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DEFENSE ACQUISITIONS

Issues to be Considered for Army's Modernization of Combat Systems

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Why GAO Did This Study

Future Combat System (FCS) has been at the center of the Army's efforts to become a lighter, more agile, and more capable combat force by replacing existing combat systems with a family of manned and unmanned vehicles and systems, linked by an advanced information network. To meet the challenges of FCS's scope and schedule, the Army contracted with Boeing to be lead systems integrator (LSI), to help define, develop, and integrate FCS systems.

Earlier this year, the Secretary of Defense proposed restructuring FCS to lower risk and address more near-term needs, shortly before FCS was to undergo a congressionally-mandated review to determine its future. The Department of Defense (DOD) and the Army have already begun to make programmatic and budgetary adjustments to FCS. This statement reviews aspects of FCS that should be considered for inclusion in future efforts, aspects that were problematic and need re-examination, and considerations for shaping future Army ground force modernization.

The testimony is drawn from GAO's body of work on FCS management and acquisition strategy, including knowledge gaps, cost, affordability, oversight, and the Army/LSI relationship. GAO has made numerous recommendations aimed at managing FCS risks, but it is not making any new recommendations in this testimony.

View [GAO-09-793T](#) or key components. For more information, contact Paul Francis at (202) 512-4841 or francisp@gao.gov.

DEFENSE ACQUISITIONS

Issues to be Considered for Army's Modernization of Combat Systems

What GAO Found

FCS has many good features that should be considered in future efforts, including a holistic vision of the future force, government insight into subcontractor selection and management, a focus on leveraging capabilities through an information network, and establishment of organizations to train with and evaluate technologies to be spun out to current forces.

Other more difficult lessons from FCS must also be used to put future modernization efforts on the soundest footing possible. FCS was not executable within reasonable bounds of technical, engineering, time, or financial resources. From the start, the program was immature and unable to meet DOD's own standards for technology and design. Although adjustments were made, including adding time and trading off requirements, vehicle weights and software code grew, key network systems were delayed, and technologies took longer to mature. By 2009, it was still not known that the FCS concept would work. Oversight has been extremely challenging, given the program's vast scope and the innovative, but close, partner-like relationship between the Army and the LSI. Oversight by the Office of the Secretary of Defense did not compensate for these risks early in the program. Oversight was further challenged by the fact that the planned schedule for making decisions outpaced demonstrated knowledge—major production commitments were to be made before basic designs were demonstrated.

As the Army proceeds with a different approach to modernization, there will be a number of important factors to consider. Rather than a single FCS program going forward, several programs with more targeted objectives may emerge. These programs need to be based on principles such as knowledge-based acquisition, sound cost estimating, and transparency and accountability for oversight. Beyond these principles, the Army will have to tailor its approaches to the needs of the individual programs. For example, the acquisition approach for spinning out mature technologies to current forces would differ from the approach needed to develop an information network. Several issues with transitioning from FCS will have to be addressed, including: closing out or restructuring current contractual arrangements; transferring FCS knowledge to emergent programs; transitioning the FCS information network to current Army forces; placing early emphasis on key design considerations such as sustainability; and balancing investments between future capabilities and keeping fielded systems capable.

The Army's experience with FCS has been productive. The key in going forward will be to take the best from both positive and negative lessons learned and apply them to the ground force modernization efforts that will succeed FCS. The Army and DOD should continue to be innovative as to concepts and approaches, but anchored in knowledge-based strategies when it comes to proposing a specific system development effort.

Mr. Chairman and Members of the Subcommittee:

I am pleased to be here today to discuss the Department of the Army's modernization efforts to transform into a lighter, more agile, and more capable combat force using a new concept of operations, technologies, and information network. For the past 6 years, the Future Combat System (FCS), a revolutionary and expansive program, formed the core of Army modernization. Earlier this year, the Secretary of Defense recommended restructuring the FCS program to lower risk and to address more near term needs. His recommendation came a few months before the FCS program was scheduled to undergo a congressionally-mandated go/no-go review to determine the program's future. Although the Army has not yet officially implemented the Secretary's recommendation, the Department of Defense (DOD) and the Army have begun to make conforming programmatic and budgetary adjustments to FCS.

