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United States General Accounting Office
Washington, DC 20548

August 13, 2003

The Honorable Curt Weldon
Chairman
The Honorable Neil Abercrombie
Ranking Minority Member
Subcommittee on Tactical Air and Land Forces
Committee on Armed Services
House of Representatives

Subject: *Issues Facing the Army's Future Combat Systems Program*

In October 1999, the Army announced plans to transform into a more strategically responsive force that could more rapidly deploy and effectively operate in all types of military operations, whether small-scale contingencies or major theater wars. The Future Combat Systems (FCS) program is to provide the suite of weaponry and other equipment for the transformed force. The Army plans to develop a family of 18 systems under the FCS program. Because of its size, the FCS program will dominate the Army's investment accounts over the next decade.

In July 2002, we began to review the FCS program as the program was approaching a decision on whether to start the system development and demonstration (SDD) phase—referred to as the milestone B decision. On April 10, 2003, we briefed staff of the House Committee on Armed Services on our work and provided a copy of the briefing to the staff of the Senate Armed Services Committee. We also briefed Army and DOD officials associated with the FCS program. The objectives of the briefing were to provide (1) an understanding of the content, approach, and schedule of the FCS program; (2) observations on both the positive and challenging features of the program; and (3) different approaches to proceeding with FCS that warrant consideration. The enclosure contains the briefing slides.

On May 17, 2003, the Under Secretary of Defense (Acquisition, Technology, and Logistics) approved the Army's request to begin the SDD phase for the FCS program. He directed the Army to perform a full milestone B update in November 2004 to obtain authority to continue SDD and to authorize prototype production. He also listed 14 actions items to be completed prior to the milestone update.

We believe the issues raised in our briefing remain relevant as the FCS program begins the SDD phase. Because of your committees' interest in the FCS program, we

are enclosing the full briefing with this report and summarizing it in the following paragraphs.

Background

Under its transformation efforts, the Army plans to change the way it organizes, trains, deploys, and equips its forces. It expects the future force to be organized around brigade-size units that perform virtually all Army combat functions.[1] The Army wants to fully equip these units with FCS, a family of 18 networked, war-fighting systems which are intended to be more lethal, survivable, deployable, and sustainable than existing heavy combat systems. In order to deploy faster, the FCS vehicles are expected to be a fraction of the weight of existing heavy armored fighting vehicles. The Army believes that nontraditional fighting tactics coupled with an extensive information network will compensate for the loss of size and armor mass by utilizing information superiority and synchronized operations to see, engage, and destroy the enemy before the enemy detects the future forces.

The Army has allocated about $22 billion for the FCS program during fiscal years 2004 through 2009 and several billions more for non-FCS programs that the FCS will need to become fully capable. In addition, the Army recently implemented FCS schedule changes, which added about 2 years to the SDD phase.

Features and Challenges of the FCS Concept

The FCS program has several progressive features, but also faces a number of challenges. The FCS concept shows that the Army leadership is thinking innovatively to arrive at the best ways to prepare for future Army operations. For example, Army leaders decided to include interoperability with other systems in the FCS design and design the individual FCS systems to work as part of a networked system-of-systems. These features represent an improvement over the past approach of developing individual systems first and then attempting to integrate them later, an approach that could lead to schedule and cost growth. The system-of-systems approach also allows program managers more flexibility to make trade-offs among the individual systems. Collectively, the system-of-systems could still provide an effective combat capability even if some of the individual system capabilities are lost or degraded. In addition, the Army has adopted best practice tools to measure the progress of technology development. For example, it is employing technology readiness levels to measure the maturity of technologies being considered for FCS components.

The acquisition strategy for the FCS is aggressive, particularly in light of the program's vast scope. The SDD phase began with more risk present than recommended by best practices or DOD guidance. For example, many critical technologies were significantly immature and will require further development at the same time as product development is conducted. This concurrent development

[1] According to Army planning documents, Special Forces, Rangers, and airborne forces are the only combat formations that will continue to perform their current missions and not be replaced in the future force.

increases the risk of cost growth and schedule delays. Since FCS will dominate the Army's investment accounts over the next decade, any cost growth and schedule delays could affect the entire Army.

Even with the recent extension of SDD by about 2 years, the FCS strategy calls for developing multiple systems and a network in less time than DOD typically needs to develop a single advanced system. In addition, a favorable decision to begin SDD on a system-of-systems like FCS poses challenges for the acquisition process such as defining and evaluating requirements, analyzing alternatives, estimating and tracking costs, conducting test and evaluation, and conducting oversight.

