
# The Army's Future Combat System (FCS): Background and Issues for Congress

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# Summary

The Future Combat System (FCS) is a multiyear, multibillion dollar program at the heart of the Army's transformation efforts. It is the Army's major research, development, and acquisition program consisting of 14 manned and unmanned systems tied together by an extensive communications and information network. FCS is intended to replace such current systems as the M-1 Abrams tank and the M-2 Bradley infantry fighting vehicle. The FCS program has been characterized by the Army and others as a high-risk venture due to the advanced technologies involved and the challenge of networking all of the FCS subsystems together so that FCS-equipped units can function as intended.

The FCS program exists in a dynamic national security environment which could significantly influence the program's outcome. The Administration has committed the United States to "the Long War," a struggle that could last for decades as the United States and its allies attempt to locate and destroy terrorist networks worldwide. Some question if FCS, envisioned and designed prior to September 11, 2001 to combat conventional land forces, is relevant in this "Long War" where counterinsurgency and stabilization operations feature prominently. The FCS program has achieved a number of programmatic milestones and is transitioning from a purely conceptual program to one where prototypes of many of the 14 FCS systems are under development. With a variety of estimates on the total cost of the FCS program, questions have been raised about FCS affordability. In 2007, citing the impact of past budget cuts, the Army restructured the program from 18 to 14 systems. In June 2008, primarily in response to both congressional and Department of Defense (DOD) concerns about deploying FCS technologies to forces in the field sooner and overall program affordability, the Army restructured the program again. As currently restructured, the Army will instead focus its FCS equipping efforts on Infantry Brigade Combat Teams (IBCTs) as opposed to heavier FCS BCTs.

The overall FCS program is in a variety of developmental phases, with some technologies on the verge of being fielded to units and others still under development with varying degrees of success. The 111th Congress, in its appropriation, authorization, and oversight roles may wish to review the FCS program in terms of its projected capabilities, relevance to current and possible future military operations, and program costs. This report will be updated as the situation warrants.

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The Future Combat System (FCS) is a multiyear, multibillion-dollar program at the heart of the Army's transformation efforts. It is the Army's major research, development, and acquisition program for the foreseeable future and is to consist of 14 manned and unmanned systems tied together by an extensive communications and information network. FCS is intended to replace such current systems as the M-1 Abrams tank and the M-2 Bradley infantry fighting vehicle. The Army's success criteria for FCS is that it should be "as good as or better than" the Army's current force in terms of "lethality, survivability, responsiveness, and sustainability."[1]

The primary issues presented to 111th Congress are the capabilities and affordability of the FCS program, and the likelihood, given a myriad of factors, that the Army will be able to field its first FCS Brigade Combat Team (BCT) by 2015 and eventually field up to 15 FCS BCTs. Key oversight questions for consideration include the following:

- Future of FCS BCTs.
- Impact of the June 2008 Restructuring.
- Funding FCS at the Expense of Current Ground Combat Systems.
- Financial Crisis, Constrained Budgets, and FCS.

The 111th Congress's decisions on these and other related issues could have significant implications for U.S. national security, Army funding requirements, and future congressional oversight activities. This report will address a variety of issues including the program's timeline, budget, program management issues, program developmental progress and challenges, and how other related programs could affect FCS.

# Background

## FCS Program Origins

In October 1999, then Chief of Staff of the Army (CSA) General Eric Shinseki introduced the Army's transformation strategy which was intended to convert all of the Army's divisions (called Legacy Forces) into new organizations called the Objective Force. General Shinseki's intent was to make the Army lighter, more modular, and—most importantly—more deployable. General Shinseki's deployment goals were to deploy a brigade[2] in four days, a division in five days, and

[1] Government Accountability Office (GAO) Report "Defense Acquisitions: Improved Business Case is Needed for Future Combat System's Successful Outcome," GAO-06-367, March 2006, p. 2.

[2] According to Department of the Army Pamphlet 10-1, "Organization of the United States Army," dated June 14, 1994, a brigade consists of approximately 3,000 to 5,000 soldiers and a division consists of approximately 10,000 to 18,000 soldiers.

five divisions in 30 days.[3] As part of this transformation, the Army adopted the Future Combat System (FCS) as a major acquisition program to equip the Objective Force.[4]

This transformation, due to its complexity and uncertainty, was scheduled to take place over the course of three decades, with the first FCS-equipped objective force unit reportedly becoming operational in 2011 and the entire force transformed by 2032.[5] In order to mitigate the risk associated with the Objective Force and to address the near-term need for more deployable and capable units, the Army's transformation plan called for the development of brigade-sized units called the Interim Force in both the active Army and the Army National Guard. These Interim Brigade Combat Teams (IBCTs) were the predecessors to the Army's current Stryker Brigade Combat Teams (SBCTs).[6]

General Shinseki's vision for the FCS was that it would consist of smaller and lighter ground and air vehicles—manned, unmanned, and robotic—and would employ advanced offensive, defensive, and communications/information systems to "outsmart and outmaneuver heavier enemy forces on the battlefield."[7] In order to initiate the FCS program, General Shinseki turned to the Defense Advanced Research Projects Agency (DARPA), not only because of its proven ability to manage highly conceptual and scientifically challenging projects, but also because he reportedly felt that he would receive a great deal of opposition from senior Army leaders who advocated heavier and more powerful vehicles such as the M-1 Abrams tank and the M-2 Bradley infantry fighting vehicle. In May 2000, DARPA awarded four contracts to four industry teams to develop FCS designs and in March 2002, the Army chose Boeing and Science Applications International Corporation (SAIC) to serve as the lead systems integrators to oversee certain aspects of the development of the FCS's 18 original systems. On May 14, 2003, the Defense Acquisition Board[8] (DAB) approved the FCS's next acquisition phase and in August 2004 Boeing and SAIC awarded contracts to 21 companies to design and build its various platforms and hardware and software.

[3] Frank Tiboni, "Army's Future Combat Systems at the Heart of Transformation," Federal Computer Week, February 9, 2004.

[4] James Jay Carafano, "The Army Goes Rolling Along: New Service Transformation Agenda Suggests Promise and Problems," *Heritage Foundation*, February 23, 2004, p. 5.

[5] Bruce R. Nardulli and Thomas L. McNaugher, "The Army: Toward the Objective Force," in Hans Binnendijk, ed. Transforming America's Military (National Defense University Press, 2002), p. 106.

[6] The Stryker is the Army's name for the family of wheeled armored vehicles that will constitute most of the brigade's combat and combat support vehicles. Annex A (Modular Conversion) to Army Campaign Plan, Change 2, September 30, 2005, p. A-1.