My statement today is based on the work we conducted over the last several years in response to the National Defense Authorization Act for Fiscal Year 2006, which requires GAO to report annually on the FCS program.¹ As Congress will be asked to make significant funding commitments for Army ground force modernization over the next several years, this statement will review: (1) aspects of FCS that should be preserved in future efforts, (2) aspects of FCS that were problematic and need re-examination, and (3) considerations for shaping future Army ground force modernization.

Background

With FCS, the Army embraced a new warfighting concept designed to replace most of its existing combat systems with a family of manned and unmanned vehicles and systems linked by an advanced information network. According to the Army, FCS represented the greatest technology and integration challenge it had ever undertaken—an FCS-equipped force was to be as lethal and survivable as today's force, but significantly lighter and thus easier to both move and sustain. The Army determined it could not meet the challenges of the FCS scope and schedule with its workforce alone and with traditional management approaches. In 2003, the Army contracted with the Boeing Company as the lead systems integrator (LSI) to assist in defining, developing, and integrating FCS systems. Boeing subcontracted with Science Applications International Corporation (SAIC)

¹Pub. L. No. 109-163, §211.

to assist in performing the LSI functions. Over the past several years, Congress, GAO, and other organizations have expressed numerous concerns about the management and acquisition strategy for the FCS program, including significant knowledge gaps, questionable costs and affordability, the relationship between the Army and the LSI, and the lack of oversight by the Office of the Secretary of Defense (OSD).

This committee has been influential in overseeing the FCS program and protecting the government's interests therein. In particular, the committee advocated changes to the original contract structure and type to incorporate more Federal Acquisition Regulation provisions, including those related to the Truth-in-Negotiations Act and the Procurement Integrity Act.

This statement is based on work we conducted over the last several years 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 the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Aspects of FCS that Should Be Considered for Inclusion in Future Efforts

There is no question the Army needs to ensure its forces are well-equipped. The Army has vigorously pursued FCS as the solution, a concept and an approach that is unconventional, yet with many good features that should be considered in future efforts. These features include a holistic, system-of-systems architectural vision, government insight into subcontractor selection and management, a focus on leveraging capabilities through an information network, and establishing organizations to train with and evaluate FCS-related spin-out technologies being provided to current forces.

FCS resulted from Army leadership's vision of how land forces should be organized, equipped, and trained to fight in the future. The decisions to pursue FCS, along with modular combat units, became the centerpiece for realizing this vision. To the Army's credit, these decisions were harder than just replacing current combat systems, like the Abrams tank and Bradley fighting vehicle, with new versions. Rather, Army leadership saw FCS as breaking with tradition. It was to be a system of systems—an overall architecture through which the collective capabilities of individual systems, both manned and unmanned, would be multiplied because of the synergistic effect of being linked by an advanced information network.

Individual systems were to be designed to work within the architecture and the network—an improvement over a traditional, system-centric design approach that would integrate the systems after the fact. Army leadership also chose to cross its own stove-piped combat lines, such as infantry, armor, and fire support. The resultant scope of the FCS program was overly broad for a single acquisition program. Nonetheless, such a holistic view, anchored in a vision of how the land force of the future needs to fight, should continue to guide the modernization investments the Army makes. A context, it should be noted, does not necessarily equate to a program or programs.

While we have reported a number of risks associated with the LSI arrangement on FCS (which are discussed later), the insights the Army gained into subcontractors was beneficial. Army leadership set up the FCS program and LSI contract in such a way that it would create more competition and have more influence over the selection of subcontractors below the LSI. Traditionally, once the Army contracted with a prime contractor, that contractor would bring its own supplier chains, and the Army was not very involved in the choice of the subcontractors. In FCS, the Army called for the LSI to hold a competition for the next tier of contractors. The Army had veto power over these selections. The Army also directed that the LSI contract with integrators at lower levels in the program, and the Army was involved with these selections. These integrators held competitions to select suppliers for those systems. This strategy kept the first tier of subcontractors from bringing their own supplier chains, and the approach promoted competition and pushed Army visibility down lower into the supplier chain. It was also a means for the Army to ensure commonality of key subsystems across FCS platforms. Enhanced visibility into the selection and design decisions of subcontractors appears to have benefited the FCS program and warrants consideration in future efforts.

