Army Future Combat System (FCS) "Spin-Outs" and Ground Combat Vehicle (GCV): Background and Issues for Congress

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Summary

The Future Combat System (FCS) was a multiyear, multibillion dollar program at the heart of the Army's transformation efforts. It was to be 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 was intended to replace current systems such 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 because of the advanced technologies involved and the challenge of networking all of the FCS subsystems together so that FCS-equipped units could function as intended.

On April 6, 2009, Secretary of Defense Gates announced that he intended to significantly restructure the FCS program. The Department of Defense (DOD) would then plan to accelerate the spin out of selected FCS technologies to all brigade combat teams (BCTs). Gates also recommended cancelling the manned ground vehicle (MGV) component of the program, which was intended to field eight separate tracked combat vehicle variants built on a common chassis that would eventually replace combat vehicles such as the M-1 Abrams tank, the M-2 Bradley infantry fighting vehicle, and the M-109 Paladin self-propelled artillery system.

In October 2009, the Army announced a new BCT modernization strategy to implement Gates's restructuring announcement. Some of the key tenets of this strategy are as follows:

- Deliver capability packages consisting of key FCS technologies and warfighter urgent requirements in two year increments. The Army plans to expand the fielding of these capability packages to all BCTs by 2025.
- Get some FCS spin-outs—capabilities from the FCS program aimed at the current force—to the field in the FY2011-FY2012 capabilities package.
- Upgrade select core Army systems.
- Fully integrate Mine-Resistant, Ambush-Protected (MRAP) Vehicles into formations.
- Develop a Ground Combat Vehicle (GCV) concept focused on building a versatile platform incorporating combat lessons learned, and field the system by 2017.

The Army states that a "new Ground Combat Vehicle, synchronized with upgrades, reset and divestiture of current vehicles is the most effective and affordable way to improve capability in the mid-term, mitigate risk associated with identified operational shortfalls and provide our Army the agility to adapt and versatility to meet the challenges of an ever-changing operational environment."

The Army's restructured FCS program and the new plan for modernizing BCTs pose several oversight issues for Congress. Congressional decisions regarding these new plans may significantly affect Army capabilities and funding requirements, and the ground combat portion of the defense industrial base.

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Introduction

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

In the aftermath of Secretary Gates's April 2009 recommendation to cancel the Manned Ground Vehicle (MGV) portion of the FCS, reflected in the May 2009 DOD budget submission, the Army announced a new acquisition strategy in October 2009. Its basis was an "incremental BCT Modernization Plan" intended to provide "capabilities packages" to BCTs in the Army's Force Generation (equipping and deploying) cycle every two years and to develop a new Ground Combat Vehicle that would be fielded starting in 2017.[2]

The primary issues for congressional concern are how the Army plans to transition from the FCS program to a BCT Modernization Program, incorporating selected remaining FCS technologies in a series of spin-outs—capabilities from the FCS program aimed at the current force. Key oversight questions for consideration include the following:

- What is the Army's BCT modernization strategy and spin-out plan?
- What is the impact of an incremental modernization strategy on the Army's budgets for FY2011 and beyond?
- Is the Army rushing the GCV program?
- Will the Army replace the Non-Line-of-Sight Cannon (NLOS-C)?
- What is the impact on the Army's operational concept, force structure, and doctrine?

Congress's decisions on these and other related issues could have significant implications for Army capabilities and funding requirements, as well as the ground combat portion of the defense industrial base.

Background

FCS Program Origins

In October 1999, then-Chief of Staff of the Army General Eric Shinseki introduced the Army's transformation strategy, which was intended to convert all of the Army's divisions (called Legacy

[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] Army G-8, *2009 Army Modernization White Paper,* October 2009, p. 3, 5. Available at http://www.g8.army.mil, accessed on November 12, 2009.

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[3] in 4 days, a division in 5 days, and five divisions in 30 days.[4] As part of this transformation, the Army adopted the Future Combat System (FCS) as a major acquisition program to equip the Objective Force.[5]

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.[6] 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).[7]

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."[8] 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[9] (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] 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.

