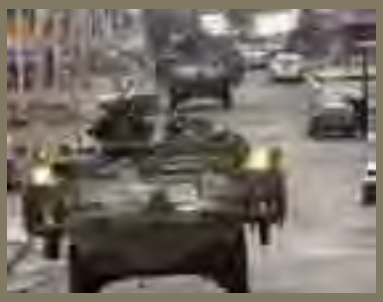
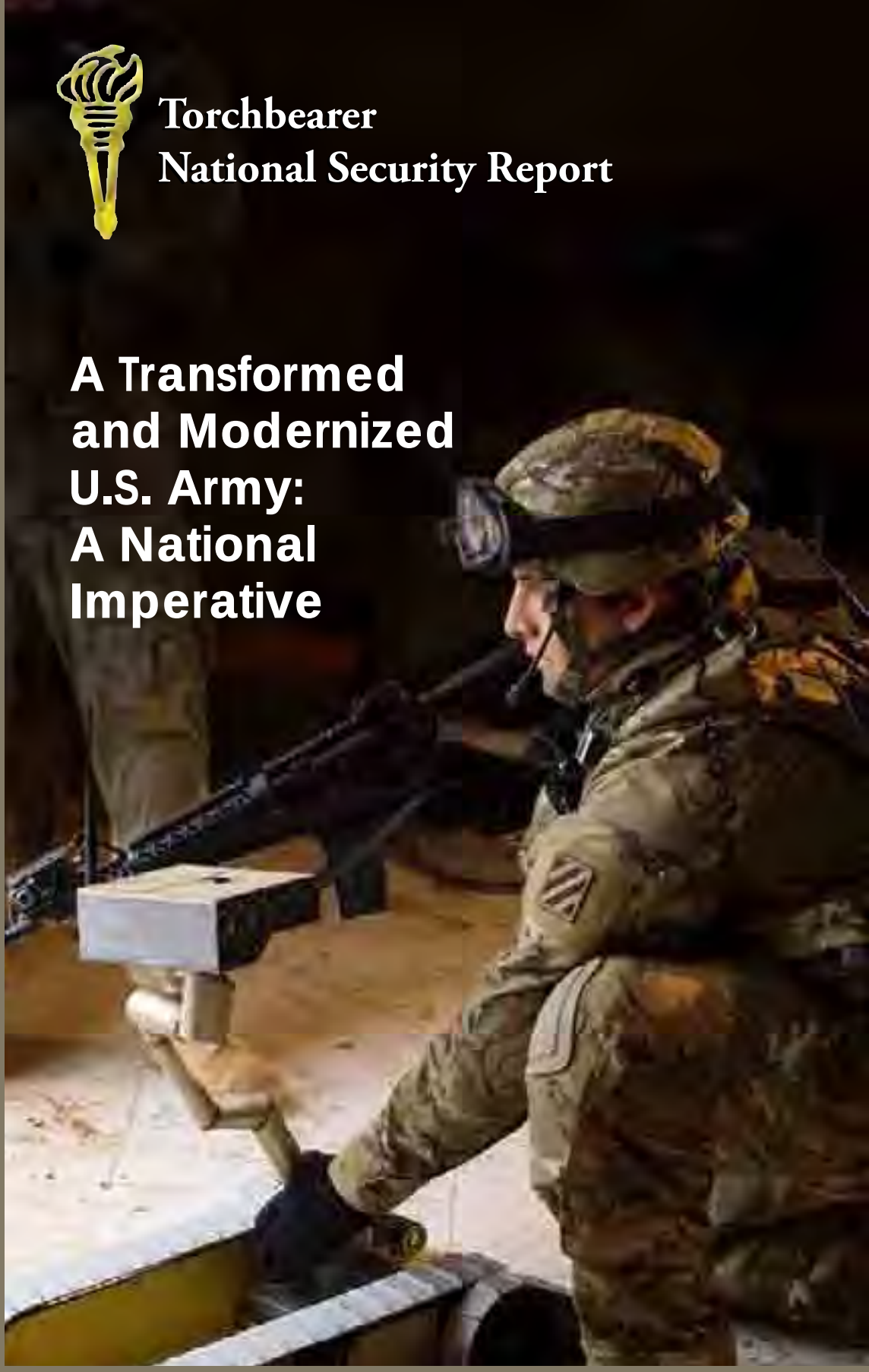


Torchbearer
National Security Report

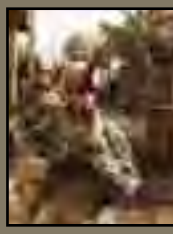
A Transformed and Modernized U.S. Army: A National Imperative



An AUSA Torchbearer Issue
April 2007







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A speaker at an AUSA-sponsored Land Warfare forum in January 1992 spoke on the U.S. Army in the post-industrial world and outlined some Army requirements: a family of combat vehicles capable of fighting on the ground together at full tempo; Army air vehicles that complement the ground vehicles in a synergistic way, multiplying the capability of ground forces; systems that enable commanders to command and control the force, enhancing a common perception of the battlefield; and the ability to sustain the force—not only with mass quantities but with precision. The continued operational requirements Soldiers have encountered in the subsequent 15 years have only served to validate those requirements, and it is gratifying to see the Army make steady progress toward satisfying them.

The strength of the Army results from whole, cohesive units and Soldiers that are fully manned, equipped, trained and ready to conduct full-spectrum operations today—and modernized to meet the challenges of today and tomorrow. The Army has adopted a new comprehensive, innovative modernization strategy. That strategy provides the best equipment currently available to Soldiers fighting the Global War on Terror while simultaneously developing new capabilities essential for future operations.

In this latest installment of AUSA's signature Torchbearer series, we provide an in-depth analysis of the Army's modernization plan—centered on Future Combat Systems technologies and a holistic, system-of-systems approach—to prepare the Army for success in the complex environment of the 21st century. We hope you find this report a useful resource and that you will continue to look to AUSA for thoughtful, credible analysis of contemporary national security issues.