The Army envisioned an unprecedented information network as the backbone of FCS. Inventing such a network while concurrently designing vehicles and other systems dependent on it was too grand an approach. However, the recognition that an integrated combat network should be deliberately designed versus derived or cobbled together from other systems was discerning. Since FCS began, the Army has achieved an understanding of what the information network needs to be, what may be technically feasible, how to build it, and how to demonstrate it. It has also consciously endeavored to develop the FCS network and software over time in a series of pre-planned blocks. Although work on such a network needs to be properly situated within the acquisition process and guided by

requirements that are technically realistic, the deliberate development of an integrated network seems a sound approach.

The Army initiated spin-out development in 2004, when it embarked on an effort to bring selected FCS capabilities, such as the unattended ground sensors and the non-line-of-sight launch system, to current forces while core FCS development continued. In 2006, the Army established the Army Evaluation Task Force to use, evaluate, and train with the spin-out capabilities, and the Task Force began its testing of the first FCS equipment in early 2008. As noted by both Army and DOD officials, the Task Force has proven quite useful in identifying system issues and suggesting design changes. Accordingly, the Army should continue utilizing the Task Force to better understand and improve its systems, spin out and otherwise.

Aspects of FCS that were Problematic and Need Re-Examination

In our work, we found the greatest obstacle to the Army's realizing its vision for FCS to be that the program was not executable within reasonable bounds of technical, engineering, time, or financial resources. The program was very immature when it began, never measuring up to DOD's own standards for technology and design. Over time, adjustments were made such as adding development time and trading off requirements, but nonetheless, vehicle weights and software code grew substantially, key network systems were delayed, and technologies took longer to mature than planned. By 2009, whether FCS would work as planned remained undemonstrated. As we have reported, these difficulties do not necessarily represent problems that could have been avoided; rather, they reflect the actual immaturity of the program. Yet, to a large extent, these difficulties are foreseeable at the start of programs that do not apply the standards embodied in DOD's own acquisition policies.

Oversight of FCS was extremely challenging given the program's vast scope and the innovative, but close, partner-like relationship between the Army and the LSI. OSD did not play an active oversight role, such as stringently applying its own acquisition policies, until about the past 2 years of the program. Congress intervened by mandating a go/no-go milestone decision to occur in late 2009. Oversight was further challenged by the pace of the program; the schedule for making decisions outpaced demonstrated knowledge to the extent that major production commitments were to be made before basic designs were to be demonstrated. Lessons from this experience should be applied to put future modernization efforts on the soundest footing possible for execution.

Strategy to Acquire FCS Was Not Executable Within Projected Resources

Originally, the Army intended to define thousands of requirements; mature critical technologies; and develop the network, manned and unmanned vehicles, and other systems within about 5 1/2 years from development start—much faster than a single system typically takes. When FCS entered development in 2003, the Army had not yet established firm requirements that were matched with mature technologies and preliminary designs. Although the Army lengthened the development schedule to 10 years, it did not plan to demonstrate the level of knowledge needed at development start until 2009.

In 2003, only 40 percent of the FCS critical technologies were nearing maturity, although DOD's acquisition policy called for all critical technologies to be mature at development start. Originally, the Army officials believed it could mature the remaining technologies in just 3 years. While the Army has made significant progress, today it is still conducting evaluations to demonstrate minimum maturity levels for several critical technologies. Also, the Army needed capabilities being developed by programs outside of FCS to meet network and other requirements. However, these programs were immature as well, and synchronizing them with FCS proved elusive. In particular, the Joint Tactical Radio System and Warfighter Information Network-Tactical programs, the primary enablers of the network, experienced developmental delays that adversely affected the FCS schedule. As technologies, designs, and requirements evolved, key tradeoffs became necessary. For example, the weight of the manned ground vehicles grew from 19 tons to 29 tons, and the use of the C-130 as the main transport aircraft had to be abandoned.