[7] The following description of the early stages of the FCS program is taken from Frank Tiboni's Army's Future Combat Systems at the Heart of Transformation.

[8] The Defense Acquisition Board (DAB) is the Defense Department's senior-level forum for advising the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD(AT&L)) on critical decisions concerning DAB-managed programs and special interest programs.

# The FCS Program

## Program Overview[9]

The Army describes FCS as a joint (involving the other services) networked "system of systems." FCS systems are to be connected by means of an advanced network architecture that would permit connectivity with other services, situational awareness and understanding, and synchronized operations that are currently unachievable by Army combat forces. FCS is intended to network with existing forces, systems currently in development, and systems that will be developed in the future. At present, the Army intends to eventually field 15 FCS BCTs equipped with new FCS manned ground vehicles and will provide selected FCS communications, sensor, and unmanned vehicle technologies to all 43 of its Infantry Brigade Combat Teams (IBCTs) by FY2025. Because the focus of the FCS program is the 15 "heavy" FCS BCTs and less is known about how FCS technologies will be incorporated into IBCTs, and because FCS BCTs will be the more costly of the two BCTs to develop and field, this report focuses on FCS BCTs.

### Structure

FCS Brigade Combat Team (BCT) units would include the following:

- Unattended ground sensors (UGS);
- Two classes of unmanned aerial vehicles (UAVs);
- Three classes of unmanned ground vehicles (UGVs): the Armed Robotic Vehicle - Assault (Light) (ARV-AL), the Small Unmanned Ground Vehicle (SUGV), and the Multifunctional Utility/Logistics and Equipment Countermine and Transport Vehicle (MULE-T/C);
- Eight types of Manned Ground Vehicles (MGVs);
- The Network; and
- The individual soldier and his personal equipment and weapons.

The FCS is to serve as the core building block of the Army's Future Force. FCS-BCTs are to consist of:

- Three FCS-equipped Combined Arms battalions (CABs);
- One Non-Line-of-Sight (NLOS) Cannon battalion;
- One Reconnaissance, Surveillance, and Target Acquisition (RSTA) squadron;
- One Forward Support battalion (FSB);
- One Brigade Intelligence and Communications company (BICC); and
- One Headquarters company.

[9] Information in this section is taken from the Army's official FCS website http://www.army.mil/fcs/overview.html and an FCS Acceleration Briefing provided to CRS on July 21, 2008.

For a more detailed description of FCS subsystems, see **Appendix**.

### Capabilities [10]

According to the Army, the FCS Brigade Combat Team (BCT) will be designed to be:

- Self-sufficient for 72 hours of high-intensity combat;
- Self-sufficient for seven days in a low to mid-intensity environment;
- Able to reduce the traditional logistics footprint for fuel, water, ammunition, and repair parts by 30% to 70%;
- Sixty percent more strategically deployable than current heavy BCTs; and
- Able to operate across larger areas with fewer soldiers.

## FCS Program Timeline

FCS is currently moving towards the System of Systems Preliminary Design Review (PDR) now scheduled for February 2009. The PDR is described as "a multi-disciplined technical review to ensure that a system is ready to proceed into detailed design and can meet stated performance requirements within cost, schedule, risk, and other system restraints."[11] Despite the Army's June 28, 2008, decision to significantly restructure the FCS program "to accelerate FCS deliveries to IBCTs,"[12] Army officials have stated that "the core program has not changed in terms of its time lines."[13]

### 2009 "Go or No Go" Review [14]

In 2006 Congress directed that after the February 2009 FCS System of Systems Preliminary Design Review (PDR), that DOD conduct a FCS Milestone Review to assess (1) if warfighter's needs are valid and can best be met through the FCS program; (2) whether the concept of the program can be developed and produced within existing resources; and (3) should FCS continue as currently structured, continue in a restructured form or; (4) be terminated. This "Go or No Go" Review is currently scheduled for August 2009.

[10] Information in this section is taken from the 2007 Army Modernization Plan, March 5, 2007, pp. 8-11, and FCS Brigade Combat Team 14+1+1 Systems Overview 14 March 2007, at http://www.army.mil/fcs/whitepaper/FCSwhitepaper07.pdf.

[11] "Glossary of Defense Acquisition Acronyms and Terms," Defense Acquisition University, Fort Belvoir, VA, 12th ed., July 2005, p. B-121.

[12] U.S. Army News Release, "Army to Accelerate Future Combat Systems Deliveries (FCS) to Infantry Brigade Combat Teams," Army Public Affairs Office, Washington D.C., June 26, 2008.

[13] Ann Roosevelt, "FCS Needs No New Funds to Accelerate, Officials Say," *Defense Daily*, June 27, 2008.

[14] For information in this section see P.L. 109-364, John Warner National Defense Authorization Act for Fiscal Year 2007, Section 214.

## Program Schedule

Prior to the Army's June 2008 restructuring, the FCS program was operating under the schedule depicted below:

**Table 1. FCS Program Schedule[15]**

| Event | Date (FY) | Event description |
|---|---|---|
| Systems of Systems Preliminary Design Review (PDR) | February 2009 | A technical review to evaluate the progress and technical adequacy of each major program item. It also examines compatibility with performance and engineering requirements. |
| FCS Milestone "Go or No Go" Review | August 2009 | A DOD review established by Section 214, P.L. 109-364 to determine if the FCS program should continue as planned, be restructured, or be terminated. |
| Critical Design Review (CDR) | 2011 | A technical review to determine if the detailed design satisfies performance and engineering requirements. Also determines compatibility between equipment, computers, and personnel. Assesses producibility and program risk areas. |
| Design Readiness Review | 2011 | Evaluates design maturity, based on the number of successfully completed system and subsystem design reviews. |
| Milestone C | 2013 | Milestone C approves the program's entry into the Production and Deployment (P&D) Phase. The P&D Phase consists of two efforts—Low Rate Initial Production (LRIP) and Full Rate Production and Deployment (FRP&D). The purpose of the P&D Phase is to achieve an operational capability that satisfies the mission need. |
| Initial Operational Capability (IOC) | 2015 | IOC is defined as the first attainment of the capability to employ the system as intended. (Part of the P&D Phase). |
| Full Operational Capability | 2017 | The full attainment of the capability to employ the system, including a fully manned, equipped, trained, and logistically supported force. (Part of the P&D Phase). |

**Note:** Event descriptions in this table are taken from the Defense Acquisition Acronyms and Terms Glossary published by the Defense Acquisition University, Fort Belvoir, VA, 12th ed., July 2005.