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

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

[6] 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.

[7] The Stryker is the Army's name for the family of wheeled armored vehicles that are to 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.

[8] 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.

[9] 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.

Program Overview[10]

The Army described FCS as a joint (involving the other services) networked "system of systems." FCS systems were 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 was intended to network with existing forces, systems currently in development, and systems that would be developed in the future. The Army intended to field 15 FCS BCTs equipped with new FCS manned ground vehicles (MGVs) and to provide selected FCS communications, sensor, and unmanned vehicle technologies to its Infantry Brigade Combat Teams (IBCTs) by FY2025.

DOD's April 2009 FCS Restructuring Decision

On April 6, 2009, Secretary of Defense Gates announced that he intended to significantly restructure the FCS program.[11] The Department of Defense (DOD), Gates said, now planned to accelerate the spin out of selected FCS technologies to all brigade combat teams (BCTs). Gates also recommended cancelling the manned ground vehicle (MGV) component of the program. The MGV program was intended to field eight separate tracked combat vehicle variants built on a common chassis that would eventually replace combat vehicles such as the M-1 Abrams tank, the M-2 Bradley infantry fighting vehicle, and the M-109 Paladin self-propelled artillery system. Secretary Gates was concerned that there were significant unanswered questions in the FCS vehicle design strategy and, despite some adjustments to the MGVs, that the vehicles did not adequately reflect the lessons of counterinsurgency and close-quarters combat in Iraq and Afghanistan. Secretary Gates was also critical that the FCS program did not include a role for Mine-Resistant, Ambush-Protected (MRAP) vehicles[12] that have been used successfully in current conflicts. After reevaluating requirements, technology, and approach, DOD planned to relaunch the Army's vehicle modernization program, including a competitive bidding process.

The Army halted the current FCS program shortly after the completion of a May 2009 Systems of Systems Preliminary Design Review. The successor to the FCS program is called the Army Brigade Combat Team Modernization (ABCTM) program, which is to be responsible for developing and fielding a new ground combat vehicle (GCV) and spinning out remaining FCS technologies to the Army's 73 BCTs.[13] The FCS program's lead systems integrators—Boeing and Science Applications International Corporation (SAIC)—are not to be retained for the GCV program.[14] Boeing and SAIC are expected to receive about $350 million in cancellation penalties due to the decision to discontinue their services as lead systems integrators for the MGV program.[15] Some analysts have reported that the Army is concerned that the cancellation fees may have to come from other modernization programs.[16]

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[10] Information in this section is taken from the FCS Program Manager System Overview Briefing, December 10, 2008.

[11] Information in this section is taken from a transcript of Secretary of Defense Robert M. Gates Budget Press Briefing, Arlington, VA April 6, 2009.

[12] For additional information on MRAPs see CRS Report RS22707, *Mine-Resistant, Ambush-Protected (MRAP) Vehicles: Background and Issues for Congress*, by (name redacted).

[13] Kris Osborn, "FCS is Dead: Program Lives On," *Defense News*, May 18, 2009.

[14] Ibid.

[15] Ibid.

[16] Matthew Potter, "FCS Cancellation Fallout," *Defense Procurement News*, July 6, 2009.

Army Modernization After FCS Restructuring

June 23, 2009, Acquisition Decision Memorandum[17]

On June 23, 2009, Under Secretary of Defense for Acquisition, Technology, and Logistics (USD AT&L) Ashton B. Carter issued an acquisition decision memorandum (ADM) that cancelled the FCS BCT acquisition program, retained the Non-Line-of-Sight Cannon (NLOS-C) Special Interest Program, and directed the Army to transition to a modernization program consisting of several other integrated acquisition programs, including the following:

- A program to produce and field the first seven Spin-Out Early Infantry Brigade Combat Team (SO E-IBCT) units sets.
- One or more Major Defense Acquisition Programs (MDAPs)[18] to include but not limited to follow-on BCT modernization to develop, produce, and field the required unmanned systems, sensors, and networking for the remaining 66 BCTs.
- One MDAP to continue to develop and field an incremental ground tactical network capability.
- One MDAP to develop ground combat vehicles (GCVs).

