United States Government Accountability Office

GAO

Testimony

Before the Subcommittee on Airland, Committee on Armed Services, U.S. Senate

For Release on Delivery
Expected at 2:00 p.m. EDT
Thursday, April 15, 2010

# DEFENSE ACQUISITIONS

# Opportunities and Challenges for Army Ground Force Modernization Efforts

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Acquisition and Sourcing Management

April 15, 2010

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## Opportunities and Challenges for Army Ground Force Modernization Efforts

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Highlights

Highlights of GAO-10-603T, a testimony before the Subcommittee on Airland, Committee on Armed Services, U.S. Senate

### 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 acquisition program. As a result, the Army is outlining a new approach to ground force modernization. This statement outlines the Army's preliminary post-FCS actions and identifies the challenges the Department of Defense (DOD) and the Army must address as they proceed. This testimony is based on GAO's report on the Army's Ground Force Modernization effort released on March 15, 2010. It emphasizes the December 2009 decision to begin low-rate initial production for Increment 1 of the Brigade Combat Team Modernization.

### What GAO Recommends

In its March report, GAO recommended 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 recommended 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.

View GAO-10-603T or key components.
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### What GAO Found

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 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 an approved acquisition program that will produce and field the initial increment of the FCS spinout equipment, which includes unmanned aerial and ground vehicles as well as unattended sensors and munitions. It has preliminary plans for two other major defense acquisition programs to (1) define and develop follow-on increments and (2) develop a new ground combat vehicle (GCV). The individual systems within Increments 1 and 2 are to be integrated with a preliminary version of an information network. Currently, the Army is continuing selected development work—primarily that related to Increments 1 and 2 and the information network—under the existing FCS development contract. The Army has recently released a request for proposals for the technology development phase of the proposed GCV development effort. The Army's projected investment in Increments 1 and 2 and GCV is estimated to be over $24 billion through fiscal year 2015.

With these modernization efforts at an early stage, DOD and the Army face the immediate challenge of setting them on the best possible footing by buying the right capabilities at the best value. DOD and the Army have an opportunity to better position these efforts by utilizing an enhanced body of acquisition legislation and DOD policy reforms—which now incorporate many of the knowledge-based practices that GAO has previously identified—as well as lessons learned from the FCS program. Preliminary plans suggest that the Army and DOD are strongly considering lessons learned. However, DOD recently approved the first of several planned low-rate initial production lots of Increment 1 despite having acknowledged that the systems and network were immature, unreliable, and not performing as required. That decision reflects DOD's emphasis on quickly providing new capabilities to combat units. This decision did not follow knowledge-based acquisition practices and runs the risk of delivering unacceptable equipment to the warfighter and trading off acquisition principles whose validity has been so recently underscored.

The Army needs to seize the opportunity of integrating acquisition reforms, knowledge-based acquisition practices, and lessons learned from FCS into future modernization efforts to increase the likelihood of successful outcomes.

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss some of the Department of the Army's ground force modernization efforts as it moves away from the now-canceled Future Combat System (FCS) program. My statement today is based on the work we conducted over the last year in response to a request from the Subcommittee on Air and Land Forces, House Committee on Armed Services. This statement focuses on the Army's post-FCS acquisition plans. In particular, it emphasizes the December 2009 decision to begin low-rate initial production for Increment 1 of the Brigade Combat Team Modernization. Our recent report on the Army's ground force modernization efforts provides additional information on the Army's efforts.[1]

This statement is based on work we conducted from March 2009 through 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.

## Background

Since it started development in 2003, FCS has been 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.

[1]GAO, *Defense Acquisitions: Opportunities Exist to Position Army's Ground Force Modernization Efforts for Success*, GAO-10-406 (Washington, D.C.: Mar. 15, 2010).

As we reported in 2009,[2] the FCS program was immature and unable to meet the Department of Defense's (DOD) own standards for technology and design from the start. 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, 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 vs. 2009)**

| | 2003 | 2009 | |
|---|---|---|---|
| Cost estimate (Fiscal year 2009 billions of dollars) | Research and development: $20.9 | Research and development: $29.0 | $8.1 billion increase |
| | Procurement: $68.2 | Procurement: $129.3 | $61.1 billion increase |
| | Total: $89.8 | Total: $159.3 | $69.5 billion increase |
| Schedule (Development start to initial operational capability) | 7 yr 6 mo | 12 yr 3 mo | Over 4-1/2 years added |
| Requirements | Undefined | System-level requirements not matched with emerging designs | Persistent gaps |
| Software lines of code | 34 million | 114 million + | Tripled in size |
| Projected maturity date of critical technologies[a] | 2006 | 2009 | 3 years added |

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

[a]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 a Technology Readiness Level 7, a prototype demonstrated in a realistic environment, are mature.

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

In April 2009, the Secretary of Defense proposed a significant restructuring of the FCS program to lower risk and address more near-term combat needs. The Secretary noted significant concerns that the FCS program's vehicle designs—where greater information awareness was expected to compensate for less armor, resulting 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.