## Program Schedule Concerns

The Government Accountability Office (GAO) has monitored of the FCS program since its inception. One of GAO's continuing program schedule concerns is that

> FCS design and production maturity are not likely to be demonstrated until after the production decision is made. The critical design review will be held much later on FCS than on other programs, and the Army will not be building production-representative prototypes to test before production. The first major test of the network and FCS together with a majority of prototypes will not take place until 2012. Much of the testing up to the 2013 production decision will involve simulations, technology demonstrations, experiments, and single system testing.[16]

[15] MG Charles A. Cartwright and Mr. Tony Melita, Future Combat Systems (Brigade Combat Team) Defense Acquisition Board In-Process Review, June 13, 2007, p. 4.

[16] United States Government Accountability Office (GAO), Testimony Before the Subcommittee on Air and Land Forces, Committee on Armed Services, House of Representatives, "Defense Acquisitions: Future Combat System Risks Underscore the Importance of Oversight," GAO-07-672T, March 27, 2007.

GAO suggests that because testing occurs so close to the production decision, that problems identified during testing will need to be resolved during the production phase, which historically is the most expensive phase in which to correct problems.[17]

## Selected FCS Program Issues

The FCS program has been characterized as a large, risky, and highly complex program. The following sections address selected program issues, to include important supporting or what are known as complimentary programs that are necessary for FCS to achieve its full operational potential.

### 2008 Program Restructuring

On June 26, 2008, primarily in response to both congressional and Department of Defense (DOD) concerns about getting FCS technologies to forces in the field sooner and overall program affordability, the Army restructured the program. In an official press release, the Army announced the restructuring, characterizing it as an effort "to accelerate FCS deliveries to Infantry Brigade Combat Teams (IBCTs)."[18] The Army now plans to field the following technologies to 43 IBCTs during the 2011 to 2025 time frame:[19]

- Tactical and Urban Unattended Ground Sensors;
- Non-Line of Sight (NLOS) Launch System (NLOS-LS);
- Network Kits for High Mobility, Multi-Wheeled Vehicles (HMMWV);
- Class I Unmanned Aerial Vehicles (UAVs);
- Small Unmanned Ground Vehicles (SUGVs); and
- Ground Soldier Ensemble, a soldier-worn command and control system for dismounted soldiers modeled on the Army's Land Warrior System, which was terminated by the Army in FY2008.

The Army conducted a Preliminary Limited User Test (P-LUT) focused on infantry units at Ft. Bliss, TX, in July 2008 in lieu of a previously scheduled heavy FCS BCT Limited User Test. A formal LUT for the infantry BCT is scheduled for FY2009, and the Army hopes to "Spin Out" these technologies to IBCTs beginning in FY2011. The Army will alter its overall FCS testing schedule to accommodate the IBCT FCS spin outs. Army officials plan to field IBCT Spin Out One equipment to both Active and National Guard IBCTs, based on when the units are scheduled to deploy to Iraq or Afghanistan.[20]

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[17] Ibid.

[18] U.S. Army News Release, "Army to Accelerate Future Combat Systems Deliveries (FCS) to Infantry Brigade Combat Teams," Army Public Affairs Office, Washington D.C., June 26, 2008.

[19] Ann Roosevelt, "Army Tightens FCS Focus on Infantry and Current Fight," *Defense daily*, June 26, 2008; U.S. Army News Release, "Army to Accelerate Future Combat Systems Deliveries (FCS) to Infantry Brigade Combat Teams," Army Public Affairs Office, Washington D.C., June 26, 2008; and Daniel Wasserbly, "Bringing Soldiers Into the Network: Army to Align Ground Soldier Program with FCS Spin Out 1 Fielding," *InsideDefense.com*, June 30, 2008 and a FCS Acceleration Briefing provided to CRS on July 21, 2008.

[20] Daniel Wasserbly, "Testing Pushed Back to Next Summer: Army to Reprogram Funding in FY 08, FY 09 for FCS (continued...)

## Joint Tactical Radio System (JTRS)

JTRS radios are software-defined radios that are to be used to provide voice, video, and data communications to FCS manned and unmanned ground and aerial vehicles. One of the primary benefits of JTRS is that it is intended to operate on multiple radio frequencies, permitting it to talk to certain non-JTRS radios that are expected to stay in the Army's inventory. JTRS is a joint program and therefore is not a part of the FCS program but is instead what the Army describes as a "complimentary program." JTRS is to form the "backbone" of the FCS Network and therefore of critical importance to the program's success. Some have criticized the JTRS family of radios as "falling short of what the FCS requires" in terms of capabilities, range, and encryption but note that without the high-bandwidth, all digital JTRS "there is simply no way to transmit the vast amount of data that the new [FCS] networks will require."[21]

### *A Possible Reduction in JTRS Procurement?*

The Army is said to be reexamining the number of JTRS radios that it may require and looking for possible areas where current or "legacy" radios may instead be substituted so that the Army can cut back the procurement of more expensive JTRS radios.[22] Army officials note that JTRS radios, which have been under development for more than a decade, are more capable and will be relied upon heavily in the FCS BCTs. The Army is also planning to field a less-expensive version of the JTRS Handheld Manpack System (HMS) radio to troops by 2011.[23] This less-expensive version will use the same high bandwidth soldier radio waveform, but will transmit only data and voice and not images or videos that are planned to be part of the JTRS HMS. While it may be argued by some that in both these instances that the Army is doing the prudent thing by attempting to reduce costs and get improved technologies to soldiers sooner, others might question if the Army really needs all the JTRS variants it plans to procure if it is settling for substitutes and less capable versions.

## Potential Radio Spectrum Problems[24]

One report suggests that the Army's former Assistant Secretary of the Army for Acquisitions, Logistics, and Technology, Claude Bolton, was concerned that within the next five years, the Army may not have enough radio spectrum "to allow its next-generation networked force [FCS] to work as it is being designed to." The concern is that beginning in 2010, when the Army introduces JTRS and additional technologies designed to transmit vast amount of data from soldiers, sensors, and unmanned and manned ground and aerial vehicles, the available bandwidth will become overwhelmed. To get a better appreciation for the potential problem, both the Army

(...continued)

Spin Out 1 Changes," *InsideDefense.com,* June 30, 2008.

[21] Sydney J. Freedberg, "Army Struggles Towards the Goal of Wi-Fi Infantry," National Journal, September 20, 2008.