The Army set forth an ambitious schedule for software development and the program as a whole. Originally, the Army anticipated 33 million lines of software code for FCS—which at the time made the program the largest software-intensive acquisition program in DOD history. That estimate has now grown to over 114 million lines of software code. The Army approach to managing the software effort has employed disciplined management practices, but these have been impaired by late and changing requirements. With such a schedule in mind, the Army allowed the program to proceed through developmental and test events without sufficient knowledge. Similarly, the Army was poised to begin early production without having adequately tested production-representative articles.

In light of these and other risks, the John Warner National Defense Authorization Act for Fiscal Year 2007 mandated that the Secretary of Defense carry out a Defense Acquisition Board milestone review of FCS not later than 120 days after the system-of-systems preliminary design review, which occurred in May 2009.² According to the law, the milestone review should include an assessment of:

1. whether the warfighter's needs are valid and can be best met with the concept of the program;
2. whether the concept of the program can be developed and produced within existing resources; and
3. whether the program should
 - a. continue as currently structured;
 - b. continue in restructured form; or
 - c. be terminated.

In our March 2009 report on FCS, we concluded that the Army would be challenged to convincingly demonstrate the level of knowledge needed to warrant an unqualified commitment to the FCS program at the milestone review.³ We identified a number of knowledge gaps that have persisted throughout the development program. Specifically, the FCS program has yet to show that critical technologies are mature, design issues have been resolved, requirements and resources are matched, performance has been demonstrated versus simulated, and costs are affordable. Also, network performance is largely unproven. In summary, we determined that the FCS program was not executable within Army cost and schedule projections.

The pace of the program called for key commitments in advance of needed information. For example, the Army had scheduled only 2 years between the critical design review and the production decision in 2013, leaving little time to gain knowledge between the two events. As a result, FCS was planning to rely on immature prototypes for making the decision to proceed into production. Also, by 2009, the Army had already spent about 60 percent of its planned development funds and schedule but had only proceeded to the preliminary design stage. That would have left only 40 percent of its financial and schedule resources left to complete what is typically the most challenging and expensive development work ahead.

²Pub. L. No. 109-364, § 214 (2006).

³GAO, *Defense Acquisitions: Decisions Needed to Shape Army's Combat Systems for the Future*, [GAO-09-288](#) (Washington, D.C.: Mar. 12, 2009).

The timing of planned commitments to production funding put decision makers in the difficult position of making production commitments without knowing if FCS would work as intended. Facilitization costs were planned to begin in fiscal year 2011, the budget for which would have been presented to Congress in February 2010, several months prior to the planned FCS critical design review. Further, in February 2011, when Congress would have been asked to approve funding for initial low-rate production of core FCS systems, the Army would not yet have proven that the FCS network and the program concept worked.

Oversight Challenges Were Too Great

The relationship between the Army and the LSI was shaped by the ambitious scope of the FCS program and limitations in the Army's ability to manage it. The relationship is complex; on one hand, the LSI has played the traditional contractor role of developing a product for the Army. On the other hand, the LSI has also acted like a partner to the Army, ensuring the design, development, and prototype implementation of the FCS network and systems. The Army believed this relationship would offer more real-time, better informed decisions; reduce rework; and provide increased flexibility to adjust to new demands. While a close partner-like relationship offers benefits, such as the government and the contractor working together on a continual basis to decide what work is to be done, the partner-like relationship between the Army and the LSI broke new ground. As such, it posed oversight risks such as the government becoming increasingly vested in the results of shared decisions and being less able to provide oversight, especially when the government is disadvantaged in terms of workforce and skills. The Institute for Defense Analysis has also reported on the risks of the Army and LSI relationship, noting that the government cannot expect contractors to act in the best interest of the government as that could potentially conflict with their corporate financial interests. The Institute recommended that the Army take steps to ensure that it has, and continually uses, a competent internal capability to develop a corporate Army position on key FCS issues such as measuring program status and trends as well as independent operational testing.