GORDON R. SULLIVAN
General, United States Army (Retired)
President, AUSA

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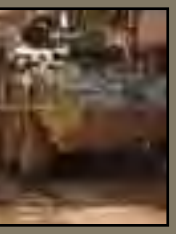




Executive Summary

[The nation] must remain committed to investing in technologies and equipment that enable our most important asset—the Soldier—to remain ahead of our adversaries who are quickly adapting their methods, tactics and tools of warfare. ***Investing sufficiently in our future readiness is a strategic necessity which must be viewed as a matter of priority, not just affordability.*** [emphasis added]

Army Chief of Staff General Peter J. Schoomaker in testimony
before the Senate Armed Services Committee, 15 February 2007

The 21st century security environment and changing operational requirements make a transformed and modernized Army a national imperative. Transnational organizations and movements waging "irregular warfare"—employing terror, information warfare and the most deadly weapons available in an environment where it is difficult to distinguish combatants from noncombatants—pose increasingly significant new threats to America's security. Nation-states with large-scale conventional military forces not only continue to possess capabilities that could directly challenge vital U.S. interests, but also look to incorporate irregular techniques into their conventional capabilities to indirectly counter U.S. technological superiority. As a result, the nation faces a broad range of likely contingencies, ranging from major combat to small-scale operations. Simultaneously, the U.S. military must secure the American homeland and provide military assistance to civil authorities in the event of a domestic disaster.

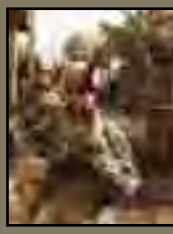
Transformation and modernization are two parts of an inseparable whole. The keystone initiative for Army transformation is modular conversion—the transition from a division- to a brigade-centric force. Future Combat Systems (FCS) is the centerpiece of Army modernization—the first comprehensive modernization effort in decades. This combination—building a modular Army and fielding FCS technologies—enables the Army's continuous evolution from the current to the future force.

Future Combat Systems is a system of systems—an integrated combat suite of multiple, interdependent systems that leverage common designs. This interconnected system of weapons, communications and intelligence assets (including sensors, manned and unmanned ground and aerial vehicles, and improved linkages to national- and theater-level surveillance and imagery systems) will be immediately responsive to Soldiers and commanders. It will provide persistent, ubiquitous intelligence, surveillance and reconnaissance (ISR) capabilities. In addition, it will create an integrated, distributed network to leverage the value of intelligence and facilitate the rapid employment of all weapon systems available. Each system is a node of the information network that will provide Soldiers near real-time situational awareness. FCS is the Soldier using a robust communications network integrating 14 manned and unmanned air and ground systems.

This comprehensive Army modernization strategy is to provide the best equipment currently available to Soldiers fighting the Global War on Terror while simultaneously developing new capabilities essential for future operations. The Army is speeding up the development and fielding of high-payoff technologies in support of warfighters. The strategy includes replacing battlefield losses and upgrading legacy equipment as units leave combat and reset for future deployments, while also adjusting modular units' equipment inventories to add combat power. This innovative strategy also includes incorporating lessons learned from current operations at home and abroad. Early iterations of FCS technologies and equipment such as the PackBot tactical robot are saving Soldiers' lives in Iraq and Afghanistan today. Consequently, **FCS capabilities are providing Soldiers with significant tactical and operational advantages now, especially in close combat.** By spinning out FCS technologies into the current force as soon as the capabilities are ready, the Army is strengthening its current force and working to stay ahead of enemies who are constantly adapting their methods. The first major spin-out of technologies is on track for delivery in 2008. Current-force brigade combat teams (BCTs) will become FCS-enabled BCTs.







The future force—a balanced mix of light, medium and heavy formations—will comprise both fully-equipped FCS BCTs and the current-force FCS-enabled BCTs. The FCS BCT is a single, coherent tactical warfighting unit. It is equivalent to the Navy's carrier battle group or the Air Force's air expeditionary wing—each tactical unit is made up of components upon which the rest of the unit depends. The combat effectiveness of the FCS BCT, like that of the carrier battle group or air expeditionary wing, is at its maximum when all components are present and integrated into the whole. Removing components degrades the effectiveness—and survivability—of the unit. Current plans call for the Army to field 15 fully equipped FCS BCTs, the first in 2015.

The Army has cancelled more than 100 programs in recent years to free resources to fund FCS. It reduced from 18 to 14 the number of platforms upon which FCS technologies would be used, reduced the number of spin-outs and slowed the pace at which FCS BCTs are fielded. More recently, $3.4 billion was cut from planned FCS spending for Fiscal Years (FYs) 2008–2013 to accommodate budgetary constraints placed on the Army.

The newly created Army Evaluation Task Force (AETF)—designed to test, refine and validate FCS technologies—is helping to minimize development costs in terms of time and money and maximize operational utility by making Soldiers an integral part of the acquisition and procurement process. The AETF is using robust field experimentation at Fort Bliss, Texas, to spin out FCS technologies in a way that more fully and faithfully addresses Soldiers' requirements in the current fight while paving the way for fully equipped FCS BCTs.

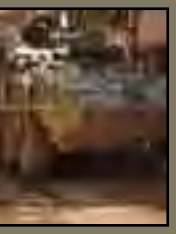
The intent of the Army's modernization initiative is to develop and field an integrated modular BCT, not disparate units. The Army does not merely require new vehicles; it requires *networked* vehicles that *empower Soldiers*. In sum, investing sufficiently in modernization is a strategic necessity that meets a compelling operational need now and in the future. It must be viewed as a matter of national priority, not simply as a matter of affordability. **The cost of modernization is measured in dollars; the cost of *failing* to modernize is measured in *lives*.**

To be able to execute the National Defense and Military Strategies, the Army must maintain readiness to fulfill current requirements while developing the capabilities to be ready for future challenges. **The Army has created an effective, affordable and technologically feasible modernization strategy—with FCS as its focal point—to complement the modular force conversion and leverage a variety of technologies to maintain the strategic overmatch of U.S. landpower.** The plan is holistic in its approach, drawing strength from the blending of complementary capabilities.