Options for Proceeding with FCS

In our briefing, we noted that while proceeding with FCS as planned posed significant challenges, doing nothing would not allow the Army to meet its transformation objectives. Moreover, if each of the 18 FCS systems and the network were managed as traditional, individual programs, it could weaken the architecture and would amount to controlled evolution versus transformation.

We offered three options for proceeding with FCS at lower risk. Each option involves trade-offs or consequences, as indicated below.

Proposed Action	Potential Consequences
Further mature key technologies before entering SDD.	Reduces risk and increases knowledge but could delay system integration and fielding.
Use advanced technology demonstrations to mature key technologies.	Accelerates development of least mature and most complex technologies but could delay fielding.
Approve FCS architecture while implementing a knowledge-based approach for incorporating individual systems into SDD.	Provides a better fit with the acquisition process and more opportunity to change course if planned progress is not made. Could increase the difficulty of maintaining the integrity of the system of systems and reduce flexibility to make decisions across system lines.

Agency Comments

In early April 2003, we discussed a draft of the briefing at length with Army and DOD officials and revised the briefing as appropriate. We recently provided a draft of this

letter and enclosed briefing to DOD for review and comment. In official oral comments, DOD officials stated that there were no objections to the content of the letter and briefing.

Scope and Methodology

We focused our assessment on the Army's strategy for developing and acquiring FCS and compared it with knowledge-based acquisition principles. Specifically, we examined (1) the technologies the Army has proposed for FCS and (2) the challenges associated with developing a complex system-of-systems. We reviewed relevant program documents and interviewed key officials to understand the FCS concept and determine the Army's strategy for developing and acquiring FCS. We met with officials from the research and development commands to identify key technologies the Army is considering for use in FCS.[2] We conducted our work from July 2002 to June 2003 in accordance with generally accepted government auditing standards.

We plan to provide copies of this report to the Senate Armed Services Committee; the Senate Committee on Appropriations, Subcommittee on Defense; and the House Committee on Appropriations, Subcommittee on Defense. We also will provide copies to the Director, Office of Management and Budget; the Secretary of Defense; and the Secretary of the Army. We will make copies available to others upon request.

If you or your staff have any questions concerning this report, please contact me on (202) 512-2811; or Bill Graveline, Assistant Director, on (256) 922-7514. Major contributors to this correspondence are John David Anderson, Marcus Ferguson, Lawrence Gaston, Thomas Gordon, and William Lipscomb.

Paul L. Francis
Director, Acquisition and Sourcing Management

Enclosure

[2] On April 28, 2003, the Institute for Defense Analysis issued a draft report of the Independent Assessment Panel for Future Combat Systems, called the *Welch Report*. We could not include information from that report in our briefing of April 10, 2003. The report, however, is being considered in our ongoing work regarding FCS.

Enclosure

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Future Combat Systems

Briefing by GAO

April 2003

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Briefing Structure

- Understanding Future Combat Systems (FCS)
- Criteria For Knowledge-Based Acquisitions
- FCS Technologies
- Schedule for FCS Increment 1
- FCS Affordability
- FCS Program Review
- Observations
- Options

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Understanding FCS

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Army Transformation

- Army is radically transforming its combat capabilities including culture, doctrine, personnel, training, and weapon systems. This transformation is predicated on Army Visions and Concepts, new unit designs, etc.
- Army wants a force, called the Objective Force, that is agile, flexible, deployable, and mobile, yet as tough as the current heavy force. Its basic combat unit will be the Unit of Action.
- The Objective Force means more than different equipment and organizations—for example, it means delegating decision-making authority to commanders close to the action.
- The FCS acquisition program will provide most of the combat systems to equip the Objective Force.

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Understanding FCS

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Transformation Demands of FCS

- To meet the needs of transformation, FCS must be:
  - Lethal – equal to the current heavy force.
  - Survivable – equal to the current heavy force.
  - Deployable – within days, not months.
  - Sustainable – immediately and with a small logistical footprint.
- FCS is expected to be a system of systems featuring advanced, networked air- and ground-based maneuver, maneuver-support, and sustainment systems that will include manned and unmanned platforms.

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General Description

- The smaller, lighter systems that enhance deployability will have to do the work of heavy systems. This requires:
  - New technologies that give conventional systems more capability (e.g., armor, munitions, and propulsion).
  - New technologies that provide unconventional capabilities (e.g., unmanned sensors, robotics).
  - A command, control, communications, computer, intelligence, surveillance, reconnaissance (C4ISR) network that substitutes information superiority and synchronized operations for mass and makes for a system of systems whose whole is greater than the sum of its parts.