October 2009 Army BCT Modernization Strategy[19]

Pursuant to Secretary Gates's recommendation to cancel FCS MGVs and the June 23, 2009, ADM cancelling the FCS BCT Program, the Army announced a new BCT modernization strategy in October, 2009. Some of the key tenets of this strategy are as follows:

- Deliver capability packages consisting of key technologies and warfighter urgent requirements in two year increments that would enable the Army Force Generation model (ARFORGEN) beginning in FY2011. The Army plans to expand the fielding of these capability packages to all BCTs by 2025.
- Get some FCS spin-outs to field in the FY2011-FY2012 capabilities package, including Non Line of Sight Launch System (NLOS-LS), Small Unmanned Ground Vehicle (SUGV), Unattended Ground Sensors (UGS), Class I Unmanned Aerial Vehicle (UAV), and the Network Integration Kit (NIK).

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[17] Memorandum for the Secretary of the Army from the Under Secretary of Defense for Acquisition, Technology, and Logistics, "Future Combat Systems (FCS) Brigade Combat Team (BCT) Acquisition Decision Memorandum," June 23, 2009.

[18] According to the Defense Acquisition University, in order to be an MDAP, an acquisition program must either be designated by the USD(AT&L) as an MDAP or estimated by the USD(AT&L) to require an eventual total expenditure for research, development, test, and evaluation of more than $365 million in FY2000 constant dollars or more than $2.190B in procurement in FY2000 constant dollars. MDAPs are either Acquisition Category (ACAT) I "D" (for "Defense Acquisition Board (DAB)" and for which the USD (AT&L) is the Milestone Decision Authority) or ACAT I "C" (for "Component" and for which the Component/Service Acquisition Executive is the Milestone Decision Authority).

[19] Information in this section is from: Army G-8, *2009 Army Modernization White Paper*, October 2009, available at http://www.g8.army.mil.

- Upgrade select core Army systems. Targeted systems include the M777 Howitzer, the Patriot Advanced Capability—Phase 3 Patriot Missile (PAC-3), the Buffalo Route Clearance Vehicle, Single Channel Ground to Air Radio System (SINCGARS)/Enhanced Position Location Reporting Systems (ELPRS), Distributed Common Ground System-Army (DCGS-A), Biological Integrated Detection System (BIDS), and the Stryker.
- Fully integrate MRAPs into formations.
- Develop a Ground Combat Vehicle (GCV) concept focused on building a versatile platform incorporating combat lessons learns, to be fielded by 2017.

Army Chief of Staff General George Casey announced to the Army's Industry Day on October 16, 2009, that the first platform in the GCV program would be an infantry fighting vehicle (IFV), able to carry an infantry squad-sized unit, armed with a remotely operated weapons system.[20]

Current Ground Combat Vehicle (GCV) Details[21]

The Army's 2009 modernization strategy focuses on quickly developing a new GCV in a technologically versatile approach. The Army Capabilities Integration Center, the office in charge of developing the CGV concept, states that a "new Ground Combat Vehicle, synchronized with upgrades, reset and divestiture of current vehicles is the most effective and affordable way to improve capability in the mid-term, mitigate risk associated with identified operational shortfalls and provide our Army the agility to adapt and versatility to meet the challenges of an ever-changing operational environment."

The CGV concept, in short, is to

- field the CGV by 2015-2017,
- design the platform with sufficient margin for future capabilities,
- incorporate only mature technologies for vehicle integration,
- maintain a continuous armor development, and
- design the vehicle to accept current and future network capabilities (radios, sensors, jammers).[22]

Army leadership has also indicated that the GCV could be either a tracked or wheeled vehicle. The Army has also suggested that it sees "a lot of value in common chassis in terms of logistics support," and the Army might pursue a common chassis for GCV variants.[23] Other possible GCV features could include a V-shaped hull and side armor to protect against improvised explosive devices (IEDs).[24] Another possible feature for the new GCV could be fuel efficiency.[25] The air

[20] Daniel Wasserbly, "Industry Days Reveal US Army's Future Armoured Vehicle Requirements Post FCS," *Jane's International Defence Review*, October 27, 2009.