To realize the full potential of the Army's modernization program, Congress and the Department of Defense (DoD) must:

- increase base defense budget funding well beyond 4 percent of the Gross Domestic Product;
- increase the Army share of the DoD base budget to at least 28 percent;
- provide full, timely and predictable funding of the Army's FY 2008 President's Budget request and supplemental appropriations required to:
  - build readiness (through transformation to a modular force) to execute the National Defense Strategy; and
  - pay for the costs of the war now and throughout the Future Years Defense Program (FYDP);
- fully fund the Army's comprehensive modernization strategy—which includes FCS, aviation and other key supporting programs—as part of an integrated transformation plan;
- provide timely funding for modernization initiatives to coincide with reset operations when opportunities exist to enhance equipment with improved capabilities (i.e., resetting equipment forward, not backward to legacy design capability); and
- fully fund Advanced Technology Development focusing on maturing critical future modular force technology enablers such as FCS.

A transformed and modernized U.S. Army is a national imperative.





A Transformed and Modernized U.S. Army: A National Imperative

Five times over the past 90 years, the United States has either slashed defense spending or disarmed outright in the mistaken belief that the nature of man or the behavior of nations had somehow changed, or that we would no longer need capable, well-funded military forces on hand to confront threats to our nation's interests and security. . . . Each time, we have paid a price.

Secretary of Defense Robert M. Gates[1]

Introduction

In the five years since the 11 September 2001 terrorist attacks on the U.S. homeland, the international security environment has become increasingly dangerous. New sociological, technical and military trends—for example, the rise of non-state extremist movements and organizations, the corresponding deterioration in the adherence of America's adversaries to international law and norms, the rise of globalization, the diffusion of technology, the dramatic growth of Internet and cellular communications and growing disparities between "haves" and "have nots" throughout the world—have produced an increasingly volatile and complex national security environment. Transnational organizations and movements waging "irregular warfare"—employing terror, information warfare and the most deadly weapons available in an environment where it is difficult to distinguish combatants from noncombatants—pose increasingly significant new threats to America's security, while nation-states with large-scale conventional military forces continue to possess capabilities that could challenge vital U.S. interests and look to incorporate irregular techniques into their conventional capabilities to indirectly counter U.S. technological superiority. This strategic environment is dynamic as adversaries learn, adapt and innovate.

As a result, the nation faces a broad range of likely contingencies, ranging from major combat to small-scale operations. These may include low-intensity conflicts, border clashes, counterinsurgency missions, humanitarian and peacekeeping assistance and stability operations—all typically in distant and austere environments. Simultaneously, the U.S. military must secure the American homeland and provide military assistance to civil authorities in the event of a domestic disaster. Therefore, the Army must, as part of a highly versatile joint force, be prepared to handle a diverse array of new and complex challenges that span the full spectrum of military operations. These new challenges put serious pressure on the Army's military and technological superiority.

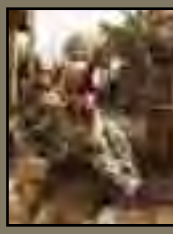
The 21st century security environment and changing operational requirements make a transformed, modernized Army a national imperative. With technology advancing at breakneck speed and the ingenuity and agility of current and potential adversaries increasing as well, the Army must transform and modernize to retain its current overmatch capabilities. Failure to do so now will put the lives of Soldiers (active Army, Army National Guard and Army Reserve) at risk and jeopardize the Army's ability to prevail in future conflicts.

The Army has anticipated these 21st century security challenges and already has in place both a successful transformation plan and a complementary modernization strategy. **Transformation and modernization are two parts of an inseparable whole.** The keystone initiative for Army transformation is modular conversion—the transition from a division- to a brigade-centric force. Future Combat Systems (FCS) is the centerpiece of Army modernization—the first comprehensive modernization effort in decades.

[1] In testimony before the Senate Armed Services Committee on the Fiscal Year 2008 Defense Budget and FY 2008 Supplemental, 6 February 2007.







The Security Environment

Irregular

Irregular challenges from the adoption or employment of unconventional methods by non-state and state actors to counter stronger state opponents—terrorism, insurgency, civil war, etc.
Seeking to *erode* U.S. power

Ethnic war; guerilla; insurgency; terror

Catastrophic

Catastrophic challenges involving the surreptitious acquisition, possession and possible terrorist or rogue employment of weapons of mass destruction (WMD) or methods producing WMD-like effects.
Seeking to *paralyze* U.S. power

WMD: rogue; terrorist; homeland missile attacks

Traditional

Traditional challenges posed by states employing legacy and advanced military capabilities and recognizable military forces, in long-established, well-known forms of military competition and conflict.
Seeking to *challenge* U.S. power

Legacy nuclear forces; uniformed militaries

Disruptive

Disruptive future challenges emanating from competitors developing, possessing and employing breakthrough technological capabilities intended to supplant U.S. advantages in particular operational domains.
Seeking to *marginalize* U.S. power

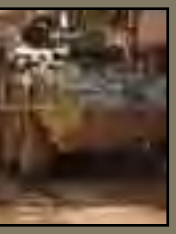
Cyber-war; directed energy; genetic weapons; nano weapons

Source: Headquarters, Department of the Army

This combination—building a modular Army and fielding FCS technologies—enables the Army's continuous evolution from the current to the future force. The combined effect of transformation and modernization is improving Army readiness to deal with traditional, irregular, catastrophic and disruptive challenges as a vital member of the joint force.

Army Transformation

For the Army, transformation is the continuous development of capabilities to evolve the current operational Army into the future force. The future force is a strategically responsive, campaign-quality Army, dominant across the range of military operations and fully integrated with the joint, interagency, intergovernmental and multinational (security framework. To address 21st century threats, the Army has already embarked on its most sweeping transformation in recent history. This transformation includes a comprehensive set of interdependent initiatives, all designed to make the Army more agile, adaptive, responsive and deployable. **The Army is**





transforming to build a more capable and relevant force while fully engaged in the war on terror and sustaining the range of its global commitments. The Army's objective is a fully manned, trained and equipped force comparably balanced between active and reserve components.