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Understanding FCS

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Key Features of FCS

- FCS depends on light systems so they can deploy anywhere in the world quickly.
- FCS systems are to roll off combat ready and self-sustaining for 3 to 7 days.
- Once deployed, the FCS will need to fight in nontraditional ways to be successful.
- The Network will be used to gain informational superiority, locate and identify the enemy, and kill at a distance before the enemy can engage the manned FCS systems.
- FCS is expected to use advanced signature management and other techniques to avoid detection and advanced armors to survive the engagement if the enemy systems approach within direct fire range.

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FCS Acquisition Strategy

- Eventually replace all the heavy and interim combat units with the FCS-equipped objective force units.
- Evolutionary acquisition focused on providing warfighters with an initial capability which can be delivered sooner than an ultimate capability.
- Incremental or block approach using spiral development to reach full requirements.

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FCS Acquisition Strategy (cont.)

- Collaborative effort involving user, developer, testers, and industry in Integrated Product Teams (IPTs).
- Defense Advanced Research Projects Agency lead agency in Concept and Technology Development (CTD) phase. Army will be the lead agency during the Systems Development and Demonstration (SDD) Phase.
- Competitively selected Lead System Integrator (LSI) is responsible during CTD for identifying possible FCS technologies, performing trade studies, and developing a FCS system of systems architecture. LSI to continue during SDD.
- Program documents are being concurrently developed for the upcoming milestone B decision point (Operational Requirements Document, Analysis of Alternatives, Baseline Cost Analysis).

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FCS Key Performance Parameters

- Operational Requirements Document for FCS increment 1 dated January 22, 2003 is under review by Joint Requirements Oversight Council.
- Operational Requirements Document contains seven Key Performance Parameters.
  - Joint interoperability
  - Networked battle command
  - Networked lethality
  - Transportability
  - Survivability
  - Sustainability and reliability
  - Training

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FCS Increment 1 Concept

- Increment 1 of the FCS system of systems includes 18 direct systems plus the network.
- FCS platforms will be networked via a joint C4ISR architecture to enable levels of situational understanding and synchronized operations heretofore unachievable.
- Complementary systems are needed to provide capabilities to the Unit of Action and will have to stay synchronized with the FCS program.

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Increment 1: 18 Direct FCS Systems

Manned Systems

- Command and Control Vehicle
- Infantry Carrier Vehicle
- Mounted Combat System
- Non Line of Sight - Cannon
- Non Line of Sight - Mortar
- Reconnaissance and Surveillance Vehicle
- FCS Recovery and Maintenance Vehicle
- Medical Vehicle

Unmanned Systems

- 4 types of Unmanned Aerial Vehicles classed by size
- 3 types of Unmanned Ground Vehicles
  - Armed Robotic Vehicle
  - Multi-Function Utility/Logistics Equipment Vehicle
  - Small Unmanned Ground Vehicle
- Unattended Ground Sensors
- Intelligent Munition System
- Non-Line of Sight Launch System

A Unit of Action will need 690 direct FCS systems.

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Network Concept

- The Network is envisioned as a voice, data, and video communication, command, and intelligence system linking the unit commander and all levels within the unit of action including the individual vehicles and dismounted soldiers with:
  - All sources of intelligence including unattended ground sensors, dismounted soldiers, ground vehicles, aircraft, and space satellites.
  - All sources of combat firepower including systems both inside and outside the unit regardless of the services that owns them.
  - Members of the Joint, Interagency and/or Multinational Coalition forces.

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Network Concept (cont.)

The FCS network will require

- Obtaining and fusing imagery and other data from National and commercial assets (e.g. satellites), Army assets both within the unit of action and above the unit of action, and other services assets.
- Developing and networking unit of action assets such as unmanned aerial and ground vehicles, unmanned ground sensors, dismounted soldiers, and manned FCS vehicles.
- Interoperability with the current Army radios and those of joint and multinational coalitions.
- Access to and management of bandwidth to transfer vast amounts of information.
- Two complementary programs--Joint Tactical Radio System (JTRS) and Warfighter Information Network – Tactical (WIN-T) are expected to enable the interoperability and increases in bandwidth.

