strike the right balance in prematurely approving low-rate initial production of Increment 1 of brigade combat team modernization. Although the Army will argue that it needs to field these capabilities as soon as possible, none of these systems has been designated as urgent and it is not helpful to provide early capabilities to the warfighter if those capabilities are not technically mature and reliable. If the Army moves forward too fast with immature Increment 1 designs, this could cause additional delays as the Army and its contractors concurrently address technology, design, and production issues. Production and fielding is not the appropriate phase of acquisition to be working on such basic design issues.

---

While the Army has not yet finalized its plans for its post-FCS initiatives, one thing is certain—these programs are likely to require significant financial investments. In its fiscal year 2011 budget request, the Army has asked the Congress to approve funding for Increment 1 development and production, Increment 2 development, GCV development, and some network development. At this time, detailed plans for these efforts are still being developed and were not yet available as of early January 2010. This means that the Congress will have limited information on which to base its funding decisions. The Army's fiscal year 2011 budget request does not provide sufficient details to allay all concerns. DOD and the Army need to clearly define and communicate plans in order to ensure broad agreement among all stakeholders, including the Congress. It appears that the Army's plans may not be solidified until well beyond the point when the congressional defense committees will have marked up the fiscal 2011 defense authorization bill.

---

## Recommendations for Executive Action

In order to ensure that only technically mature and reliable capabilities are fielded to the warfighters, we recommend that the Secretary of Defense mandate that the Army correct the identified maturity and reliability issues with the Increment 1 network and systems prior to approving any additional lots of the Increment 1 network and systems for production. Specifically, the Army should ensure that the network and the individual systems have been independently assessed as fully mature, meet reliability goals, and have been demonstrated to perform as expected using production-representative prototypes. We also recommend that the Secretary of the Army not field the Increment 1 network or any of the Increment 1 systems until the identified maturity and reliability issues have been corrected.

In order to enhance congressional visibility into the Army's plans in this area, we also recommend that the Secretary of Defense direct the Army to submit a comprehensive report to the Congress before the end of fiscal year 2010 on its ground force modernization investment, contracting, and management strategies.

---

## Agency Comments and Our Evaluation

DOD concurred with, and provided comments to, all our recommendations. Regarding our recommendation to correct Increment 1 maturity and reliability issues prior to approving additional production, DOD stated that the need to correct those issues has been communicated to the Army. DOD also asserts that all Increment 1 systems will be tested in their production configuration, and performance will be independently

---

assessed against capability requirements prior to approving production of any additional lots of Increment 1 systems. DOD's comments concisely summarize the instructions that the Under Secretary of Defense for Acquisition, Technology and Logistics included in his December 2009 acquisition decision memorandum that approved low-rate initial production for the first brigade's worth of infantry brigade combat team systems. The memorandum includes a number of sensible provisions, such as (1) an aggressive risk reduction plan to grow and demonstrate network maturity and reliability, (2) monthly reporting requirements for network and system reliability improvements, (3) a comprehensive precision mix analysis to demonstrate the cost-effectiveness of the non-line-of-sight launch system, (4) the use of a configuration steering board to examine reliability and military utility, and (5) a plan to compare the effectiveness of operational units with and without the Increment 1 systems and network. However, neither the memorandum nor DOD's comments to this report indicated the minimally acceptable standards that must be met in order to proceed with additional procurement lots of the Increment 1 systems and network. The Army has many Increment 1 development and testing activities planned for the coming months and we intend to monitor their progress closely.

Regarding our recommendation that the Army not field the Increment 1 systems and network until maturity and reliability issues had been corrected, DOD stated that Increment 1 systems would not be fielded until performance is sufficient to satisfy the warfighter's capability requirements. We believe it will be vitally important that (1) Increment 1 systems and network clearly demonstrate their ability to fully satisfy the needs of the warfighter and (2) DOD and the Army not be willing to accept whatever acquisition results are delivered regardless of their military utility. Again, we intend to follow the Army and DOD's activities and actions in the coming months.