At the heart of this transformation lies the modular conversion—reorganizing the Army into smaller and more versatile units designed to be interoperable with any joint force. To sustain a steadily increasing demand for military forces, the Army's modular force is centered on the brigade combat team (BCT)—3,500 to 4,000 Soldiers trained and equipped as a combined-arms team—as the basic building block of the Army's fighting capability. Modular conversion across the active and reserve components is designed to create brigade-based modules able to "plug into" joint and coalition task forces in both expeditionary and campaign settings. These forces will be better organized to accept advanced new capabilities and technology to meet the demands of the current war, sustain other global commitments, establish the organizational structure needed to accelerate modernization and support a new global basing posture that will rely more heavily on rotational presence.

The Army's plan creates a rotational pool of 76 BCTs: 48 in the active component and 28 in the Army National Guard. These BCTs will be supported with approximately 225 support brigades and enabling organizations. They are critical to BCTs' accomplishing their assigned missions as well as providing essential capabilities to other services and civil authorities in homeland defense missions, to include consequence management and disaster relief. With modular conversion as the main effort, the Army has, in fact, already begun to transform every dimension of its doctrine, organization, training, materiel, leadership and education, personnel and facilities (DOTMLPF) to develop the most capable force for the 21st century.

America as a nation has historically entered conflicts "flatfooted," to quote Army Chief of Staff General Peter J. Schoomaker. During the decade of the 1990s, this nation underfunded military investment accounts by approximately $100 billion. In 2001 the Army entered the long war on terror with "holes in the force" amounting to $56.2 billion in equipment shortages (see table on page 8)—shortages that were acceptable under the concept of "tiered readiness." This concept, in which later-deploying units would not receive all the personnel and equipment necessary to conduct combat operations until shortly before deployment, did not anticipate the high operational tempo of the Global War on Terror. To meet combatant commanders' immediate wartime needs, the Army began redistributing resources from across the entire force to equip Soldiers and units—active and reserve component—deploying into those conflicts. This practice, continuing even today, increases risk for the next-to-deploy units and limits the Army's ability as a whole to respond to emerging contingencies. Through transformation and modernization, the Army is forming cohesive units that are fully manned, equipped and trained to accomplish their assigned missions. To sustain increased demand for military forces, the Army is building modular forces that are designed to receive FCS technologies. Current-force BCTs (Heavy, Infantry, Stryker) will be enabled by FCS technologies, allowing interoperability and integration of many FCS capabilities. These FCS-enabled BCTs will complement the fully-equipped FCS BCTs, enhancing the Army's ability to execute the full spectrum of operations required by the combatant commanders.

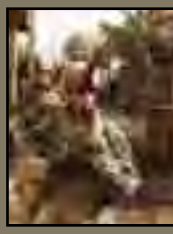
Army Modernization

General

Army modernization involves building a more nimble and responsive modular force. The Army's modernization initiatives—the materiel piece—center on FCS and include new aviation systems and more than 300 advanced technologies and systems. FCS, the Army's first comprehensive modernization in decades and its most critical investment, is fast becoming a reality.







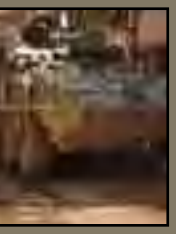
Operations in Afghanistan and Iraq illustrate that technological and training superiority are critical elements of battlefield success and must be sustained. For the benefit of the current force, the Army will field mature FCS technologies into the force beginning in 2008. To benefit the future force, the Army will field FCS BCTs beginning in 2015, to achieve the optimum balance of deployability, mobility, lethality and survivability to conduct successful early-entry, full-spectrum operations.

The Army is focusing development efforts on identifying promising FCS technologies and fielding these enhanced capabilities to enable Soldiers to retain technological overmatch, particularly in the areas of information and identification. Given today's wartime

2001 "Holes in the Force"

U.S. Army 9/10/2001	Abrams	$653 million
	Bradley	$500 million
	High-Mobility Multipurpose Wheeled Vehicle (HMMWV)	$1,148 million
	Family of Medium Tactical Vehicles	$668 million
	Heavy Expanded Mobility Tactical Truck	$416 million
	Small Arms/Mortars	$162 million
	Generators	$127 million
	Trailers	$366 million
	Global Positioning System	$94 million
	Ammunition	$5,500 million
	Apache	$1,217 million
	Black Hawk	$1,432 million
	Command and Control Systems	$1,024 million
	Communications Security	$86 million
	Lightweight Laser Designator Rangefinder	$145 million
	Single Channel Ground and Airborne Radio System	$404 million
	Recapitalization/Upgrade	$21,500 million
	Other Systems	$6,300 million
Total 2001 Shortages		***$41.7 billion***
Plus Global War on Terror (GWOT)-Related Operational Needs	Armored Security Vehicle	$763 million
	Up-Armored HMMWV	$1,291 million
	Warlock	$2,000 million
	Soldier Kit	$2,000 million
	Route Clearance Vehicles	$387 million
	Joint Network Nodes	$2,000 million
	Ammunition	$2,560 million
	Counter Rocket, Artillery and Mortar	$600 million
	Single Channel Ground and Airborne Radio System	$2,900 million
Total GWOT Operational Needs		***$14.5 billion***
Total		**$56.2 billion**

Source: Headquarters, Department of the Army





imperative, the Army cannot wait for transformational change and modernization over multiple decades. The Army is employing a balanced approach to transformation that ensures Soldiers and combatant commanders receive the best possible support and capabilities as soon as possible, now and in the future. Modular transformation allows for the more rapid integration of materiel modernization with FCS.