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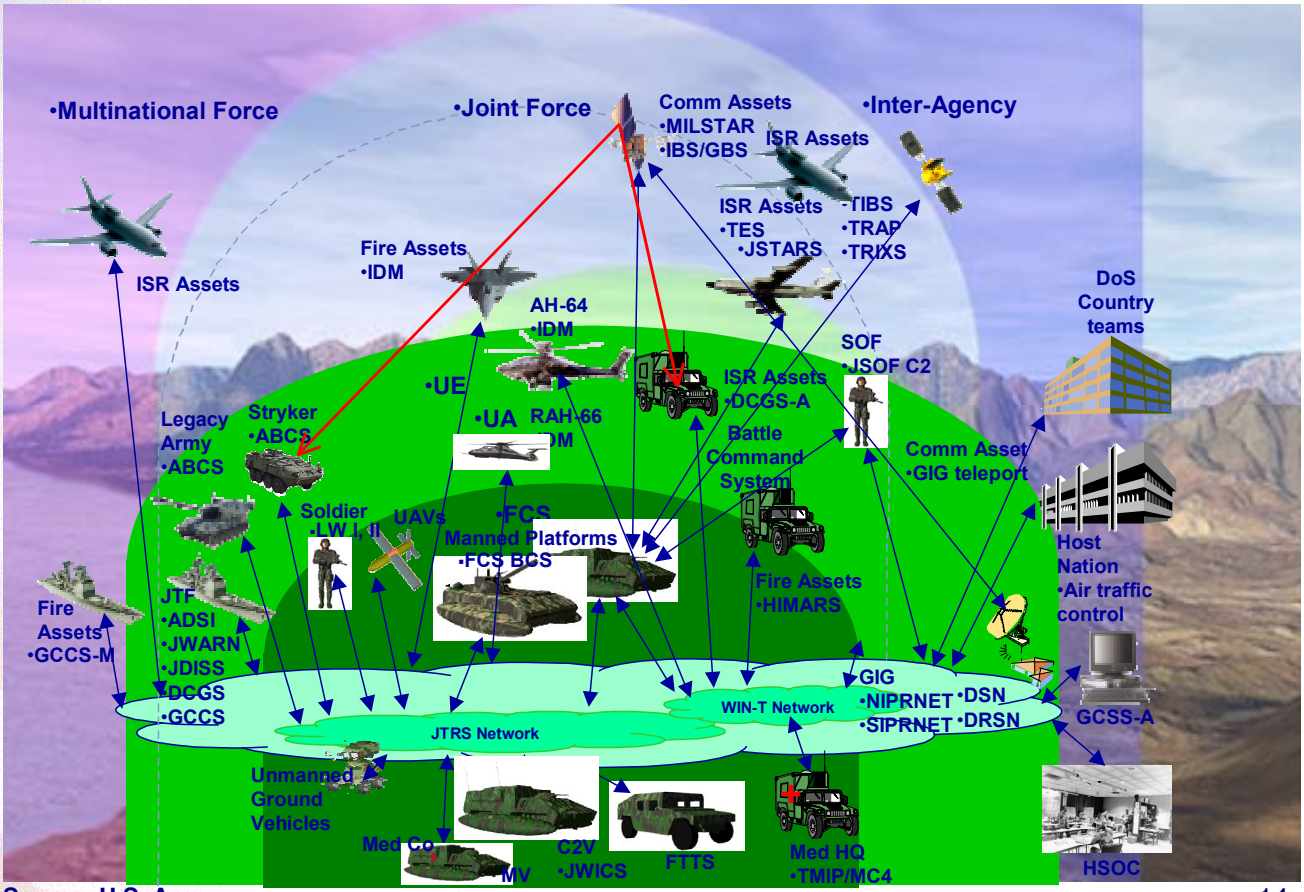
Understanding FCS – The Network



Source: U.S. Army.

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Examples of Complementary Systems

- Comanche Helicopter
- High Mobility Artillery Rocket System
- Engineer Vehicle
- Future Tactical Truck System
- Theater Support Vehicle
- Combined Arms/Psychological Operations Vehicle
- Chemical, Biological, Radiological, Nuclear Response System
- Common Missile
- Aerial Common Sensor
- JTRS
- WIN-T
- Distributed Common Ground System – Army
- Army Airborne Command and Control System
- Technical Enhancement Program
- Prophet (signal intelligence)
- Multi-Mission Radar
- Land Warrior Block II

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Criteria For Knowledge-Based Acquisition

- Separate technology development from product development.
- Match user needs with developer's resources by milestone B (Indicator: Technology readiness).
- Demonstrate design stability by Critical Design Review (CDR) (Indicator: percent of drawings releasable to manufacturing).
- Demonstrate production process maturity before manufacturing articles are ready for delivery to the customer.
- Endorsed by Defense Acquisition policies.

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Criteria For Knowledge-Based Acquisition

- Experience has shown that programs with technologies that reach high maturity levels at product launch were better able to meet cost, schedule, and performance requirements.
- Experience also indicates that programs that proceed with immature technologies encounter significant cost growth and schedule slippage.
- The acquisition process puts pressure on programs to accept immature technologies and to make optimistic assumptions about product development.