Part of the Army's original rationale for using an LSI was to keep the contractor's efforts focused on development, rather than on production. Early on in the FCS program, steps were taken to reinforce this focus, such as strengthening organizational conflict of interest provisions. While the original Other Transactions Agreement for FCS development and demonstration contained an organizational conflict of interest clause that required certain safeguards be put into place if and when Boeing and SAIC

competed for FCS subcontracts, the 2006 Federal Acquisition Regulation-based contract precluded the Boeing/SAIC team from competing for any FCS subcontract awards. By this time, Boeing already had prime responsibility for two critical software efforts. As the program evolved however, the LSI's role in production grew. In 2007, the Army decided that the LSI should be the prime contractor for the first spin outs as well as low-rate production of FCS core systems. This was a significant change from the early steps taken to keep the LSI's focus on development.

The Army structured the FCS contract consistent with its desire to incentivize development efforts and make it financially rewarding for the LSI to make such efforts. In general, contracts are limited in that they cannot guarantee a successful outcome. As with many cost-reimbursable research and development contracts, the LSI was responsible to put forth its best effort on the development of the FCS capability. If, given that effort, the FCS capability falls short of needs, the LSI would not be responsible, would still be entitled to have its costs reimbursed, and may earn its full fee. Specific aspects of the contract could make it even more difficult to tie the LSI's performance to the actual outcomes of the development effort. Under the terms of the FCS contract, the LSI could earn over 80 percent of its \$2.3 billion fee by the time the program's critical design review is completed in 2011, and the Army would have paid out roughly 80 percent of contract costs by that point. Yet the actual demonstration of individual FCS prototypes and the system-of-systems would have taken place after the design review. Our work on past weapon system programs shows that most cost growth—symptomatic of problems—occurs after the critical design review. The Army shared responsibility with the LSI for making some key FCS decisions and to some extent the Army's performance could thus affect the performance of the LSI.

OSD's oversight did not compensate for these risks early in the program. OSD has largely accepted the program and its changes as defined by the Army, even though it is at wide variance from the best practices embodied in OSD's own acquisition policies. Until recently, OSD had 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, OSD approved the program's entrance into system development and demonstration in 2003. OSD 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. Furthermore, OSD did

not plan to conduct another review and decision point until the 2013 production decision, when it would be too late to have a material effect on the course of the program. In addition, OSD has allowed the Army to use its own cost estimates rather than independent—and often higher—cost estimates when submitting annual budget requests.

Over the last couple years, the Under Secretary of Defense for Acquisition, Technology, and Logistics has taken steps to improve oversight on the FCS program. For instance, in 2007, the Under Secretary deemed the Non-Line-of-Sight Cannon program as being in need of special attention, so he designated the program as special interest and declared that his office would be the decision authority on production. Also, in 2008, the Under Secretary issued a directive to pursue alternate arrangements for any future FCS contracts. The Under Secretary found that the fixed fee was too high and the fee structure allows industry to receive most of the incentive fee dollars prior to demonstrating integrated FCS system-of-systems capability. The Under Secretary also directed that the Army conduct a risk-based assessment to examine contracting alternatives for FCS capability. This assessment is to evaluate opportunities for procurement breakout of the individual platforms and systems that comprise FCS and how the government's interests are served by contracting with the LSI as compared to contracting directly with the manufacturers of the items.

Considerations for Shaping Future Army Ground Force Modernization Efforts

In April, the Secretary of Defense announced plans to cancel the FCS manned ground vehicle and non-line-of-sight cannon development and initiate a new ground combat vehicle program that leverages successful outcomes from FCS investments and incorporates lessons learned from current combat operations. Explaining the rationale for his decision, the Secretary noted that FCS vehicle designs did not reflect lessons learned from combat in Iraq and Afghanistan and that the contract fee structure provided little leverage to promote cost efficiency.