This comprehensive Army modernization strategy is to provide the best equipment currently available to Soldiers fighting the GWOT while simultaneously developing new capabilities essential for future operations. The Army is speeding up the development and fielding of high-payoff technologies in support of warfighters. The strategy includes replacing battlefield losses and upgrading legacy equipment as units leave combat and reset for future deployments, while also adjusting modular units' equipment inventories to add combat power. Furthermore, the modernization strategy calls for continued equipping and fielding of Stryker BCTs and for distributing some combat-proven Stryker capabilities to other formations.

Future Combat Systems

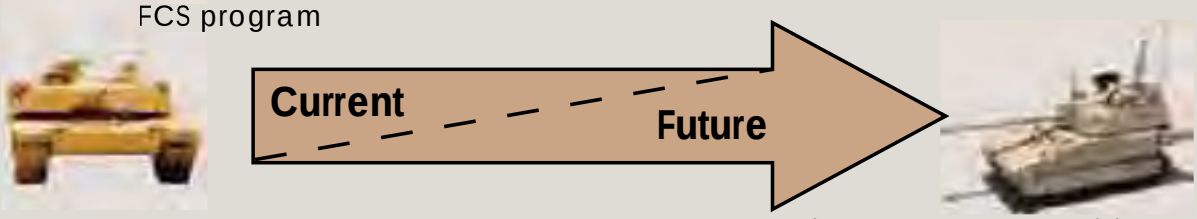
Future Combat Systems is a system of systems—an integrated combat suite of multiple, interdependent systems that leverage common designs. This interconnected system of weapons, communications and intelligence assets (including sensors, manned and unmanned ground and aerial vehicles, and improved linkages to national- and theater-level surveillance and imagery systems) will be immediately responsive to Soldiers and commanders.

FCS will provide persistent, ubiquitous intelligence, surveillance and reconnaissance (ISR) capabilities. In addition, it will create an integrated, distributed network to leverage the value of intelligence and facilitate the rapid employment of all weapon systems available.[2] Each system is a node of the information network that will provide Soldiers near real-time situational awareness.

Current to Future Force Strategy

Continually transition the current Army modular force to the future Army modular force by:

- Spinning out Future Combat Systems (FCS) and other advanced technologies—such as active protection, networking, unattended sensors and munitions, and unmanned aerial and ground vehicles—into the current force
- Integrating Operation Iraqi Freedom/Operation Enduring Freedom (OIF/OEF) lessons learned in the areas of doctrine, organization, training and leadership into the current force
- Incorporating advanced manned combat platforms developed in the FCS program

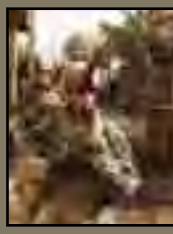


Source: Headquarters, Department of the Army

[2] See AUSA's Torchbearer National Security Report *The U.S. Army's Information Revolution: Delivering Information Dominance to the Warfighter,* August 2006, online at http://www.ausa.org/PDFdocs/TBSecRpt/TBSecRepAug06.pdf.







FCS is the Soldier using a robust communications network integrating 14 manned and unmanned air and ground systems: eight manned ground vehicles (MGVs); two classes of unmanned ground vehicles (UGVs)—the small unmanned ground vehicle (SUGV) and the multifunctional utility/logistics and equipment vehicle (MULE); two classes of unmanned aerial vehicles (UAVs); the non-line-of-sight launch system (NLOS-LS); and unattended ground sensors (UGS). This creates a fully networked system of systems.

Comprehensive Modernization

Applicability to the Current Force. The Army has adopted an innovative modernization strategy that includes the early fielding of FCS capabilities and equipment to the current force. This strategy incorporates lessons learned from current operations at home and abroad. Consequently, FCS capabilities are providing Soldiers with significant tactical and operational advantages now, especially in close combat.

Early iterations of FCS technologies and equipment are saving Soldiers' lives in Afghanistan and Iraq. The PackBot tactical robot, for instance, is an early version of the FCS SUGV. Soldiers use the PackBot to clear caves and bunkers, search buildings, cross minefields and defuse improvised explosive devices (IEDs). In fact, there are 800 PackBots and more than 4,000 counter-IED robotic devices deployed in theater today. These capabilities provide constant awareness of friendly and enemy situations and improve the ability to operate across larger areas with fewer Soldiers. When they are fully inserted into the current force, FCS capabilities will enhance the ability to defeat weaponry that includes IEDs, antitank weapons and small arms. Because of improved situational awareness, understanding of battlefield conditions and protection, Soldiers will ultimately be able to operate from extended distances, remote locations and the protection of their vehicles for longer periods, resulting in fewer casualties. They will also benefit from the greater precision and responsiveness of their weapons, which will improve their ability to operate in urban terrain and other complex environments.

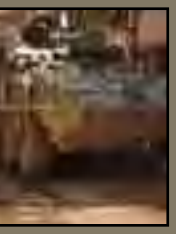
The Army is using an evolutionary acquisition process to develop, field and upgrade FCS technologies throughout its lifecycle. On 22 July 2004, the Army announced plans to accelerate the delivery of selected FCS capabilities to the current force. The acceleration will be accomplished by fielding selected FCS BCT operational capabilities within a structured release called "spin-outs." By spinning out FCS technologies into the current force as soon as the capabilities are ready, the Army is strengthening its current forces and working to stay ahead of enemies who are constantly adapting their methods.

The first spin-out, on track for delivery in 2008, will introduce UGS, NLOS-LS and an early iteration of the network (linked through the Joint Tactical Radio System, or JTRS). These capabilities will enhance Soldiers' understanding of their situation in dynamic battlefield conditions by promoting a common perspective of enemy and friendly locations on digital maps. This improvement will greatly increase the area that Soldiers can influence and control. The network will also provide Soldiers with more timely actionable intelligence.

The second and third spin-outs are on track for 2010 and 2012, respectively. These spin-outs will introduce new unmanned air and ground systems to better support Soldiers. The technologies will enable Soldiers to employ greater numbers of sensors to see and find their enemies first; they will also enable robotic reconnaissance of dangerous areas, mines and booby traps. Together, the spin-outs will increase Soldier protection and effectiveness and will enhance the precision of their weapons.