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FCS Increment 1 Still Being Defined

- Army has defined the system of systems architecture and concept, but the individual systems are expected to evolve during SDD:
  - Complete system definitions have been put off at least until the preliminary design review scheduled for fiscal year 2005 or perhaps until critical design review in fiscal year 2006.
  - If some technologies do not work out, the Army plans to work with the user community to modify the current requirements, and pursue the technology in a later phase of the program.
- The Army plans to continue to mature technologies during SDD and spiral them into the system of systems when they become mature. Thus, the composition of the system of systems and the design of the individual systems will change throughout SDD.

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FCS Technologies

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Design Concept Must Balance Tensions

- Small and light systems are key to meeting deployability requirements but meeting the survivability and lethality requirements puts pressure on size and weight of the systems.
- Sensors, sensor fusion, relays, and data flow are critical to lethality and survivability. System of systems performance will be sensitive to degradation in these areas.
- Technical sophistication is needed to deliver performance characteristics but has to be balanced with high reliability, maintainability, and sustainability.

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Technical Assessment Used Good Processes

- The Science and Technology IPT identified and assessed 31 critical FCS technology areas that, if not available, would result in significant degradation of Unit of Action effectiveness.

- The assessment process:
  - Used approved criteria—Technical Readiness Levels (TRLs).
  - Was transparent.
  - Was a clear confrontation of technical challenges.

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Many Key Technologies Not Mature

- The maturity assessment of the 31 critical FCS technology areas showed:
  - 7 were at TRL 6 (or had funded SDD program)
  - 10 were between TRL 5 and 6
  - 10 were at TRL 5
  - 4 were at less than TRL 5
  - 22 required risk mitigation plans
- These scores were based on the assessed maturity of underlying technologies and their readiness for FCS applications.

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Independent Technology Assessment

- Validated the IPT technology maturity assessment.
- Reviewed the FCS program's risk mitigation plans.
- Concluded that:
  - TRLs support entry into SDD for FCS Increment 1 in May 2003 and
  - Risk mitigation strategies are reasonable.
- Army drew on very senior and experienced individuals to make these judgments.
- Although the Army concluded that the TRLs supported entry into SDD, most technologies are at TRL levels considered immature by best practice standards.
- FCS expected to present a major technology integration challenge.

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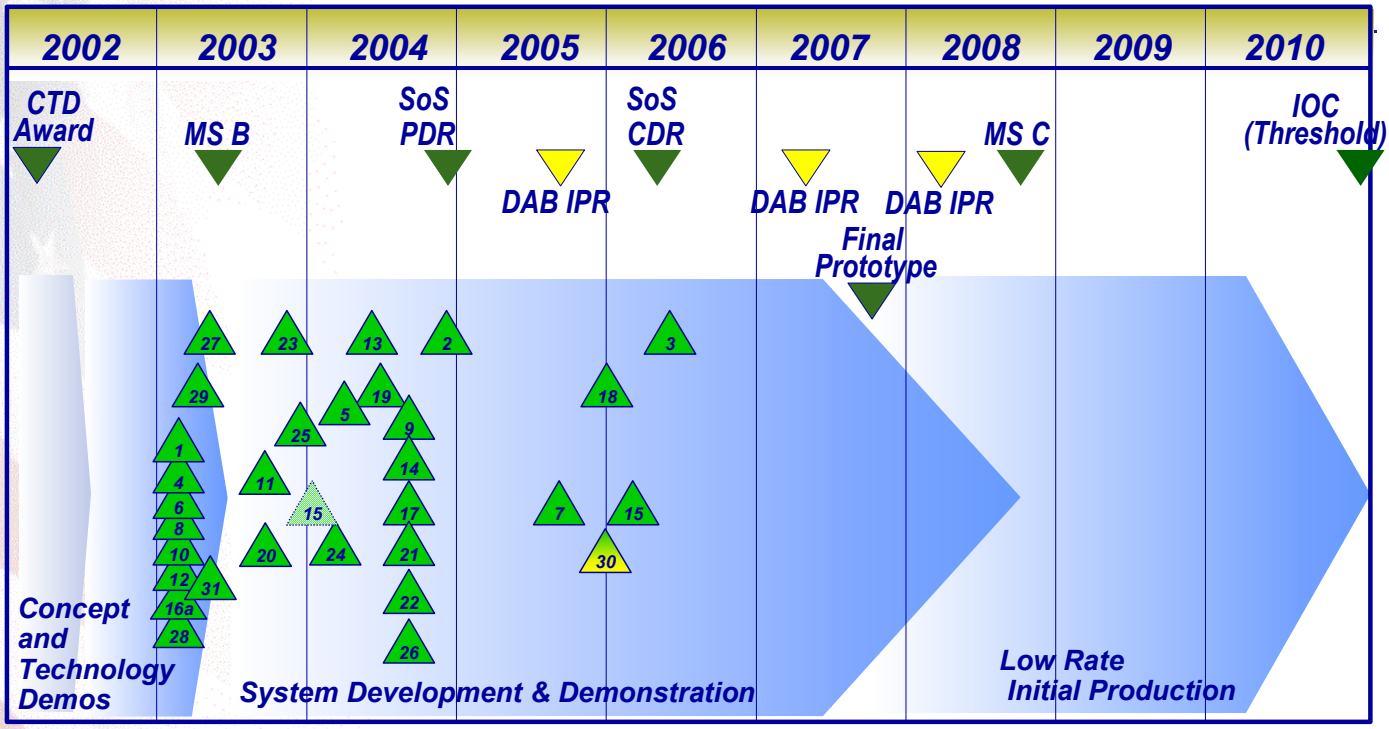
FCS Technologies