[22] Daniel Wasserbly, "Thompson: JTRS Procurement May Decrease in Favor of Legacy Radios," *InsideDefense.com,* October 13, 2008.

[23] Kris Osborn, "U.S. Army Plans New JTRS Radios for Soldiers," *Defense News,* July 28, 2008.

[24] Information in this section is taken from Kris Osborn "U.S. Army Faces Spectrum Crunch," *Defense News,* January 7, 2008: Sandra I. Erwin, "Army Struggling With Rising Demand for Communications," National Defense, April 2008; and Alec Klein, "Weapons Upgrade Faces Big Hurdles: Problems With Wireless Technology May Threaten Army's Ambitious Plans," *Washington Post,* April 8, 2008 .

Science Board and RAND Corporation have been asked to estimate the Army's future bandwidth needs, and the FCS program is investigating how FCS will perform if the network is degraded by lack radio spectrum availability and network failure. Industry officials also suggest that the Army is having a hard time keeping up with information demands, suggesting, for example, that Army leadership has become "addicted" to video teleconferencing, one of the most bandwidth-consuming applications.

## Warfighter Information Network - Tactical (WIN-T)

WIN-T is described as the Army's "communications network of the future consisting of a three-tiered architecture of orbital, airborne, and ground links that will provide connectivity to a dispersed and highly mobile force."[25] WIN-T is intended to permit the Army to communicate and transfer large amounts of data on the move and is a capability central to the success of the FCS program.[26]

### *WIN-T Increments*

[27] The Army is presently fielding WIN-T Increment One (which began fielding in 2004 as Joint Network Node or JNN). WIN-T Increment One is intended to support static headquarters. WIN-T Increment Two is intended to provide network management and the mobile portion of the system, including on-the-move satellite communication (SATCOM) and networking line-of-sight radio. Testing of Increment Two is currently underway, with additional testing slated for March 2009, and if testing is successful, Increment Two equipment could begin to enter service in 2011.[28] WIN-T Increment Three is slated to enter service in 2015 and will link UAVs and other intelligence systems to on-the-move ground systems. WIN-T Increment Four is planned to include linkage to the U.S. Air Force's Transformation Communication Satellite (TSAT) system, which will provide a more capable and protected on-the-move SATCOM system.

## Delay in the Transformational Communications Satellite (TSAT) Program [29]

In October 2008, the Pentagon decided to delay the award of a potential $6 to $7 billion contract for the TSAT until the fourth quarter of FY2010. TSAT is described as a constellation of satellites that securely transmit large quantities of data at unprecedented speeds, which should permit military forces to communicate more effectively on the move. Prior to the postponement, TSAT was scheduled to be available by 2015, but the delay now means that the earliest that the first TSAT satellites could be launched is around 2019. There is no guarantee, however, that the TSAT

[25] Scott Nance, "Analyst: Advanced Networks to be Rumsfeld Legacy," *Defense Today*, Volume 26, Number 233, December 8, 2005, p. 3.

[26] "Army Restructures WIN-T to Meet Future Combat System Requirements," *Inside the Army*, July 3, 2006 and Josh Rogin, "DOD: Projected WIN-T Costs Soars by $2.2 Billion," Federal Computer Weekly, April 10, 2007.

[27] Information in this section is from Giles Ebbut, "WIN-T Restructuring Fuels Greater Demand," Jane's International Defence Review, December 2007, p. 17.

[28] Kris Osborn, "2nd WIN-T Phase Adds Ad-Hoc Networking to Moving Vehicles," *Defense News*, November 10, 2208, p. 16.

[29] Andrea Shalal-Esa, "Pentagon Postpones Big Satellite Contract Until FY10," Reuters.com, October 20, 2008; Andy Pasztor, "Pentagon Delays Program to Build New Satellite, *Wall Street Journal*, October 21, 2008; and Daniel Wasserbly, "Army:TSAT Delays Would Hinder FCS Comms, But Service Can Wait," *InsideDefense.com*, October 27, 2008.

program will go forward, as some Members have expressed concerns about the program's proposed technologies as well as its cost, and some Pentagon acquisition officials believe that less-complex and less-costly alternatives are available.

### *The Army's Position on the TSAT Program Delay*

[30] Army officials acknowledge that the TSAT delay affects FCSs' networking capabilities but that current satellites are sufficient until faster and more capable satellites become available. Army officials have said that TSAT is not required for the initial fielding of FCS BCTs in 2015 but, in order to achieve the Army's full vision of FCS, that the TSAT or an equivalent system will be required. Some suggest that the TSAT program is "sinking fast"and there is a possibility that the Army is downplaying the negative operational impact that a TSAT program termination could have on FCS.

## FCS Program Budget Issues

### FY2009 FCS Budget Request [31]

The Administration requested $3.7 billion for FY2009—with approximately $3.3 billion for R&D and approximately $300 million for procurement. Procurement funds include the manufacturing and assembly of the first six Non-Line-of-Sight Cannons (NLOS-C) to be fielded in FY2010 and FY2011 and for software and communications packages that are intended to link the FCS network to M-1 Abrams, M-2 Bradleys, and modified wheeled vehicles that will serve as surrogates for FCS MGVs during FCS initial operational tests scheduled for FY2011.

### FCS—FY2009 Defense Authorization and Appropriations [32]

The Senate Armed Services Committee (SASC) recommended fully funding the President's FCS FY2009 Budget Request. The House Armed Services Committee (HASC) Air and Land Subcommittee initially recommend $ 200 million less than the President's Budget Request.

The Duncan Hunter National Defense Authorization Act for FY2009 (S. 3001/P.L. 110-417) authorizes an increase in FCS RDT&E funding by $33 million while reducing procurement funding by $137.7 million—a net reduction of $104.7 million as opposed to the original HASC-proposed $200 million reduction.[33] The FY2009 National Defense Authorization Act (NDAA) also contained the following FCS-related provisions:[34]

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[30] Ibid.

[31] Information in this section is taken from "The Army Budget - Fiscal Year 2009," U.S. Army News Release, Army Public Affairs Office, February 4, 2008 and Daniel Wasserbly, "Army's FY-09 Budget Includes $3.6 Billion for Future Combat Systems," *InsideDefense.com*, February 11, 2008.

[32] For additional information on FY2009 Defense Authorizations and Appropriations, see CRS Report RL34473, *Defense: FY2009 Authorization and Appropriations*, by Pat Towell, Stephen Daggett, and Amy Belasco; Press Release, United States Senate Committee on Armed Services, "Senate Armed Services Committee Completes Markup of National Defense Authorization Bill for Fiscal Year 2009," May 1, 2008; John M. Donnelly, "Defense: House Armed Services Panel Aims at Administration's Defense Priorities," *CQ Today*, May 7, 2008, p. 11.