The 2012 spin-out also includes the technologies required to complete the fielding of the network (Warfighter Information Network-Tactical, or WIN-T). This improvement will reinforce the comprehensive efforts now underway to improve the accuracy and responsiveness of the joint weapon systems designed to support Soldiers, while providing unparalleled connectivity and situational awareness.

Modular BCTs actually accelerate modernization because they are versatile and better organized





Future Combat Systems

Manned Ground Vehicles (MGVs)

Reconnaissance and Surveillance Vehicle (RSV)

Infantry Carrier Vehicle (ICV)

Command and Control Vehicle (C2V)

Non-Line of Sight Cannon (NLOS-C)

Medical Vehicle Evacuation (MV-E)

Medical Vehicle Treatment (MV-T)

Mounted Combat System (MCS)

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

FCS Recovery and Maintenance Vehicle (FRMV)

The Soldier

Unmanned Aerial Systems (UAS)

Class I UAV

Class IV UAV

The Network

- Applications
- Services
- Transport
- Standards

Unmanned Ground Vehicles (UGVs)

MULE-C

Multifunction Utility/ Logistics and Equipment (MULE) Countermine and Transport

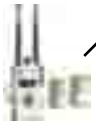
MULE-T

Armed Robotic Vehicle – Assault (Light) (ARV-A-L)

Small UGV (SUGV)

Unattended Sensors and Munitions

U-UGS



Tactical and Urban Unattended Ground Sensors (UGS)

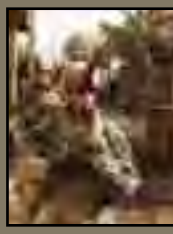
T-UGS

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

Source: Headquarters, Department of the Army



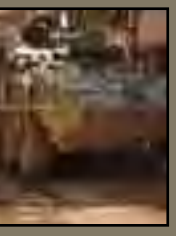




Future Combat Systems Platforms

Manned Ground Vehicles (MGVs). A common chassis with eight variants:

- **Infantry Carrier Vehicle (ICV):** The ICV has four sub-variants: the company commander, platoon leader, rifle squad and weapons squad vehicles. All appear identical from the outside, to prevent specific targeting of leader vehicles. The rifle and weapons squad variants carry nine-Soldier squads. The ICV is intended to protect Soldiers longer so they can engage closer to the fight; the vehicle can also deliver supporting or self-defensive fire.
- **Command and Control Vehicle (C2V):** The C2V is the linchpin for command and control in the battlefield—each echelon of command at the company level and above will have C2Vs. The vehicle allows battlefield commanders to access, process, analyze and disseminate information in real time for all allied forces connected to the FCS network.
- **Mounted Combat System (MCS):** The MCS functions like traditional armor, supplying firepower to support dismounted Soldiers and to destroy vehicles and structures. The MCS also offers beyond-line-of-sight (BLOS) firepower that can target points up to eight kilometers from the MCS.
- **Reconnaissance and Surveillance Vehicle (RSV):** The RSV provides all-weather, day/night observation in radio, infrared and visible ranges, as well as chemical detection, to provide a complete picture of the battlespace to units in the field and higher-echelon commanders. Included in the RSV's equipment are unattended ground sensors, a small unmanned ground vehicle and two unmanned aerial vehicles.
- **Non-Line-of-Sight Cannon (NLOS-C):** The NLOS-C functions like traditional artillery, supplying extended-range firepower to destroy point and area targets rapidly and precisely. The NLOS-C can also support FCS combined-arms battalions with BLOS networked fires capability.
- **Non-Line-of-Sight Mortar (NLOS-M):** The NLOS-M provides traditional, dismounted 81mm mortar capabilities but also adds a 120mm, breech-loaded NLOS mortar and the capability to operate autonomously or semi-autonomously in computing range and direction for infantry support, suppression or illumination fires.
- **FCS Recovery and Maintenance Vehicle (FRMV):** The FRMV acts as a force multiplier by allowing units in the field to recover and repair damaged equipment and return it quickly to the fight. The FCS family of MGVs is unique in that up to 80 percent of vehicle maintenance tasks can be performed by the crew in the field. The FRMV extends that capability to damage that goes beyond the crew's ability to repair but is light enough not to require removal from the battlefield. Each FRMV carries three crewmembers, with space for up to three additional crewmembers from vehicles too badly damaged to return immediately to the fight.
- **Medical Vehicle—two sub-variants (MV-Evacuation and MV-Treatment):** The two MV variants, MV-E and MV-T, work together to provide a new level of trauma care to injured Soldiers. The MV-E allows critical response within one hour of a Soldier's sustaining





traumatic injury and provides for casualty evacuation. The MV-T augments the trauma response capability by providing Advanced Trauma Management/Advanced Trauma Life Support at the unit level. Both vehicles are assisted by a suite of telemedicine capabilities.

Unmanned Ground Vehicles (UGVs). Two classes of ground robotic vehicles:

- **Small (Manpackable) Unmanned Ground Vehicles (SUGV):** The SUGV—or "PackBot," as Soldiers call it—is a 30-pound, man-packable, treaded robot for use in a variety of nonpermissive or constrained environments, including buildings, sewers and caves. It allows Soldiers to stay at stand-off distances while the robot relays real-time video, audio and sensor readings in both visual and infrared ranges.
- **Multifunctional Utility/Logistics and Equipment (MULE)—three variants (MULE Transport, MULE Countermine and Armed Robotic Vehicle-Assault-Light, or ARV-A-L):** A common chassis with autonomous navigation systems and "leader-follower" capability supports the MULE-T, MULE-C and ARV-A-L vehicles. The MULE-T can carry a load of 1,900–2,400 pounds of equipment and/or rucksacks to support dismounted infantry. The MULE-C detects, marks and neutralizes antitank mines. The ARV-A-L incorporates weapons and a reconnaissance, surveillance and target acquisition (RSTA) platform to support dismounted Soldiers in combat.