In June 2009, the Under Secretary of Defense for Acquisition, Technology and Logistics 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).

Subsequently, 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 modernization efforts.

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

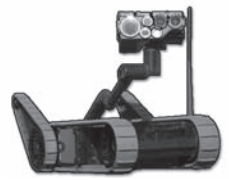
The Army is implementing DOD direction and redefining its overall modernization strategy as a result of the Secretary of Defense's decisions to significantly restructure the FCS program. It is transitioning from the FCS long-term acquisition orientation to a shorter-term approach that biennially develops and fields new increments of capability within capability packages. It now has an approved acquisition program that will produce and field the initial increment of the FCS spinout equipment, which includes unmanned aerial and ground vehicles as well as unattended sensors and munitions, and preliminary plans for two other major defense acquisition programs to define and develop follow-on increments and develop a new GCV. The Army also plans to integrate network capabilities across its brigade structure and to develop and field upgrades to other existing ground force equipment.

- 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 a range extension relay.[3] 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.[4] 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 brigades with the Increment 1 network and systems, supported by an independent cost estimate, would be about $3.5 billion.

[3]The system-of-systems common operating environment is the operating environment that serves as middleware between operating systems and software applications.

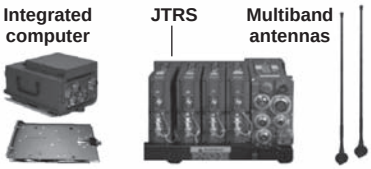
[4]The Army had developed a concept of continual modernization of ready-to-go capabilities through biennial deliveries of what are called capability packages.

**Figure 2: Increment 1 Systems**



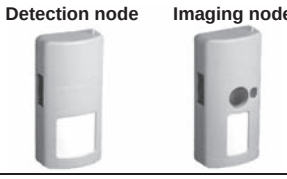
***Small unmanned ground vehicle Block 1***

Provides enhanced situational awareness and force protection through reduced exposure to hazards during soldier-intensive and/or high-risk functions.



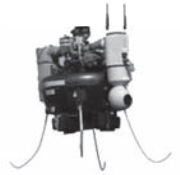

***Network integration kit***

Provides enhanced communications and situational awareness through radios with multiple software waveforms, connections to unattended sensors, and links to existing networking capabilities.




***Urban unattended ground sensor***

Provides force protection in an urban setting through a leave-behind, network-enabled reporting system of movement and/or activity in cleared areas.



***Class 1 unmanned aerial vehicle Block 0***

Provides independent, soldier-level aerial reconnaissance, surveillance, and target acquisition capability.

***Non-line-of-sight launch system***

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.

***Tactical unattended ground sensor***

Provides enhanced situational awareness, force protection, and early warnings in a tactical setting through cross-cues to sensors and weapon systems.

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

- For the second acquisition program, Increment 2 of brigade modernization, the Army has preliminary plans to mature Increment 1 capabilities—potentially demonstrating full FCS threshold requirements—

as well as contributing further developments of the system-of-systems common operating environment and battle command software, and demonstrating and fielding 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. Army officials indicated that they are currently working to define the content, cost, and schedule for Increment 2 with a low-rate initial production decision planned for fiscal year 2013 and a Defense Acquisition Board review expected later in fiscal year 2010.

- 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. DOD and the Army met in February 2010 to make a materiel development decision on the GCV, and the Army was subsequently authorized to release a request for proposals for GCV technology development.[5] 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 development in September 2010.[6] 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

[5]A materiel development decision is a review that is the formal entry point into the acquisition process and is mandatory for all programs. After the materiel development decision, the Milestone Decision Authority may approve entry into the acquisition management system at any point consistent with phase-specific entrance criteria and statutory requirements.

[6]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.

subsystems. In the technology development phase, the contractors will be expected to fabricate and evaluate several subsystem prototypes, including an automotive test rig and a mine blast test asset. The contractors will also be expected to develop a near-critical design review level design for their integrated vehicle and, in the process, inform the GCV concept development document. That document is expected to be finalized at the Milestone A decision point. Competitive prototypes will be fabricated and tested during the engineering and manufacturing development phase. 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 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 upon 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 its network development plans later in 2010. (See table 1.)

**Table 1: Army Budget Requests for Fiscal Year 2011 and Fiscal Years 2012-2015 for Increments 1 and 2 and GCV**

| Dollars in millions | | |
|---|---|---|
| | **Fiscal year 2011** | **Fiscal years 2012-2015** |
| **Research and Development** | | |
| Increments 1and 2 | $1,568.0 | $4,126.0 |
| GCV | 934.4 | 6,245.4 |
| **Subtotal** | **$2,502.4** | **$10,371.4** |
| **Procurement** | | |
| Increments 1and 2 | $682.6 | $9,840.5 |
| GCV | 0 | 876.2 |
| **Subtotal** | **$682.6** | **$10,716.7** |
| **Total** | **$3,185.0** | **$21,088.1** |

Source: Fiscal Year 2011 President's Budget.