Army Assessment of FCS Critical Technology Readiness



Note: calendar year shown

Critical Technology Number

CTs after PDR

3 Network Security
7 Wideband Waveforms
15 Dual Mode Seeker Precision Munitions
18 Manned/Unmanned Collaborations
30 Countermine

Source: U.S. Army.

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Network Technology Challenges

- Development of these capabilities will require:
  - Full time unmanned air vehicle to provide relays.
  - Wideband waveform from the JTRS to provide necessary bandwidth. (Alternatively, the FCS program is working on means to better manage available bandwidth.)
  - Availability of FCS version of JTRS in fiscal year 2007.
  - Significant software development effort.
  - Sensor/data fusion and other algorithms.
- If the network capability falls below critical mass (yet to be defined), the lethality and survivability of the unit of action will be reduced.

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Lethality Technology Challenges

- FCS must achieve a high kill-per-round-fired ratio and at greater ranges to achieve its lethality goal. The FCS will use networked fires and advanced precision weapons to achieve its goal.
- Traditional delivery systems, including cannons and howitzers, mounted on 16 to 20-ton platforms present physics challenges (i.e. shock impact).
  - Lightweight 120 mm cannon development is not yet at TRL 5.
- Advanced precision weapons including Common Missile, Compact Kinetic Energy Missile, Loiter and Precision Attack Missiles, precision mortar round are not yet mature.
- The FCS lethality goal also depends upon:.
  - Network's ability to locate and identify targets and communicate to the shooter in real time.
  - Automatic Target Recognition.
  - Sensor-Shooter Algorithms and Fire Control.
  - Rapid battle damage assessment.
- Lethality affects the amount of munitions that must be carried by FCS which in turn affects FCS's sustainability and deployability.

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Survivability Technology Challenges

- FCS manned system survivability is dependent on its ability to detect and kill the enemy beyond direct combat range, to avoid detection if the enemy approaches within direct combat range, and to survive the first shot if the enemy engages the FCS system.
- Killing the enemy first depends on achieving the FCS's lethality as discussed on the previous slide.
- Avoiding detection depends on vehicle's signature management and the ability of the network to tell FCS systems precisely where the enemy is before the enemy detects FCS.
- Surviving the first shot depends on robust ballistic armor, active protection system, electronic armor, and other means.
  - Each presents technical challenges and could make reaching other goals (like high reliability) more difficult.

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Sustainment Technology Challenges

- To achieve its self-sustainment and logistics footprint reduction requirements, the FCS will need to:
  - Obtain very high levels of reliability and maintainability by:
    - Developing robust, simple FCS designs despite high complexity of the FCS concept and the use of advanced technologies in the designs.
    - Achieving advances in embedded prognostics and diagnostics systems.
  - Emphasize the use of common subsystems and components.
  - Achieve its high kill-per-round-fired goals.
  - Develop a robust real time battlefield damage assessment system.

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Other Technology Challenges

- Other critical technologies that are not yet mature include:
  - High-power density/Fuel efficient propulsion.
  - Semi-autonomous Unmanned Ground Vehicles.
  - Water purification and generation.
  - Hybrid electric power systems.