[21] Information in this section is from : Army Capabilities Integration Center, *The Ground Combat Vehicle Strategy: Optimizing for the Future*, October, 2009, available at http://www.g8.army.mil.

[22] *2009 Army Modernization White Paper*, p. 5.

[23] Emelie Rutherford, "Army Casting Wide Net for Post-FCS Vehicles Coming in Five to Seven Years," *Defense Daily*, May 13, 2009.

[24] Ibid.

transportability of the GCV is to also be a key design consideration, and the Army has said that the GCV must be able to fit on C-17 transports.[26] As of November 2009, the CGV is to have some military equipment directed by the Army, such as radios and chemical protection systems, but officials are leaving most of the specific solutions to industry recommendations based on Army-determined requirements.[27]

FCS Program Budget Issues

FY2010 Budget Request and Savings from Termination of Manned Ground Vehicle (MGV)[28]

According to the Office of Management and Budget (OMB), the Administration requested $2.981 billion for FCS in FY2010—$633 million less than the FY2009-enacted amount of $3.614 billion. Including the $2.981 billion for FY2010, OMB estimates that the remaining elements of FCS would cost approximately $24.5 billion through FY2015. OMB has said that the cancellation of the MGV program should save approximately $22.9 billion.

FY2010 FCS Budget Request for FCS Programs[29]

A breakdown of FCS program budget requests for FY2010 is as follows:

- Non-Line-of-Sight Launch System (NLOS-LS): $88.660 million;
- Non-Line-of-Sight Cannon (NLOS-C): $58.216 million;
- FCS Manned Ground Vehicles: $368.557 million;[30]
- FCS Systems of Systems Engineering & Program Management: $1.067 billion;
- FCS Reconnaissance (UAV) Platforms: $68.701 million;
- FCS Unmanned Ground Vehicles: $125.616 million;
- FCS Unattended Ground Sensors: $26.919 million; and
- FCS Sustainment & Training Research and Development: $749.182 million.

For a detailed description of the cancelled MGV variants as well as remaining FCS systems that are to be spun out to BCTs, see the **Appendix**.

(...continued)

[25] John T. Bennett, "Carter: FCS Successor Effort Could Have Many Primes," *Defense News*, May 18, 2009.

[26] Marjorie Censer and Kate Brannen, "Army Assessing Brigade Combat Modernization in Plan Due to OSD," *InsideDefense.com*, May 18, 2009.

[27] Daniel Wasserbly.

[28] Information in this section is from the United States Government Fiscal Year 2010 Budget: Terminations, Reductions, and Savings, Office of Management and Budget, May 2009, pp. 30-31.

[29] Information in this section is taken from the Army's Supporting Data FY 2010 Budget Estimate – May 2009, Research, Development, Test, and Evaluation.

[30] This amount ($ 368.557 million) is reportedly to cover program cancellation penalties. See Kris Osborn, "FCS is Dead: Program Lives On," *Defense News*, May 18, 2009.

Potential Issues for Congress

Proposed Ground Combat Vehicle (CGV)

One potential oversight issue for Congress is whether the Army is rushing the development of the GCV and thereby inviting undue risk that would set the stage for another unfulfilled acquisition program. What changes in acquisition approach have DOD and the Army made that should enable the Army to meet its goal of fielding the GCV five to seven years from now? How is the GCV acquisition process different from the FCS acquisition process? Are key technologies for the GCV sufficiently mature to support the fielding of the GCV within five to seven years? An additional aspect of the issue concerns the Army's proposed incremental RDT&E strategy for developing the GCV. Opponents of this strategy might argue that it follows a largely untested process. Supporters might argue that the strategy provides flexibility to adapt the GCV development effort to lessons learned in current combat operations.