As the Army proceeds to modernize and ensure its ground forces are well equipped for current and future operations, there are several important factors to consider, and some questions to answer. While the Army and DOD are in the early stages of deciding how to proceed with modernization, it appears likely that rather than a single program like FCS going forward, several programs with more targeted objectives will emerge. For example, the spin-out program may continue in an accelerated form and a program to develop a new family of manned ground vehicles will likely be pursued per the Secretary of Defense's

direction. It is also conceivable that a program focused on developing an information network would also be considered.

Regardless of how the Army's ground force modernization program is structured or managed, some key principles will have to be embodied. These include:

- Knowledge-based acquisition: any emergent modernization programs should be put on the soundest footing possible for success, by following DOD's latest acquisition policy that spans the initial decision to pursue a material solution, analysis of alternatives, concept formulation, technology maturation, requirements definition, incremental system design and development, production, and fielding. Sound systems engineering practices should be the guide throughout these phases.
- Sound cost estimating: Any emergent program following a knowledge-based approach should be well understood and defined sufficiently to facilitate realistic cost estimates with reasonable levels of confidence. In order to ensure the accuracy, completeness, and reliability of these estimates, independent cost estimates should be completed and assessed before approval into the product development phases.
- Transparency and accountability for oversight: The emerging programs need to include sufficiently detailed and transparent reporting approaches to facilitate oversight. Those should include an acquisition strategy that features demonstrations of knowledge before planned commitments to future phases and additional funding; a contracting strategy that features as much competition as possible and protections for the government's interests; complete justification materials to support budget requests; and a clear and understandable framework for selected acquisition and earned value management reporting.

Beyond these principles, the Army will have to tailor its approaches to the needs of the individual programs that emerge, allowing for the different challenges they represent. For example, the current spin-out program is in the late stages of development, approaching production. The Army now plans to field at least some FCS equipment and some portion of the FCS network to its current 73 Brigade Combat Teams. We have reported that the pace of the spin-out program has been hurried, not allowing enough time to test and evaluate production-representative prototypes before beginning production. Specifically, it is unclear whether the Army will be testing with the specific equipment it plans to produce and use. To date,

that has not been the case. Testing thus far has employed spin-out systems that are surrogate and non-production representative, and are thus not in the form that will be fielded. Using such systems is problematic because it does not conclusively show how well the actual systems perform. Additionally, we do not know how the Army plans to determine the content and schedule of future FCS spin-out phases.

Notional plans for the new ground combat vehicle program include a goal of fielding the new vehicles within 5-7 years, with concept development efforts underway. This program will likely revert back to a pre-acquisition phase. This effort will involve different organizations, such as those involved with science and technology, different strategies, and different contracting approaches than the spin-out program. The risks for the ground combat vehicle program will be different and will have to be addressed differently. For example, under FCS, vehicles were being designed as network-dependent, a risky approach as the network has not yet been developed. In addition to the Secretary of Defense's direction that the new program incorporate lessons learned from current operations, the Army may have to consider whether the vehicle designs should be network-enhanced versus network-dependent. An incremental approach would allow the vehicle designs to incorporate increasing network capabilities as they became available.

While we do not know at this point how the Army plans to approach the development of an information network, its acquisition approach may also have to retrench to a pre-acquisition phase to reconsider how best to proceed to manage risks in line with DOD acquisition policy and to meet the direction of the Secretary of Defense. While some elements of the network may be further advanced than some of the vehicle work, the concept itself and how to test and evaluate its performance in large scale may present greater challenges than the vehicle program. Again, the network may need a different acquisition and contracting approach, as well as involvement from different organizations, than either the spin out or manned ground vehicle program.

In proceeding forward with a different modernization approach, there are several questions or issues that will have to be addressed. These include:

- Closing out or restructuring current contractual arrangements: Depending on what the Army decides to do with the new ground vehicle program, it will have to restructure or possibly terminate the existing FCS contract. To help in that process, it would be useful for the Army to have a more detailed understanding about the factors that

influenced the Secretary of Defense's recommendation to cancel the current FCS vehicle development effort. Whereas the Secretary's decision could be interpreted as a determination that the FCS concept would not meet current needs, it is not clear at this point what is required to satisfy current military needs.