As shown in table 1, the Army is proposing to make substantial investments in its post-FCS acquisition initiatives. For fiscal year 2011, the Army is proposing research and development funding of about $2.5 billion and procurement funding of about $683 million. For the following 4 years (fiscal years 2012-2015), the Army plans additional research and development investments of about $10.4 billion and procurement investments of about $10.7 billion.

## Recent Army Contract Actions Related to Its Post-FCS Efforts

For the time being, the Army is continuing selected development work—primarily that related to Increment 1, Increment 2, and network development—under the existing FCS development contract. In October 2009, the Army negotiated a modification to the existing contract that clarified the development work needed for the brigade modernization efforts. The Army previously awarded a contract for long lead item procurement for Increment 1. A modification to that contract was recently issued to begin low-rate initial production of the Increment 1 systems. The Army has also recently released a request for proposals for the technology development phase of the proposed GCV development effort.

Contractor proposals for GCV are expected to include plans, solutions, or both for, among other things, survivability (hit avoidance system, armor, and vehicle layout) and mobility (propulsion and power generation and cooling). According to the request for proposals, the proposals can utilize prior Army investment in armor recipes, but the contractors will not get an inherent advantage for doing so. Each solution will be based on its own

merits. Contractor proposals are to be submitted in April 2010 and contract awards, for cost-plus type contracts, are to be awarded after the Milestone A decision in September 2010.

## Acquisition Direction and FCS Lessons Learned Offer Opportunities to Promote Successful Outcomes, but Decision to Proceed with Initial Production Is Premature

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, 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. 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 and unreliable and cannot perform as required.

### New Acquisition Reforms Point Way to Lower Risk

The body of acquisition legislation and DOD policy reforms introduced since FCS started in 2003 incorporates nearly all of the knowledge-based practices we identified in our previous work (see table 2). For example, DOD acquisition policy 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 2: Comparison of Controls Used in Best Practices Model and DOD Policy**

| Commercial best practices model | May 2003 DOD policy | December 2008 DOD policy |
|---|---|---|
| **Knowledge point 1:** 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 |
| **Knowledge point 2:** 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 | | [a] |
| 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 | | [b] |
| 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 |
| **Knowledge point 3:** 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 | | [c] |
| 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).

[a]DOD criteria do not specify the percentage of drawings to be completed at the critical design review.

[b]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.

[c]DOD criteria establish reliability goals, but do not specify testing on production-representative prototypes.

As shown in table 2, 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.

**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.

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 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.

With one notable exception, 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, a meeting was recently held to consider a materiel development decision for the GCV, and the Army is proposing to conduct a preliminary design review on GCV before its planned Milestone B decision point. Additionally, a configuration steering board is planned for later in 2010 to address reliability and military utility of infantry brigade systems.

## Army's Decision to Proceed with Low-Rate Initial Production for Increment 1 Increases Risk

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 improvements that the Army needed to make

or that those improvements are a prerequisite for the Under Secretary 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,[7] 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. 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 being 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.

[7] GAO-09-288.

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. It concluded that, with the exception of the non-line-of-sight launch system, which had 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.

In recent testimony before a House subcommittee, the Director, Operational Test and Evaluation stated that flight testing of the non-line-of-sight launch system was conducted in January and February 2010. In that testing, two of six missiles fired achieved target hits and four missed their targets. The Army informed the Director that Failure Review Board investigations of the flight failures are under way.

## Concluding Remarks

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 with these significant financial investments, 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, such as 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 modernization. Although the Army argues that it needs to field these capabilities as soon as possible, none of these systems have been designated as urgent and it is not helpful to provide early capability to the warfighter if those capabilities are not technically mature and reliable. If the Army moves forward too fast with immature Increment 1 designs, then that 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.

In our recent report, we made recommendations intended to reduce the risk of proceeding into production with immature technologies.[8] In that regard, we 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 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 recommended that the Secretary of the Army should not allow fielding of the Increment 1 network or any of the Increment 1 systems until the identified maturity and reliability issues have been corrected.

In response, DOD concurred with our recommendations and stated that the need to correct those issues has been communicated to the Army. DOD also asserted that Increment 1 systems will be tested in their production configuration, and performance will be independently assessed against capability requirements prior to DOD approving production of any additional lots of Increment 1 systems. The Army has many Increment 1 development and testing activities planned for the coming months and we intend to monitor their progress closely. DOD also stated that Increment 1 systems would not be fielded until performance is sufficient to satisfy the warfighter's capability requirements. It is essential that (1) Increment 1 network and systems 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.

[8]GAO-10-406.

Mr. Chairman, this concludes my prepared statement. I would be happy to answer any questions you or members of the subcommittee may have.

## Contacts and Acknowledgments

For future questions about this statement, please contact Michael J. Sullivan at (202) 512-4841 or sullivanm@gao.gov. Contacts for our Offices of Congressional Relations and Public Affairs may be found on the last page of this testimony. Individuals making key contributions to this statement include William R. Graveline, Assistant Director; William C. Allbritton; Andrea M. Bivens; Noah B. Bleicher; Tana M. Davis; Marcus C. Ferguson; and Robert S. Swierczek.

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