Additional potential oversight questions concerning the GCV include the following: How many variations of the GCV does the Army envision? Can the Army afford to develop the GCV while at the same time upgrading its current Stryker combat vehicles? Has the Army set a development or unit procurement cost target for the GCV? Other than being suitable for transport on Air Force C-17 aircraft, are there any other deployability constraints that may influence the development of the GCV?

MGV Cancellation

Potential oversight issues regarding the cancellation of the MGV include the following: Should the Army be required to extend the useful lives through recapitalization of combat vehicles that the MGV was intended to replace? What technologies developed in the MGV program can be incorporated into other programs and what technologies would be "lost" when the MGV program is terminated? Is the cancellation of the MGV program to result in the termination or scaling back of the Active Protection System (APS) program? Are any of the armaments that were under development for various MGV variants, such as the Lightweight XM360 120 mm cannon, to be incorporated into other combat vehicle designs? How is DOD's cancellation of the MGV program going to influence the defense industry in future endeavors—are developmental costs to increase because industry has little confidence that DOD would remain committed to future ground combat systems programs?

Army BCT Modernization Strategy and Spin-Outs

While FCS MGVs are to be terminated, elements of the FCS program such as sensors, unmanned aerial and ground vehicles, the Non-Line-of-Sight Launch System, and a modified FCS network are to continue on and be incorporated into the Army BCT Modernization Strategy and spin-outs. DOD and the Army have committed to "spinning out" remaining FCS systems and the FCS Network to all 73 BCTs by 2025. Potential oversight questions include the following: How much does the Army estimate it would cost to modernize all 73 BCTs? How would the fielding of the proposed capability packages affect the Army Force Generation (AFORGEN) process? Is it realistic to expect that the BCT modernization program would survive the 15 years that it would

take to outfit all 73 BCTs, given the poor track record of previous long-term programs such as Crusader, Comanche, and now the MGV program?

Non-Line-of-Sight Cannon (NLOS-C) Replacement?

Regarding the proposed cancellation of the Non-Line-of-Sight Cannon (NLOS-C) program, one potential oversight question is whether the development of a new self-propelled artillery system to replace the venerable M-109 Paladin is to fall under the new GCV program—perhaps as a variant—or whether the Army plans to initiate a separate developmental and procurement effort.

Impact on Operational Concepts and Doctrine

The Army has expended a great deal of intellectual capital and budgetary authority over the past 10 years developing force structure, operational concepts, doctrine, and soldier education and training predicated on the success of the FCS program in developing and fielding 15 FCS BCTs and associated support units. In light of the FCS program restructuring, potential oversight questions include the following: Would the Army have to "go back to the drawing board" in the aforementioned areas as well? Does Training and Doctrine Command (TRADOC) and the Army Capabilities Integration Center have both an effective methodology for updating both acquisition and doctrine, as well as the ability to achieve Army-wide integration of those concepts? If there is a corresponding requirement to revise force structure, operational concepts, doctrine, and education and training, is there a plan or "road map" and what are the associated budgetary requirements?

Legislative Activity for FY2010

FY2010 National Defense Authorization Act (H.R. 2647, P.L. 111-84)

In the debate on the FY2010 National Defense Authorization Act, the House and Senate Armed Services committees both endorsed Secretary Gates's recommendation to terminate development of the eight new kinds of manned ground combat vehicles in the FCS program. The House committee recommended denying $426.8 million requested for termination costs, arguing that unspent FCS funds appropriated for FY2009 would cover the cost of ending the program. The Senate committee recommended reducing by $381.8 million the FCS termination request and recommended approving the remaining $45 million to continue developing "active protection systems"—small weapons mounted on tanks and other combat vehicles to intercept approaching missiles.[31]

[31] CRS Report R40567, *Defense: FY2010 Authorization and Appropriations*, coordinated by (name redacted), p. 58.