Regarding our recommendation to submit a comprehensive report to the Congress on Army ground force modernization investment, contracting, and management strategies, DOD stated that the Army will provide its annual *Army Modernization Strategy* no later than the third quarter of fiscal year 2010. According to DOD, this strategy document, in conjunction with the 2010 *Army Weapons Systems Handbook* and the 2011 budget request material, provides the Army's investment, contracting, and management strategies for ground force modernization. In making this recommendation, we felt that the Army had made significant changes in its investment, contracting, and management strategies as it moved away from the FCS program. We felt that a comprehensive report on its new

---

strategies for ground force modernization would be enlightening to the Congress. In the coming months, we will review the materials promised by the Army to determine if they provide adequate knowledge to the Congress.

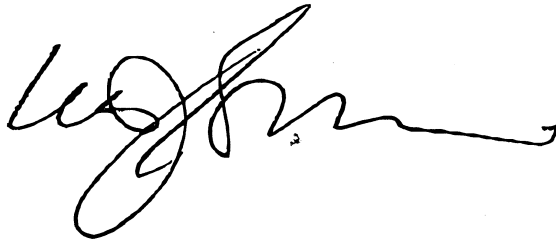
DOD's comments are reprinted in appendix II.

We received other technical comments from DOD, which have been addressed in the report.

---

We are sending copies of this report to the Secretary of Defense; the Secretary of the Army; and the Director, Office of Management and Budget. This report also is available at no charge on the GAO Web site at <http://www.gao.gov>.

Please contact me on (202) 512-4841 or [sullivanm@gao.gov](mailto:sullivanm@gao.gov) if you or your staff have any questions concerning this report. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. The major contributors are listed in appendix III.

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

Michael J. Sullivan  
Director  
Acquisition and Sourcing Management

---

# Appendix I: Scope and Methodology

---

To outline the Army's preliminary post-Future Combat System (FCS) plans, we obtained and reviewed proposed plans for the Army's new modernization approach. We compared those plans against the FCS operational concept and acquisition approach. We interviewed officials responsible for carrying out the FCS cancellation, including officials from the Office of the Under Secretary of Defense for Acquisition, Technology and Logistics and the Program Executive Office for Integration (formerly the FCS Program Office). We also met with officials responsible for reexamining current-force capability gaps and formulating the new operational concept, including officials from the Army's Training and Doctrine Command, the Future Force Integration Directorate, and the Army Evaluation Task Force.

To identify the challenges and opportunities the Department of Defense (DOD) and the Army will need to address as they proceed with Army ground force modernization efforts, we reviewed relevant Army and DOD documents, including the Secretary of Defense's April 6, 2009, announcement on restructuring FCS and the June 23, 2009, acquisition decision memorandum that implemented the Secretary's proposed restructure; the Army Capstone Concept; the Director, Operational Test and Evaluation's Fiscal Year 2009 Annual Report; the Comprehensive Lessons Learned White Paper; and the Army Modernization White Paper. Additionally, we reviewed recent acquisition reforms, including DOD Instruction 5000.02, *Operation of the Defense Acquisition System*; the Weapon Systems Acquisition Reform Act of 2009 (Public Law No. 111-23); and other legislative initiatives. In developing lessons learned from the FCS program, we reviewed current Army ground force modernization plans and assessed them against FCS approaches and outcomes, best practices, and the latest acquisition policies and reforms. In our assessment of the Army's modernization approach, we used the knowledge-based acquisition practices drawn from our body of past work as well as DOD's acquisition policy and the experiences of other programs. We interviewed officials responsible for providing independent assessments of technologies, testing, networking, and systems engineering. This included officials from the Office of the Secretary of Defense's Cost Assessment and Program Evaluation Office; Office of the Director, Defense Research and Engineering; Office of the Assistant Secretary of Defense (Networks and Information Integration); and Office of the Director, Operational Test and Evaluation.

We discussed the issues presented in this report with officials from the Army and the Secretary of Defense and made changes as appropriate. We conducted this performance audit from March 2009 to March 2010 in

---

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

# Appendix II: Comments from the Department of Defense



ACQUISITION,  
TECHNOLOGY  
AND LOGISTICS

## OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON  
WASHINGTON, DC 20301-3000

MAR 11 2010

Mr. Michael J. Sullivan  
Director, Acquisition and Sourcing Management  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, DC 20548

Dear Mr. Sullivan:

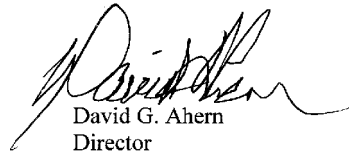
This is the Department of Defense response to the GAO draft report, GAO-10-406, "DEFENSE ACQUISITIONS: Opportunities Exist to Position Army's Post-FCS Modernization Efforts for Success," dated February 8, 2010 (GAO Code 120824).