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Schedule for FCS Increment1

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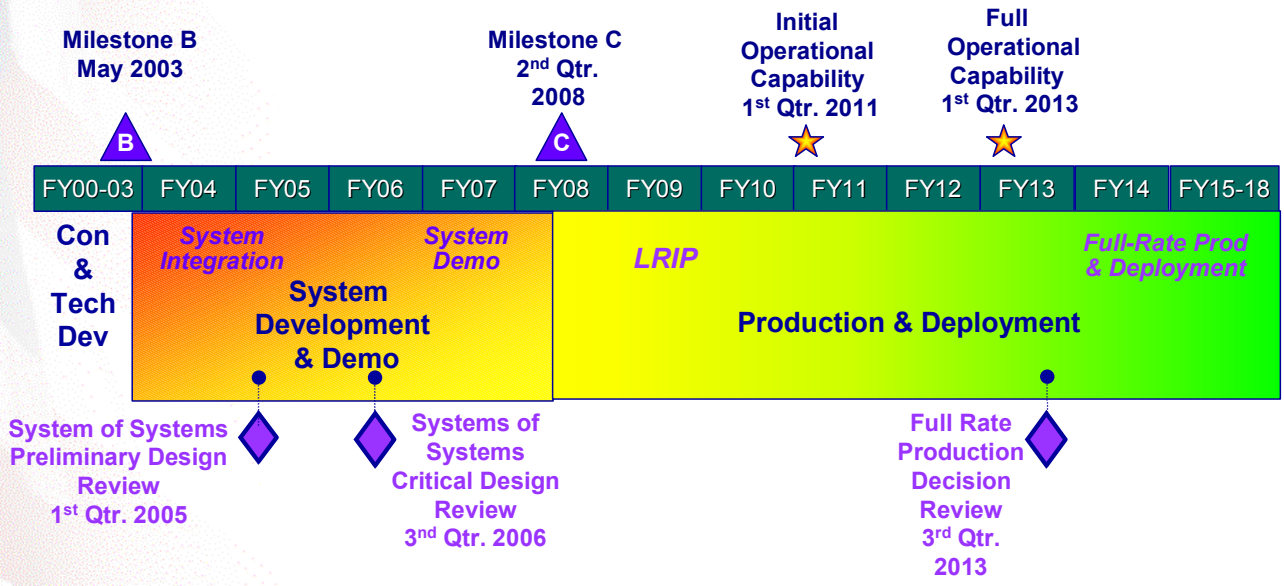
Program Schedule



56-month SDD schedule driven by FCS Increment 1 Initial and Full Operational Capability dates in fiscal years 2011 and 2013.

Source: GAO analysis of U.S. Army data.

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Schedule for FCS Increment 1

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SDD Schedule Extended

- Approximately two years added between Milestones B and C.
- First unit equipped date of fiscal year 2008 has been dropped.
- Initial operational capability is to be achieved in fiscal year 2011 with less ambitious FCS unit:
  - Includes combination of FCS and legacy units, not a unit of action.
  - Could use “in lieu of” vehicles.
- Full operational capability date extended to fiscal year 2013.

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Schedule for FCS Increment 1

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Recent Changes Improve SDD Schedule

March 2003 Schedule

- Prototype assembly to start within 3 to 5 months of start of SDD.
- Preliminary Design Review (PDR) to occur within 8 to 9 months of SDD start.
- CDR to occur within 21 months of start of SDD.
- Long lead item procurement to start within 26 months of SDD start—within 5 months after CDR—and with the benefit of only limited prototype testing.
- Not all FCS systems will be prototyped before production decision.

April 2003 Schedule

- Prototype assembly to start within 28 months of start of SDD.
- Preliminary Design Review to occur within 18 months of SDD start.
- CDR to occur within 36 months of start of SDD.
- Long lead item procurement to start within 45 months of SDD start—within 12 months after CDR—and with the benefit of only limited prototype testing.
- Need more information on FCS systems to be prototyped.

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Schedule for FCS Increment 1

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Revised Schedule More Executable But Still Aggressive

- SDD increased by two years.
- More knowledge demonstrated by PDR and CDR.
- "Offramps" added in form of Defense Acquisition Board in-process reviews.
- Smaller initial operational capability unit makes SDD scope more manageable.
- Completion of technology development, system development and integration, network integration, and system of systems integration still must occur within five years.

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FCS Affordability

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Funding and Affordability

- Army cost estimate is complete and the Cost Analysis Improvement Group's independent review is underway.
  - Cost estimates need to accurately account for significant scope and unknowns.
  - If the FCS cost estimate is not more realistic than estimates for past programs, impact on the Army's budget could be serious.
- Army has allocated about $22 billion for FCS during fiscal years 2004 to 2009 and several additional billion for complementary programs.
- Recent schedule changes and program re-scoping were made to address near term affordability issues. Army plans to address remaining near term affordability issues in budget drills later this year.
  - More details needed on Increment 1 content under revised program plans.
- Significant funding increases required in years beyond the current Future Years Defense Program period.