House Armed Services Committee (HASC) Markup[32]

The HASC recommended fully funding the elements of the original FCS program that would continue as separate programs in FY2010 at $2.45 billion. The committee further recommended providing only $100 million, a reduction of $327 million, for the termination of the FCS MGV program. The committee stated that there are unspent FY2009 funds from the FCS program, and that these funds, plus the $100 million in FY2010 funds, should be sufficient to cover termination costs. The HASC recommended limiting the number of Spin Out Early Infantry Brigade Combat Team (SO E-IBCT) equipment sets that can be procured under low-rate initial production to one brigade set to ensure that the equipment is fully tested before committing to full-rate production.

Senate Armed Services Committee (SASC) Markup[33]

The SASC recommended directing the Secretary of Defense to carry out a next-generation ground combat vehicle program and a next-generation self-propelled howitzer program for the Army and submit a strategy and plan for these new programs by March 31, 2010. The committee recommended reallocating $323.6 million of excess FCS termination liability funds to other Army research, development, test and evaluation (RDT&E) efforts in support of the GCV program, including vehicle modernization and survivability research, advanced tank armament systems, medium and heavy tactical vehicle development, and combat vehicle manufacturing technology. The SASC recommended reallocating $58.2 million of excess FCS termination liability to the Paladin Integration Management (PIM) program to accelerate the upgrade and modernization of M-109 Paladins. The SASC also recommended supporting the President's $2.5 billion budget request for RDT&E and procurement funds for further development of the FCS network and spin-out technologies.

Conference Report[34]

The Conference Report (House Report 211-188), signed into P.L. 111-84, authorized the House and Senate amounts of $285.9 million for procurement of FCS spin-outs and $42 million for advance procurement.

The report authorized no RDT&E funding for the Manned Ground Vehicle (MGV) and Non-Line of Sight Cannon (NLOS-C), but authorized unjustified termination costs (from existing contracts) for both programs, $184.6 million for MGV and $31.2 million for NLOS-C.

The report also authorized DOD-requested amounts for RDT&E for Non-Line-of-Sight Launch System (NLOS-LS): $88.660 million; FCS Systems of Systems Engineering & Program Management: $1.067 billion; FCS Reconnaissance (UAV) Platforms: $68.701 million; FCS Unmanned Ground Vehicles: $125.616 million; FCS Unattended Ground Sensors: $26.919 million; and FCS Sustainment & Training Research and Development: $749.182 million.

[32] Information in this section is taken from the HASC Summary of the H.R. 2647 National Defense Authorization Act for 2010, June 17, 2009.

[33] Information in this section is taken from SASC Press Release, "Senate Armed Services Committee Completes Markup of National Defense Authorization Bill for Fiscal Year 2010," June 26, 2009.

[34] Information in this section is taken from P.L. 111-84 and House Report 211-188 National Defense Authorization Act for Fiscal Year 2010 Conference Report, October 7, 2009.

The House bill included a provision that would limit the Army to the procurement of one brigade set of Future Combat Systems spin-out early-infantry brigade combat team equipment in order to allow for adequate testing prior to full-rate production. The Senate amendment contained no similar provision. The Senate receded with an amendment that would authorize the Army to increase the quantity of equipment procured through low-rate initial production, provided that the Under Secretary of Defense for Acquisition, Technology, and Logistics makes certain certifications with respect to the program's strategy and baseline, testing, technology readiness, and independent cost estimates.

The conference report limited Army Tactical Ground Network to obligating or expending not more than 50% of its funding until 30 days after the Under Secretary of Defense for Acquisition, Technology, and Logistics submits to Congress a report on the acquisition strategy, requirements, and cost estimates for the Army tactical ground network program.

For the GCV program, the report directs DOD to create a program for the development, test, and fielding of an operationally effective, suitable, survivable, and affordable next generation ground combat vehicle and self-propelled howitzer for the Army. DOD is required to submit a strategy report to Congress on the programs by March 31, 2010.