- Transferring knowledge from current FCS efforts to emergent programs: The Army should carry forward knowledge already gained from the significant investments in FCS systems development. While the Army plans to capture and use what has been learned, doing so depends in large part on whether that knowledge can be transferred to a follow-on program. For example, the Army and LSI have been jointly managing the development of FCS software centrally. That effort included software for the information network, manned ground vehicles, and other individual FCS systems. As the Army proceeds to structure the multiple programs, it will need to coordinate what may be multiple separate software development and demonstration efforts.
- Transition of FCS information network to current Army forces: Depending on how the Army proceeds with an information network, there are questions as to how it can be transferred to the current forces. None of the existing equipment in the current forces has been developed with such a network in mind. As part of the spin-out evaluation process, the Army encountered difficulties last year in trying to integrate even a small portion of the FCS network. Furthermore, the Abrams and Bradley vehicles have space, weight, and power constraints that may limit their ability to be integrated with an FCS-like network. Additionally, it is not clear whether the Army will be developing and fielding vehicles like the proposed FCS command and control vehicle and reconnaissance and surveillance vehicle, which were to be key components of the FCS network.
- Early emphasis on key development and design considerations: Previously, we have commended the Army's efforts to break from traditional thinking with its early emphasis on key development and design considerations. Specifically, the Army defined the larger context within which it wanted its new assets and capabilities to work, emphasizing open system designs and interoperability early in development, rather than as an afterthought. Further, we have noted the productive nature of the Army's early consideration and focus on challenging issues like sustainability. As the Army ground force modernization effort goes forward, the Army will need to find ways to retain this broader focus across multiple programs.

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- Moving from a single program structure to multiple programs: The Army's preliminary plans for the FCS restructuring call for several separate programs, including those for the new ground combat vehicles, the information network, and the FCS spin-out effort. As it shaped the original FCS program, the Army made a concerted effort to reduce the influence of the various "stovepipes" within its user organization and set up a unitary management structure. Separate programs may differ greatly from the centralized structure of the FCS program to date and would have consequences that need to be considered. On the one hand, separate structures might lend themselves more readily to better oversight within each area. On the other hand, multiple programs may require more staffing and might introduce various and competing objectives rather than maintain singular focus on interoperability and other key objectives.
 - Balancing investments between future capabilities and keeping fielded systems as capable as possible: The Army will have to strike a balance between near-term and long-term needs, realistic funding expectations, and a sound execution plan as it moves on the new FCS path forward. The Army's FCS budget material for Fiscal Year 2010, which includes the new ground combat vehicle program, provides little detail and no long-term perspective. DOD, Army, and Congress will eventually have to agree on the magnitude of funds that can be devoted to ground force modernization and how that money should be allocated among near-, mid-, and long-term needs.

Concluding Remarks

The Army's experience with FCS has been productive. Its vision, holistic context, recognition of network potential, and penchant for innovative managerial and experimentation techniques, are worthy of emulation. On the other hand, the difficulties in executing and overseeing the program were apparent at the outset of the program—they were not unexpected discoveries made along the way. The key in going forward is to take the best from both kinds of lessons and applying them, in a tailored way, to the different modernization efforts that will succeed FCS. The Army and DOD should continue to be innovative as to concepts and approaches, but anchored in knowledge-based strategies when it comes to proposing a specific system development effort. Differences in the task at hand should warrant different approaches. At one end of the spectrum, spin outs are in late development, where the focus should be on testing and production preparations. At the other end of the spectrum are efforts to develop a new family of manned ground vehicles and an information network. These would be in early stages of development, in which informed decisions on

technologies and requirements will be key. Even within these two developmental efforts, different technical and managerial approaches may be necessary, for more is known about developing and projecting the performance of vehicles than is known about a network.

Mr. Chairman, that concludes my prepared statement. I will be happy to answer any of your questions.

Contacts and Staff Acknowledgements

For future questions about this statement, please contact me on (202) 512-4841 or francisp@gao.gov. Individuals making key contributions to this statement include William R. Graveline, Assistant Director; Marcus C. Ferguson; William C. Allbritton; Noah B. Bleicher; Helena Brink; and Tana M. Davis.

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