[33] S. 3001: Duncan Hunter FY2009 National Defense Authorization Act Summary, p. 14.

[34] Joint Explanatory Statement to Accompany S. 3001, September 2008.

- (Section 111) Beginning with the FY2011 Budget Request, requiring separate procurement funding lines for five FCS equipment classes, including manned ground vehicles, unmanned ground vehicles, unmanned aerial vehicles, unattended ground sensors, and "other FCS elements";
- (Section 112) A measure that would prohibit the Army from awarding new low-rate or full-rate production contracts for "major systems or subsystems" of FCS to companies serving as the program's lead systems integrator. Under this provision, program prime contractors would be considered a lead systems integrator until 45 days after the Secretary of the Army certifies to congressional defense committees that the contractor is no longer serving as a lead systems integrator;
- (Section 211) Adds provisions to the FY2009 NDAA (P.L. 109-364) mandated FCS Systems Milestone Review addressing the use of actual demonstrations—as opposed to simulations—to demonstrate that software development is on a path to achieve threshold cost and schedule requirements; if demonstrations of the communications networks are adequate to inform major program decision points; the extent to which FCS MGVs are degraded if FCS communications are degraded; how resistant is the FCS communications network to network attacks, jamming, and interference; total program cost estimate (including spin-outs) and confidence level in that estimate; and a program affordability assessment based on the above-mentioned cost estimate and projected Army budgets.
- (Section 212) Requires that the Assistant Secretary of Defense for Networks and Integration to submit a report to congressional defense committees by September 30, 2009, on the FCS communications network and software. The report is to include an assessment of the vulnerability of FCS to enemy network attacks; electronic warfare and jamming; and adverse weather and complex terrain. Also the report is to cover FCS's dependence on satellite communications support, including network performance in the absence of assumed satellite communications support. The report will also address how a degraded network would affect FCS performance and MGV survivability. The report will also include an assessment developed in coordination with the Director of Operational Testing and Evaluation (DOT&E) on the adequacy of the FCS communications network testing schedule as well as an assessment also involving DOT&E on funding, schedule, and technological maturity of WIN-T and JTRS as they relate to the FCS program, including spin outs.
- (Section 213) Beginning February 15, 2009, through 2015, the Secretary of the Army is required to submit a Selected Acquisition Report in accordance with Section 2432, Title 10, United States Code, for each variant of the FCS manned ground vehicle (MGV).

## FCS and FY2009 Defense Appropriations [35]

H.R. 2638 (P.L. 110-329) the Consolidated Security, Disaster Assistance, and Continuing Appropriations Act of 2009 provides for, among other things, continuing appropriations for defense activities that would be covered under a regular FY2009 defense appropriations bill until the enactment of a regular appropriations bill or until March 6, 2009, whichever occurs first. Under the provisions of this act, the restructured FCS program was fully funded and $2.6 billion above the President's request was added to accelerate the unmanned aerial and ground vehicle programs.

## FY2010 Budget—Funding FCS at the Cost of Abrams, Bradleys, and Strykers?

In the Army's July 2008 draft FY2010 Program Objective Memorandum, the Army proposed to reduce funding for the M-1 Abrams tank, the M-2 Bradley fighting vehicle, and the Stryker fighting vehicle primarily to shift funds to FCS. The Army proposal was said to add $6.2 billion from FY2010-2015 by decreasing funding to a number of Army programs, most noticeably by decreasing M-1 Abrams upgrades and procurement from FY2010 to 2013 by $940 million, decreasing M-2 Bradley upgrades and procurement from FY2010 to 2013 by $293 million, and cutting $1.3 billion from Stryker upgrades and procurements from FY2010 to 2013.[36] The Army contends that this measure is needed "because Congress has cut roughly $ 1 billion from proposed FCS budgets from 2004," and that "the money will be used to help buy FCS spin out technologies such as robots, UAVs, and ground sensors."[37]

Some Members have expressed their concern to the Secretary of Defense that reducing the levels of funding for Abrams, Bradleys, and Strykers before the Army even begins to test realistic FCS prototypes "could place our future forces at risk if achieving the FCS program's aggressive schedule is delayed or if FCS manned ground vehicles cost more than is now forecasted."[38] Members also note that it is possible that the aforementioned vehicles will be part of the Army's inventory beyond 2050 and that they must continue to be upgraded to remain fully capable. There is also a concern that the Army's proposed funding cuts would result in the termination of a 2008 multiyear contract for upgrading M-1 Abrams tanks, a situation that could signal the defense industry that long-term agreements with DOD are not to be trusted which could increase equipment costs in the future.

## FCS Cost Estimates

In March 2006, GAO estimated that the current total cost for the FCS program was $160.7 billion (then-year dollars)—an increase of 76% over the Army's first estimate.[39] In July 2006, the Department of Defense's Cost Analysis Improvement Group (CAIG) estimated that the total cost

[35] U.S. Senate Committee on Appropriations Press Release, "Senate Defense Appropriations Subcommittee Approves Fiscal Year 2009 Defense Appropriations Bill," September 23, 2008 and House Committee on Appropriations Press Release, "Summary: 2009 Defense Appropriations," September 22, 2008.

[36] Kris Osborn, "U.S. Army Adds $6.2 Billion to FCS Through '15" *Defense News*, September 29, 2008.

[37] Kris Osborn, "U.S. Army, DoD Spar Over Early End to Tank Purchases," *Defense News*, September 20, 2008.

[38] Information in this section is from a Letter from the House Armed Services Committee to Secretary of Defense Gates from Representatives Skelton, Hunter, Abercrombie, and Saxton, September 29, 2008.

[39] Government Accountability Office (GAO) Report "Acquisitions: Business Case and Business Arrangements Key for Future Combat System's Success," GAO-06-478T, March 1, 2006, p. 8.

for the development, procurement and operations of FCS had increased to more than $300 billion.[40] The Army maintains that the total cost for the FCS program will be roughly $230 billion, based on an April 2006 estimate from the FCS Program Office.[41] An August 2006 Congressional Budget Office (CBO) study postulated that, given historic cost growth in similar programs, that annual FCS costs could reach $16 billion annually, exceeding the Army's estimates of $10 billion annually.[42] The Army has disputed CBO's estimates, calling them "seriously flawed" suggesting that CBO does not address the strategic environment or changing operational requirements.[43] In June 2007, the Institute for Defense Analysis (IDA)—a nonprofit corporation that administers three federally funded research and development centers—reportedly concluded that the FCS program would cost $13 billion more than what the Army has estimated, a conclusion that the Army has rejected.[44] Some maintain that this wide disparity in FCS cost estimates eight years into the program has resulted in a lack of confidence that the FCS program can be conducted in a cost-efficient manner.