The report recommends that: (1) the Secretary of Defense instruct the Army to correct the identified maturity and reliability issues with the Increment 1 network and systems prior to approving additional system procurement; (2) the Secretary of the Army not field the Increment 1 network or systems until the identified maturity and reliability issues have been corrected; and (3) the Secretary of Defense direct the Army to submit a comprehensive report to Congress on its ground force modernization investment, contracting, and management strategies.

The Department concurs with the GAO recommendations and our comments are enclosed. Detailed technical comments were provided separately.

The Department appreciates the opportunity to comment on the draft report. For further questions concerning this report, please contact Ms. Anne Swanek, [Anne.Swanek@osd.mil](mailto:Anne.Swanek@osd.mil), 703-693-9879.

Sincerely,



David G. Ahern  
Director  
Portfolio Systems Acquisition

Enclosure:  
As stated

GAO DRAFT REPORT DATED FEBRUARY 8, 2010  
GAO CODE 120824/GAO-10-406

**“DEFENSE ACQUISITIONS: OPPORTUNITIES EXIST TO POSITION  
ARMY’S POST-FCS MODERNIZATION EFFORTS FOR SUCCESS”**

**DEPARTMENT OF DEFENSE COMMENTS  
TO THE GAO RECOMMENDATIONS**

**RECOMMENDATION 1:** The GAO recommended that the Secretary of Defense mandate that the Army correct the identified maturity and reliability issues with the Increment 1 network and systems prior to approving any additional lots of the Increment 1 network and systems for production. Specifically, the Army should ensure that the network and individual systems have been independently assessed as fully mature, meet reliability goals, and have been demonstrated to perform as expected using production-representative prototypes.

**DOD RESPONSE:** Concur. The need to correct identified maturity and reliability issues with the Increment 1 network and systems has been communicated to the Army. Prior to approving any additional lots of Increment 1 network and systems for production they will be tested in their intended production configuration and performance of all systems will be independently assessed relative to capability requirements.

**RECOMMENDATION 2:** The GAO recommended that the Secretary of the Army not field the Increment 1 network or any of the Increment 1 systems until the identified maturity and reliability issues have been corrected.

**DOD RESPONSE:** Concur. The Army will not field the Increment 1 systems until system performance is sufficient to satisfy the capability requirements of the Warfighter.

**RECOMMENDATION 3:** The GAO recommended that the Secretary of Defense direct the Army to submit a comprehensive report to the Congress before the end of fiscal year 2010 on its ground force modernization investment, contracting, and management strategies.

**DOD RESPONSE:** Concur. The Army will provide their annual Army Modernization Strategy no later than 3<sup>rd</sup> quarter fiscal year 2010 that will support the 2011 President’s budget. This strategy, in conjunction with the 2010 Army Weapons Systems Handbook and the 2011 budget materials related to ground force acquisitions, provides the Army’s investment, contracting, and management strategies for ground force modernization. The investment, contracting and management strategies for the acquisitions which will provide for ground force modernization are established per acquisition law and policy for the

individual programs. Additionally, the Army Acquisition Executive has recently established a Program Executive Officer for Integration with responsibility for coordinating acquisitions to support the Army's capability package fielding. The plans for contracting and management strategies to support this integration effort are still maturing and will be aligned with acquisition plans to support the Department's fiscal year 2012 budget.

---

# Appendix III: GAO Contact and Staff Acknowledgments

---

## GAO Contact

Michael J. Sullivan, (202) 512-4841 or [sullivanm@gao.gov](mailto:sullivanm@gao.gov)

---

## Acknowledgments

In addition to the contact named above, the following staff members made key contributions to the report: William R. Graveline, Assistant Director; William C. Allbritton; Noah B. Bleicher; Helena Brink; Tana M. Davis; Marcus C. Ferguson; and Robert S. Swierczek.

---

# Related GAO Products

---

*Defense Acquisitions: Issues to be Considered for Army's Modernization of Combat Systems.* [GAO-09-793T](#). Washington, D.C.: June 16, 2009.