Unmanned Aerial Vehicles (UAVs). Two classes of aerial robotic vehicles:

- **Class I:** Weighing less than 15 pounds, the Class I UAV is a "hover-perch" platform for observing enemy movements and relaying communications at the tactical level. Changes to the FCS UAV program include equipping the Class I UAV with a laser designator, which previously was to be carried by the Class II UAV.
- **Class IV:** A variant of the Navy's Fire Scout, the Class IV UAV is an unmanned rotorcraft that combines a robust, all-weather sensor and communications platform with an endurance of 18–24 hours and a 75-kilometer radius of action.

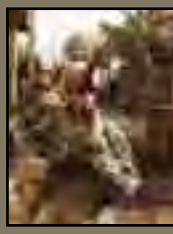
Unattended Sensors and Munitions. Two static systems placed by Soldiers or robotic systems:

- **Unattended Ground Sensors (UGS)—two variants (Tactical-UGS and Urban-UGS):** The T-UGS includes two sub-variants: intelligence, surveillance and reconnaissance (ISR) and chemical, biological, radiological and nuclear (CBRN) sensors, both providing sensing, imaging and communications on a leave-behind platform for maintaining maximal situational awareness in tactical settings. The U-UGS can be employed inside or outside buildings and extend the network through urban settings while enhancing force protection, perimeter defense and security in cleared areas.
- **Non-Line-of-Sight Launch System (NLOS-LS):** The NLOS-LS consists of 15 guided missiles, packed in Container Launch Units, and a computer/communications system. The missiles come in two variants: Precision Attack Missiles (PAMs), with direct-fire/fast-attack and boost-glide trajectories, and Loitering Attack Missiles (LAMs), with long-duration loiter capability. Both missiles can be programmed with target data prior to launch and receive updated information, including target imagery en route.

Source: www.army.mil/FCS







Enhancing Current to Future Force Through Technology Spin-Outs

Spin-out 1 — 2008

Network Sensors and Shooters
- Unattended Ground Sensors
- Non-Line-of-Sight Launch Systems
- Initial Future Combat Systems (FCS) Battle Command
- Joint Tactical Radio System (JTRS)

Soldier Protection
- Body Armor Improvements
- Up-armored Vehicles
- Other

- increases sitiational awareness
- provides actionable intelligence
- provides for greater Soldier protection

Spin-out 2 — 2010

System and Component Systems
- Active Protection Systems
- Lightweight Multifunctional Armor
- Mast-Mounted Sensor
- Warfighter Information Network-Tactical (WIN-T) (introduced)
- Distributed Common Ground System-Army (DCGS-A)
- Excaliber Precision Munition

- further improves Soldier protection
- increases use of sensors
- improves weapons precision

Spin-out 3 — 2012

Network and Ground and Aerial Sensors
- Full Future Combat Systems Battle Command
- Small Unmanned Ground Vehicles
- Unmanned Aerial Systems

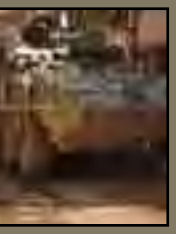
- reinforces other spin-outs
- provides unprecedented situational awareness
- fully implements Battle Command

Accelerating FCS across the force will benefit Soldiers and:
- fill critical capabilities gaps
- increase survivability
- increase lethality
- provide greater agility

Continued improvements for current and future requirements will:
- reduce manpower costs
- enable maneuver across strategic distances
- reduce logistics tail

Source: 2007 Army Posture Statement

to receive and employ modern capabilities and technologies. As discussed earlier, current-force BCTs will receive FCS technologies as they mature and will become FCS-enabled BCTs. A combined-arms unit of modular organizational design, the FCS-enabled BCT is built as an integrated, networked system of systems whose centerpiece is the Soldier. The FCS-enabled BCT is designed to be self-sufficient for 72 hours of high-intensity combat operations, or up to seven days in a low- to mid-intensity environment. The net effect of all these design considerations is a BCT with exceptional versatility and operational capability and fewer people than the current configuration. Also, the FCS-enabled BCT is 60 percent more strategically deployable with a given amount of mobility resources than today's heavy forces and is specifically designed to deploy over medium to long distances via ground, sea and air platforms that do not depend on improved roads, ports or airfields. This deployability is especially important in humanitarian relief and post-





conflict reconstruction operations, where adequate transportation infrastructure may have been damaged or destroyed. It also facilitates the rotational presence required by the new global basing posture.

FCS and the Future Force. The future force will have a balanced mix of light, medium and heavy formations that will be optimized for strategic versatility. The foundation of the future force is the FCS BCT. The FCS BCT uses advanced network architecture to enable levels of joint connectivity, situational awareness and synchronized operations capabilities previously unachievable. It is designed to interact with and enhance the Army's most valuable asset—the Soldier. When fully operational, FCS will provide the Army and the joint force with unprecedented visibility and capability to see, engage on favorable terms and defeat the enemy. FCS BCTs will consist of the following: the combined-arms battalion (three in each BCT); the Non-Line-of-Sight Cannon battalion; the reconnaissance, surveillance and target acquisition (RSTA) squadron; the forward support battalion (FSB); the brigade intelligence communications company (BICC); and the headquarters company.

When BCTs are fielded with the full complement of FCS technologies, these units will contain more fighting vehicles and more infantry squads than today's units. By leveraging technologies and the power of the

Arizona Daily Star (Tucson),
February 2, 2007

Army Unveils High-Tech Combat Tools That Could Save Soldiers' Lives

By Associated Press

OROGRANDE, N.M. — The Army unveiled parts of its high-tech Future Combat Systems on Thursday in a mock raid on a fictitious village, demonstrating equipment that aims to make soldiers' work safer.

The late morning exercise was the first public glimpse of a series of camera-mounted robots, small unmanned planes, radios that can send text messages and other equipment that Army and defense officials say will make combat safer for U.S. personnel.

Sgt. 1st Class Rick Haddad, an Afghanistan war veteran who participated in the exercise, said the new equipment "is going to make soldiers smarter."