On April 7, 2008 DOD provided Congress with revised cost estimates on a number of defense acquisition programs. DOD revised the total FCS program cost downward by 1.6 percent to just over $159.3 billion, primarily due to the application of revised inflation indices, but also including past incorrect indices, decreases in other program support, and Congressional statutory reductions.[45]

# Potential Issues for Congress

## What Is the Future of the 15 FCS BCTs?

The Army's June 2008 FCS program reorganization focuses exclusively on providing FCS technologies to IBCTs for the "current fight," although it might be argued that fielding FCS Spin Out One in 2011 to the first of 43 IBCTs does not adequately address the needs of commanders in the field today. The lack of detail about how the 15 FCS BCTs fit into this reorganization and re-prioritization could lead to speculation that the Army does not intend to field 15 FCS BCTs by 2030 as per the 2007 program plan. If this is the case, there are significant operational and budgetary issues associated with any plans to scale back or lengthen the 15 FCS BCT fielding that Congress might wish to explore with the Army and DOD.

[40] Megan Scully, "Army Sticks to its Guns, Rejects New FCS Cost Estimates," *National Journal's Congress Daily AM,* July 13, 2006.

[41] Ibid.

[42] "The Army's Future Combat Systems Program and Alternatives," A CBO Study, August 2006, p. xii.

[43] Ann Roosevelt, "Army Calls CBO's FCS Report Seriously Flawed," *Defense Daily,* Vol. 231, No. 52, September 19, 2006.

[44] Daniel Wasserbly, "Study: Army FCS Program Will Cost $13 Billion More Than Estimated," *InsideDefense.com,* July 30, 2007.

[45] DOD Press Release, "Department of Defense Releases Selected Acquisitions Reports," Number 276-08, April 7, 2008 and Marina Malenic, "DOD Revises FCS Cost Downward Using New Inflation Indicies," *Inside Defense.com,* April 14, 2008.

## What Are the Programmatic, Budgetary, and Operational Impacts of the June 2008 Program Restructuring?

The June 2008 restructuring will provide FCS technologies to IBCTs sooner than originally planned. This focus on IBCTs might be viewed by some as a concession by the Army that FCS BCTs are less relevant in counterinsurgency and stabilization operations than IBCTs, which operate dismounted and have a greater interaction with civilians. While this restructuring might prove to be beneficial, there are a number of longer-term programmatic, budgetary, and operational impacts associated with this action. Will the FCS program need to be extended beyond 2030? If FCS BCTs are to be reduced or eliminated, what is the impact on the M-1 Abrams and M-2 Bradley Programs? What are the long-term budgetary implications of the 2008 restructuring—will it increase or decrease the total FCS program cost? How will this restructuring change the tactical and operational employment of the Army throughout the entire spectrum of operations? Will the restructuring result in a less or more capable FCS-equipped force? How will the restructuring affect how the Army conducts operations with the other Services and allies?

## How Are Major Complementary Programs Affecting the Development of FCS Units?

While many FCS unmanned and manned ground and aerial vehicles are in prototyping phases and, in some instances, actually being deployed into combat,[46] there are concerns that complementary programs—viewed as essential for FCS to achieve its full potential—are not achieving the same level of success. The JTRS program, which has been criticized as "falling short of what FCS requires,"raises some concerns. The Army's decision to acquire less capable JTRS radios for dismounted soldier use and the possibility that the Army may substitute a number of less capable "legacy radios" for other variations of JTRS radios suggests that overall program requirements are ill-defined and in a state of flux. Such a potential "hodgepodge" of radios linking FCS systems will likely only exacerbate noted radio spectrum problems. There is also concern that WIN-T Increments Three and Four are still not as well defined as they should be. In the case of Increment Four, the final increment intended to tie FCS to the TSAT system, the uncertain future of the TSAT program likely has a highly detrimental impact on program planning and budgeting.

Requirements mandated in Sections 211 and 212 of the FY2009 NDAA (P.L. 110-417) should provide Congress with some preliminary insights on how JTRS, radio spectrum difficulties, WIN-T development, and potential lack of a TSAT system could affect FCS survivability and effectiveness. The value of these insights are predicated on the level of detail that the Army and DOD incorporates into these congressional requirements and reports. In particular, Section 211's requirements to include a number of these factors into the FCS System Design review could prove useful in assessing the future viability of the FCS program.

[46] Matthew Cox, "Guard Stryker Brigade to Deploy with FCS UAVs," *Army Times*, November 25, 2008.

## Funding FCS at the Expense of Abrams, Bradleys, and Strykers

The Army's proposal to fund FCS at the expense of proven, legacy ground combat systems could become an increasingly contentious approach. With FCS's viability and affordability being called into question, and the FCS program's near to mid-term focus on IBCTs, the need for Abrams, Bradleys, and Strykers seems assured. If funding proves to be problematic, perhaps a strategy that maintains modernization and procurement funding of M-1s, M-2s, and Strykers until FCS's future is more assured might be a better means of ensuring future FCS funding than the Army's current "FCS first" approach.

## The Financial Crisis, Constrained Defense Budgets, and the Future of FCS[47]

A number of experts suggest that the current financial crisis could decide the ultimate fate of the FCS program. Some Members have noted that the financial crisis will add to demands on the federal budget and force reductions in militray spending and that the former approach where the Services "got what the asked for" is no longer realistic. It has been suggested that the incoming Obama Administration would closely examine the FCS program in terms of affordability. Some DOD officials maintain that the U.S. military should prepare for a period of constrained defense budgets in light of the current economic downturn and global credit crisis. In this regard, some believe that the Pentagon will be called on to cancel program outright, as opposed its past approach, whereby smaller budget cuts were imposed across all programs. If this does become the case, FCS has been mentioned, along with Missile Defense, as a candidate for cancellation. Some senior officers note that if we fail to invest in weapons systems such as FCS, we could leave U.S. forces ill-equipped to fight modernized Russian or Chinese forces in the future. It is likely that the financial crisis will be a significant new dimension in the FCS affordability argument and will be an issue of interest for the 111th Congress.