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FCS Program Review

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Welch Panel to Review FCS and Transformation

- Confirm that the currently defined program of the Objective Force and FCS components is on course to deliver, in successive increments, the needed capability to combatant commanders for future operations.
- Confirm that the current and planned management structure can begin to deliver the 1st Increment of this force by dates planned under recently revised program.
- Study completed and results provided to the Army on April 28, 2003.

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Observations

- Overall, the FCS concept shows progressive thinking on the part of the Army, particularly regarding the architecture, but SDD slated to start with more risk than recommended by best practices or DOD guidance. The Army's recent schedule changes improve the program's executability but the acquisition strategy is still aggressive.

Positive features of FCS:

- Army leadership is thinking about the best ways to prepare for future conflicts and is thinking unconventionally.
- The architecture FCS provides will leverage individual capabilities and will facilitate interoperability and open systems. This is a significant improvement over the traditional approach of building superior individual weapons that must be netted together after the fact.
- System of systems will give managers flexibility to make tradeoffs across traditional program lines for best value.
- FCS is more like a community than an individual, so that a problem in one element does not necessarily spell disaster for the community. This gives the FCS design an inherent ability for graceful degradation.

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Observations

- Good processes were used for the user/developer interface and the technology maturity assessments. In particular, the technical challenges the Army faces have been clearly delineated by the technology maturity assessments.
- Substantial involvement of Science and Technology community should significantly facilitate handoff of technologies from technology base to program office.
- The Army plans to use good measures like technology readiness levels, engineering and manufacturing readiness levels, production readiness levels, drawing releases, and statistical process control.
- Many FCS efforts will have residual/transferable benefits for the legacy force.
- The Army is willing to make tradeoffs to fund FCS.
- Setting sustainability as a design characteristic equal to lethality and survivability is a best practice.

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Observations

Concerns About the FCS Approach:

- The FCS strategy challenges performance of past programs and best practices. Significant improvements in how technology development and system design and integration progress, and improvements in cost estimating are necessary for success.
- Many critical technologies will not be mature at Milestone B, thus technology development and product development will occur concurrently. This increases the risk of experiencing cost growth and schedule delays on the order of past programs. The cost of delays in SDD could be significant given the scope of FCS.
- Even with a longer schedule, SDD is still a significant challenge for such a vast scope—completion of technology development, design and demonstration of individual systems, design and demonstration of the network, and design and demonstration of the system of systems. The SDD strategy calls for developing multiple systems and a network within a period of time that DOD typically needs to develop a single advanced system.

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Observations

- While FCS provides for graceful degradation, increment 1 must reach a critical mass to demonstrate a viable capability—it is not enough to be more deployable and sustainable than the heavy force and more lethal and survivable than the light force. It must be as capable as the heavy force. Such critical mass is synergy-dependent and will not be demonstrated until late in SDD.
- Making a Milestone B decision on a system of systems like FCS poses challenges for the acquisition process in terms of the magnitude of the decision, defining and evaluating requirements, analyzing alternatives, conducting test and evaluation, estimating and tracking costs, and conducting oversight.
- If the Milestone B decision on FCS is viewed as a referendum on transformation, it will detract from its proper focus as an acquisition decision that must be based on a business case.

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Considerations for Proceeding

Decision makers must decide on how best to proceed.

- Proceeding as planned has significant challenges as noted above.
- Doing nothing is not acceptable in light of the Army's transformation objectives.
- Putting each of the 18 FCS systems plus the network individually through the current acquisition process could weaken the architecture and would amount to controlled evolution versus transformation.

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Considerations for Proceeding

The Army's case for proceeding as planned has compelling arguments, but is it the only acceptable way to develop FCS? Are there other ways to facilitate the realization of FCS capabilities without taking undue risks? If so, they should be considered and their pros and cons weighed. For example,

- Accelerate maturity of key technologies before holding Milestone B.
  Pros: Lower technology risk, higher knowledge level at Milestone B.
  Cons: SDD system level activities like systems engineering and system integration will be delayed, delaying fielding of FCS.

- Use mechanisms like Advance Technology Demonstrations to accelerate the maturation of FCS "long poles" like the network before Milestone B.
  Pros: Lower technology and integration risk for network, higher knowledge level at Milestone B.
  Cons: Pace of direct systems may be slowed and other SDD system level activities will be delayed, delaying fielding of FCS.

- After vetting and approving an FCS architecture, construct a streamlined—but knowledge-based—process for putting the entry of individual systems into SDD.
  Pros: Better fit with the acquisition process without paying the price of 19 separate processes; more opportunity for "off ramps" if planned progress is not made.
  Cons: Increases the difficulty of maintaining the integrity of the system of systems and could reduce flexibility to make decisions across system lines and take advantage of graceful degradation.

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