*Defense Acquisitions: Assessments of Selected Weapon Programs.* [GAO-09-326SP](#). Washington, D.C.: March 30, 2009.

*Defense Acquisitions: Key Considerations for Planning Future Army Combat Systems.* [GAO-09-410T](#). Washington, D.C.: March 26, 2009.

*Defense Acquisitions: Decisions Needed to Shape Army's Combat Systems for the Future.* [GAO-09-288](#). Washington, D.C.: March 12, 2009.

*Defense Acquisitions: 2009 Review of Future Combat System Is Critical to Program's Direction.* [GAO-08-638T](#). Washington, D.C.: April 10, 2008.

*Defense Acquisitions: 2009 Is a Critical Juncture for the Army's Future Combat System.* [GAO-08-408](#). Washington, D.C.: March 7, 2008.

*Defense Acquisitions: Future Combat System Risks Underscore the Importance of Oversight.* [GAO-07-672T](#). Washington, D.C.: March 27, 2007.

*Defense Acquisitions: Key Decisions to Be Made on Future Combat System.* [GAO-07-376](#). Washington, D.C.: March 15, 2007.

*Defense Acquisitions: Improved Business Case Key for Future Combat System's Success.* [GAO-06-564T](#). Washington, D.C.: April 4, 2006.

*Defense Acquisitions: Improved Business Case Is Needed for Future Combat System's Successful Outcome.* [GAO-06-367](#). Washington, D.C.: March 14, 2006.

*Defense Acquisitions: Future Combat Systems Challenges and Prospects for Success.* [GAO-05-428T](#). Washington, D.C.: March 16, 2005.

*Defense Acquisitions: The Army's Future Combat Systems' Features, Risks, and Alternatives.* [GAO-04-635T](#). Washington, D.C.: April 1, 2004.

*Issues Facing the Army's Future Combat Systems Program.* [GAO-03-1010R](#). Washington, D.C.: August 13, 2003.

*Best Practices: Better Matching of Needs and Resources Will Lead to Better Weapon System Outcomes.* [GAO-01-288](#). Washington, D.C.: March 8, 2001.

---

## GAO's Mission

The Government Accountability Office, the audit, evaluation, and investigative arm of Congress, exists to support Congress in meeting its constitutional responsibilities and to help improve the performance and accountability of the federal government for the American people. GAO examines the use of public funds; evaluates federal programs and policies; and provides analyses, recommendations, and other assistance to help Congress make informed oversight, policy, and funding decisions. GAO's commitment to good government is reflected in its core values of accountability, integrity, and reliability.

---

## Obtaining Copies of GAO Reports and Testimony

The fastest and easiest way to obtain copies of GAO documents at no cost is through GAO's Web site ([www.gao.gov](http://www.gao.gov)). Each weekday afternoon, GAO posts on its Web site newly released reports, testimony, and correspondence. To have GAO e-mail you a list of newly posted products, go to [www.gao.gov](http://www.gao.gov) and select "E-mail Updates."

---

## Order by Phone

The price of each GAO publication reflects GAO's actual cost of production and distribution and depends on the number of pages in the publication and whether the publication is printed in color or black and white. Pricing and ordering information is posted on GAO's Web site, <http://www.gao.gov/ordering.htm>.

Place orders by calling (202) 512-6000, toll free (866) 801-7077, or TDD (202) 512-2537.

Orders may be paid for using American Express, Discover Card, MasterCard, Visa, check, or money order. Call for additional information.

---

## To Report Fraud, Waste, and Abuse in Federal Programs

Contact:

Web site: [www.gao.gov/fraudnet/fraudnet.htm](http://www.gao.gov/fraudnet/fraudnet.htm)

E-mail: [fraudnet@gao.gov](mailto:fraudnet@gao.gov)

Automated answering system: (800) 424-5454 or (202) 512-7470

---

## Congressional Relations

Ralph Dawn, Managing Director, [dawnr@gao.gov](mailto:dawnr@gao.gov), (202) 512-4400  
U.S. Government Accountability Office, 441 G Street NW, Room 7125  
Washington, DC 20548

---

## Public Affairs

Chuck Young, Managing Director, [youngc1@gao.gov](mailto:youngc1@gao.gov), (202) 512-4800  
U.S. Government Accountability Office, 441 G Street NW, Room 7149  
Washington, DC 20548