# Additional Reading

CRS Report RL32476, *U.S. Army's Modular Redesign: Issues for Congress*, by Andrew Feickert.

CRS Report RS22707, *Mine-Resistant, Ambush-Protected (MRAP) Vehicles: Background and Issues for Congress*, by Andrew Feickert.

CRS Report RL33161, *The Joint Tactical Radio System (JTRS) and the Army's Future Combat System (FCS): Issues for Congress*, by Andrew Feickert.

[47] John Reed and Jason Sherman, "Murtha: Wall Street Bailout Will Squeeze Future Defense Budgets," *Inside the Pentagon*, September 25, 2008; Emelie Rutherford, "Danzig: Obama Would Examine Army's Future Combat Systems, National Missile Defense," *Defense Daily*, October 3, 2008; Jason Sherman, "Panel: Fiscal Constraints Will Force Next Defense Secretary to Consider Program Kills," *InsideDefense.com*, October 29, 2008; and August Cole and Yochi J. Dreazen, "Boots on the Ground or Weapons in the Sky?," *Wall Street Journal*, October 20, 2008.

CRS Report RL34333, *Does the Army Need a Full-Spectrum Force or Specialized Units? Background and Issues for Congress*, by Andrew Feickert.

CRS Report RS21195, *Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress*, by Gary J. Pagliano and Ronald O'Rourke.

# Appendix. FCS Subsystems

## Manned Ground Vehicles

FCS manned ground vehicles (MGVs) are a family of eight different combat vehicles—with some having more than one variation—that are based on a common platform and are being designed to be air transportable by the U.S. Air Force. They are to be equipped with a variety of passive and active protection systems and sensors that the Army hopes will offer them the same survivability as the current heavy armor force. In addition the Army intends for its MGVs to be highly reliable, require low maintenance, and have fuel-efficient engines. The following are brief descriptions of MGV types and variants. All are intended to have a range of 750 kilometers and a top speed of 90 kilometers per hour (kph)—55 miles per hour:[48]

### Mounted Combat System (MCS) (XM1202)

As envisioned, the MCS provides direct and beyond-line-of-sight (BLOS) fires, is capable of providing direct fire support to dismounted infantry, and can attack targets with BLOS fires out to a range of 8 kilometers. The MCS is intended to replace to current M-1 Abrams tank. The MCS is to have a crew of two and might also be able to accommodate two passengers. The MCS is to be armed with a 120 mm main gun, a .50 caliber machine gun, and a 40 mm automatic grenade launcher.

### Infantry Carrier Vehicle (ICV) (XM1206)

As planned, the ICV consists of four versions: the Company Commander version, the Platoon Leader version, the Rifle Squad version, and the Weapons Squad version. All four versions appear to be identical from the exterior to prevent the targeting of a specific carrier version. The Rifle Squad version is to have a two-man crew, and is to be able to transport a nine-man infantry squad and dismount them so that they can conduct combat operations on foot. The ICV is to mount a 30 or 40 mm cannon.

### Non-Line-of-Sight Cannon (NLOS-C) (XM1203)

The NLOS-C is to provide networked, extended-range targeting and precision attack of both point and area targets with a wide variety of munitions. Its primary purpose will be to provide responsive fires to FCS Combined Arms Battalions and their subordinate units. The NLOS is to have a two-man crew and a fully automated handling, loading, and firing capability.

### Non-Line-of-Sight Mortar (NLOS-M) (XM1204)

The NLOS-M is intended to provide indirect fires in support of FCS companies and platoons. The NLOS-M is to have a four-man crew, mount a 120mm mortar, and also carry an 81 mm mortar for dismounted operations away from the carrier.

[48] Information for these descriptions are taken from two Army sources: The Army's *FCS 18+1+1 White Paper*, dated October 15, 2004, and the *FCS Brigade Combat Team,* August 22, 2007.

### Reconnaissance and Surveillance Vehicle (RSV) (XM1201)

As planned, the RSV will feature advanced sensors to detect, locate, track, and identify targets from long ranges under all climatic conditions, both day and night. The RSV is to have a mast-mounted long-range, electro-optical infra-red sensor, sensors for radio frequency (RF) intercept and direction finding as well as a remote chemical warfare agent detector. RSVs are to also carry four dismounted scouts, unattended ground sensors (UGS), a Small Unmanned Ground Vehicle (SUGV) with various payloads, and two Unmanned Aerial Vehicles (UAVs). In addition to the four scouts, the RSV is to have a two-man crew and a defensive weapons system.

### Command and Control Vehicle (C2V) (XM1209)

The C2V is intended to serve as the "hub" for battlefield command and control. It is to provide information management for the integrated network of communications and sensors for the FCS brigade combat teams. The C2V is to have a crew of two and carry four staff officers and also be capable of employing UAVs.

### Medical Vehicle - Evacuation (MV-E) (XM1207) and Medical Vehicle - Treatment (MV-T) (XM1208)

There are to be two versions of the MV: the MV-E and MV-T. The MV-E would permit combat trauma specialists to be closer to the casualty's point of injury as it is to move with combat forces and evacuate casualties to other treatment facilities. The MV-T is to enhance the ability to provide Advanced Trauma Management/Advanced Trauma Life Support forward in the battle area and both MV-E and MV-T would be capable of conducting medical procedures and treatments using telemedicine systems. Both would have four-man crews and the capability to carry four patients.

### Field Recovery and Maintenance Vehicle (FRMV) (XM1205)

The FRMV would be the FCS Brigade Combat Team's recovery and maintenance system. The FRMV is to have a crew of three, plus additional space for up to three recovered crew members.

## Unmanned Aerial Vehicles (UAVs)[49]

Each FCS-equipped brigade will have a number of UAVs.[50] While these UAVs are to provide a variety of capabilities to forces on the ground, some experts note that they could also present an air space management challenge to not only manned Army aviation assets, but also to Navy, Marine Corps, Air Force, and other nation's aircraft that might be providing support to Army ground operations. The following are brief descriptions of the Army's four classes of UAVs:

[49] Unless otherwise noted, UAV information for these descriptions are taken from two Army sources: The Army's *FCS 18+1+1 White Paper*, dated October 15, 2004 and the *FCS Brigade Combat Team,* August 22, 2007.

[50] Sandra I. Erwin, "Army to Field Four Classes of UAVs," *National Defense,* April 2003.