FY2010 Defense Appropriations Bill (H.R. 3326)

The House-passed bill provides $2.67 billion of the requested $2.88 billion for FCS, eliminating $211 million requested for termination costs which the committee said could be covered by unspent funds previously appropriated for currently cancelled elements of the program. The Senate bill would cut $368 million form the amounts requested for FCS programs.[35]

Additional Reading

CRS Report RL32476, *U.S. Army's Modular Redesign: Issues for Congress*, by (name redacted).

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

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

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

CRS Report RS21195, *Evolutionary Acquisition and Spiral Development in DOD Programs: Policy Issues for Congress*, by (name redacted) and (name redacted).

[35] CRS Report R40567, *Defense: FY2010 Authorization and Appropriations*, coordinated by (name redacted), p. 78.

Appendix. Original FCS Subsystems

Manned Ground Vehicles

FCS manned ground vehicles (MGVs) were a family of eight different combat vehicles—with some having more than one variation—based on a common platform and being designed to be air transportable by the U.S. Air Force. They were to be equipped with a variety of passive and active protection systems and sensors that the Army hoped would offer them the same survivability as the current heavy armor force. In addition, the Army intended 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 that were cancelled in May 2009.[36]

Mounted Combat System (MCS) (XM1202)

As envisioned, the MCS was to provide direct and beyond-line-of-sight (BLOS) fires, was to be capable of providing direct fire support to dismounted infantry, and to attack targets with BLOS fires out to a range of 8 kilometers. The MCS was intended to replace to current M-1 Abrams tank. The MCS was to have had a crew of two and 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 was to have consisted of four versions: the Company Commander version, the Platoon Leader version, the Rifle Squad version, and the Weapons Squad version. All four versions were to have appeared to be identical from the exterior to prevent the targeting of a specific carrier version. The Rifle Squad version was to have had a two-man crew and able to transport a nine-man infantry squad and dismount them so that they could conduct combat operations on foot. The ICV was to have mounted a 30 or 40 mm cannon.

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

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

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

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

[36] 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 was to feature advanced sensors to detect, locate, track, and identify targets from long ranges under all climatic conditions, both day and night. The RSV was to have had 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 were also to have carried 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 was to have had a two-man crew and a defensive weapons system.

Command and Control Vehicle (C2V) (XM1209)

The C2V was intended to serve as the "hub" for battlefield command and control. It was to have provided information management for the integrated network of communications and sensors for the FCS brigade combat teams. The C2V was to have had 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 were 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 was 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 have been 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 have been the FCS BCT's recovery and maintenance system. The FRMV was to have a crew of three, plus additional space for up to three recovered crew members.

Unmanned Aerial Vehicles (UAVs)[37]

Each BCT is to have a number of UAVs.[38] 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 two classes of UAVs:

[37] 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.

[38] 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 ground vehicles, 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 BCT commanders with a long endurance capability. 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)[39]

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 was 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 was 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 is to weigh 30 pounds, operate for six hours without a battery recharge, and have a 1 kilometer ground range and a 200 meter tunnel range. Its modular design is intended to carry a variety of payloads which are to 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 is to support dismounted infantry. It is to come in two variants sharing a common chassis—a transport variant (XM1217) and a countermine variant (XM1218). The transport variant is to be able to carry 1,900 to 2,400 pounds of equipment and rucksacks for

[39] 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.

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)[40]

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 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)

The Urban UGS can 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[41]

The FCS network program is to continue but would likely be significantly modified because of the cancellation of the MGVs. The original FCS network was to have consisted 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.

[40] Ibid.

[41] Ibid.

System-of-Systems Common Operating Environment (SOSCOE)

The SOSCOE is to enable the integration of a variety of software packages into the 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 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

This consists of 16 different functions that provide 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.
- The conduct of after action reviews.

Situational 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 combat vehicles 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 force. In addition, the ISR system is intended to help formations avoid enemy fires while providing precision, networked fires to the unit.

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