### Class I UAVs (XM156)

Class I UAVs are intended to provide Reconnaissance, Surveillance, and Target Acquisition (RSTA) at the platoon level. Weighing less than 15 pounds each, these Class I UAVs are intended to operate in urban and jungle terrain and have a vertical takeoff and landing capability. They are to be used to observe routes and targets and can provide limited communications transmissions relay. The Class I UAV are to be controlled by dismounted soldiers and can also be controlled by selected FCS ground platforms, and have an endurance of 50 minutes over an 8 kilometer area, and a 10,500 foot maximum ceiling.

### Class IV UAVs (XM157)

Class IV UAVs are intended to provide the FCS brigade commander with a long endurance capability encompassing all functions in Class I through Class III UAVs. It is intended to stay aloft for 72 continuous hours and operate over a 75 kilometer radius with a maximum ceiling of 16,500 feet. It is also planned to interface with other manned and unmanned aerial vehicles and be able to take off and land without a dedicated airfield.

## Unmanned Ground Vehicles (UGVs)[51]

### Armed Robotic Vehicle - Assault Light (ARV- AL) (XM1219)

The ARV was originally intended to come in two variants—the Assault variant and the Reconnaissance, Surveillance, and Target Acquisition (RSTA) variant. The RSTA variant has been deferred as part of the Army's 2007 FCS program restructuring. The two variants were to share a common chassis. The Assault Light variant is to provide remote reconnaissance capability, deploy sensors, and employ its direct fire weapons and special munitions at targets such as buildings, bunkers, and tunnels. It is also intended to be able to conduct battle damage assessments, act as a communications relay, and support both mounted and dismounted forces with direct and anti-tank fire as well as occupy key terrain.

### Small Unmanned Ground Vehicle (SUGV) (XM1216)

The SUGV is a small, lightweight, manportable UGV capable of operating in urban terrain, tunnels, and caves. The SUGV will weigh 30 pounds, operate for 6 hours without a battery recharge, and have a one kilometer ground range and a 200 meter tunnel range. Its modular design will permit a variety of payloads which will enable it to perform high-risk intelligence, surveillance, and reconnaissance (ISR) missions, and chemical weapons or toxic industrial chemical reconnaissance.

### Multifunctional Utility/Logistics and Equipment Vehicle (MULE)

The MULE is a UGV that will support dismounted infantry. It is to come in two variants sharing a common chassis—a transport variant (XM1217) and a countermine variant (XM1218). The

[51] Unless otherwise noted, information for these descriptions are taken from two Army sources: The Army's *FCS 18+1+1 White Paper*, dated October 15, 2004 and the *FCS Brigade Combat Team,* August 22, 2007.

transport variant is to be able to carry 1,900 to 2,400 pounds of equipment and rucksacks for dismounted infantry and follow them in complex and rough terrain. The countermine variant is to have the capability to detect, mark, and neutralize anti-tank mines.

## Unattended Ground Sensors (UGS)[52]

UGS are divided into two groups—Tactical UGS and Urban UGS—and are described as follows:

### Tactical UGS (AN/GSR-10)

Tactical UGS include intelligence, surveillance, and reconnaissance (ISR) sensors and Chemical, Biological, Radiological, and Nuclear (CBRN) sensors. These sensors are to employ a variety of sensing technologies and integrated into the overall FCS network. They are intended to be deployed by hand, by vehicle, or by robot and have a 48 hour endurance. They are intended to be expendable, low-cost sensors used for such tasks as perimeter defense, surveillance, target acquisition, and CBRN early warning.

### Urban UGS (AN/GSR-9)

Urban UGS can also be employed by soldiers, vehicles, or robots and are intended to provide situation awareness inside and outside of buildings for force protection and also for previously cleared buildings and areas.

### Non-Line-of-Sight Launch System (NLOS-LS) (XM501)

NLOS-LS is to consist of missiles in a deployable, platform-independent, container launch unit (CLU), which can be fired in an unmanned and remote mode. Each CLU is to have a fire control system and 15 missiles consisting of Precision Attack Missiles (PAM).

The PAM is to have two employment modes—a direct-fire and a fast attack mode or a boost-glide mode. The missile is intended to receive target information prior to launch and receive and respond to target location updates while in flight. The PAM can be fired in the laser-designated mode and transmit near real-time target imagery prior to impact.

## The Network[53]

The FCS network is considered the most crucial system of all 14 systems. The FCS network is to consist of four interactive components—the System-of-Systems Common Operating Environment (SOSCOE); Battle Command (BC) software; communications and computers (CC); and intelligence, reconnaissance and surveillance (ISR) systems.

[52] Ibid.

[53] Ibid.

## System-of-Systems Common Operating Environment (SOSCOE)

The SOSCOE is to enable the integration of a variety of software packages into the FCS network. It is intended to use commercial, off-the-shelf hardware and allow for the integration of critical interoperability packages that translate Army, Navy, Air Force, Marine Corps, and allied message formats into internal FCS message formats.

## Battle Command (BC) Software

Battle Command mission applications are to include mission planning and preparation, situational understanding, battle command and mission execution, and warfighter-machine interface.

### *Mission Planning and Preparation*

Consists of 16 different functions that provide FCS units with the following automated capabilities:

- The development of deliberate, anticipatory, and rapid-response plans;
- The ability to perform plan assessments and evaluations;
- The ability to perform terrain analysis;
- The conduct of mission rehearsals; and
- The conduct of after action reviews.

### *Situation Understanding*

This consists of 10 different packages that allow the user to better comprehend his surroundings. These packages employ map information and a variety of databases that help to determine enemy locations and capabilities, infer enemy intentions, and assess the threat to U.S. forces.

### *Battle Command and Execution*

This package contains a variety of planning and decision aids to help commanders make rapid, informed, and accurate decisions during battle. These packages can also be used in the training and rehearsal modes.

## Warfighter-Machine Interface Package

This package receives soldier-generated information and displays information across all FCS platforms for soldier use.

## Communications and Computer (CC) Systems

The Communications and Computer network is intended to provide secure, reliable access to information over extended distances and complex terrain. This network is not intended to rely on a large and separate infrastructure because it is to be embedded in the FCS mobile platforms and move with the combat units. The communications network is to consist of a variety of systems

such as the Joint Tactical Radio System (JTRS); Wideband Network Waveform and Soldier Radio Waveform systems; Network Data Link; and the Warfighter Information Network Tactical (WIN-T).

### Intelligence, Reconnaissance and Surveillance (ISR) Systems

The Intelligence, Reconnaissance and Surveillance System is to be a distributed and networked array of multispectral ISR sensors intended to provide timely and accurate situational awareness to the FCS force. In addition, the ISR system is intended to help FCS formations avoid enemy fires while providing precision, networked fires to the unit.

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