Haddad and about two dozen other soldiers were given the job of raiding and clearing several buildings in the fake village Thursday. As they charged toward different buildings, they sent in a camera-mounted robot, called an SUGV or small unmanned ground vehicle, to get a view of what they were facing.

In one building, the camera spied an enemy soldier. In another location, it caught an improvised explosive device with a trip wire.

The images were relayed in real time to field commanders who described to forward soldiers what was being sent. Images from the small unmanned aerial vehicle were also sent to the battlefield in real time.

In a real-life combat situation without this equipment, a U.S. soldier could have been injured or killed trying to gather the same information, Army commanders said.

"You've got a visual without having to compromise yourself," Haddad said of the camera shots.

Following the exercise, soldiers said the new tools, which include computer software that tracks the movements of U.S. soldiers and the enemy, were invaluable and also help prevent deadly friendly fire incidents. . . .

Early versions of the SUGV and the small UAV are already being used in Afghanistan and Iraq.

Reprinted with permission





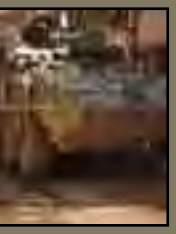
network, however, the total number of Soldiers in an FCS BCT will be significantly lower than in current formations, decreasing in size from about 3,850 today to 3,200 in the future. These BCTs will have double the number of critical infantry Soldiers, enabling the formations to operate far more effectively in irregular environments. Through the network, Soldiers and commanders will enjoy far greater ability to see and to act first—ahead of their adversaries—while dealing with the full-spectrum challenges they will face. FCS BCTs are thus more manpower-efficient and more capable across the range of operations than current or even FCS-enabled BCTs.[3]

FCS will produce numerous advantages in tactical and operational capability, enabling more efficient use of fuel and supplies and reducing other logistical support requirements; reducing costs associated with both manpower and procurement; and improving the ability of modular brigades to operate as self-sufficient, independent formations over increasingly larger areas in far more complex environments. Eventually, as key technologies are fielded across the force, battalions will be capable of similar levels of self-sufficiency—dramatically increasing the capability and effectiveness of U.S. ground and special operations forces at lower echelons than today's structure allows. These capabilities will fundamentally alter how the Army deploys, employs and sustains its forces; they will greatly improve the Army's ability to place additional forces on the ground, stabilize contested zones and support joint and interagency teams.

In short, **the FCS BCT is a single, coherent tactical warfighting unit**. It is equivalent to the Navy's carrier battle group or the Air Force's air expeditionary wing—each tactical unit is made up of components upon which the rest of the unit depends. The combat effectiveness of the FCS BCT, like that of the carrier battle group or air expeditionary wing, is at its maximum when all components are present and integrated into the whole. Removing components degrades the effectiveness—and survivability—of the unit. As an example, more than two-thirds of the network sensors in the FCS BCT will be installed on the manned ground vehicles. The sensors will provide not only the Soldiers in those vehicles but Soldiers throughout the FCS BCT with access to persistent, ubiquitous intelligence, surveillance and reconnaissance (ISR). FCS thereby minimizes Soldier risk while enhancing operational effectiveness by increasing situational awareness across the battlespace. These are critical improvements that would not be available without the networked sensors.

In sum, FCS will enable the Army to fight as an integral part of the joint team, empowering Soldiers with a networked suite of 14 new manned and unmanned air and ground systems linked through an advanced information network. The network also makes FCS a joint-interest program with applications and leveraging opportunities for the Marine Corps and special operations forces, improving the nation's ability to put "boots on the ground." **The old single-system, stove-pipe procurement paradigm, prevalent in the Cold War, has been replaced by a comprehensive modernization effort**.

[3] See AUSA's Torchbearer National Security Report *Accelerating Momentum: The Stryker Brigade Combat Team as a Learning Organization*, June 2006, online at http://www.ausa.org/webpub/deptilw.nsf/byid/JSUR-6QLHTM.





Current to Future Force Through Technology

Spin-out 1

Networked Sensors/Shooters
- Limited Battle Command
- Joint Tactical Radio System (JTRS) (Ground Mobile Radio[GMR]/Handheld, Manpack and Small Form Fits[HMS])
- Unattended ground sensors
- Non-Line-of-Sight Launch Systems

Spin-out 2

Systems/Component
- Active Protection System (APS)
- Mast-mounted Sensor

Options:
- Small Unmanned Ground Vehicle (UGV)
- Class 1 Unmanned Aerial Vehicle (UAV)

Spin-out 3

Network and Ground/Air Vehicles
- Army Battle Command System (ABCS) to Future Combat Systems (FCS) Battle Command
- Armed Robotic Vehicle-Assault (Light) (ARV-A-L)
- Small Unmanned Ground Vehicle (UGV)
- Class I Unmanned Aerial Vehicle (UAV)
- Class IV UAV

Future Combat Systems – System Development and Demonstration

Spin-out 1 FYs 2008-10

Spin-out 2 FYs 2010-12

Spin-out 3 FYs 2012-14

Core Program Delivery FY 2015—Joint Networked System of Systems

- Infantry
- Stryker
- Heavy

Fielding 6 current-force brigade combat teams per year (76)

Current

Future

Fielding 15 Future Combat Systems brigade combat teams

- Infantry
- Stryker
- Heavy
- FCS

2004–2006 | **2006–2010** | **2010 and Beyond**

Related Developments

2004–2006

Lessons Learned in Operation Iraqi Freedom and Operation Enduring Freedom
- Raven Tactical Unmanned Aerial Vehicle (UAV)
- Interceptor Body Armor (IBA)
- Counter improvised explosive device (IED) (Warlock, Duke)
- Up-armored Vehicles (Up-armored HMMWVs [UAH], Analysis of Alternatives [AoA])
- Buffalo mine-clearing vehicle

2006–2010

- Armed Reconnaissance Helicopter (ARH)—2009
- Light Utility Helicopter (LUH)—2008
- Distributed Common Ground System-Army (DCGS-A) (V3)—2007
- Excaliber—2007

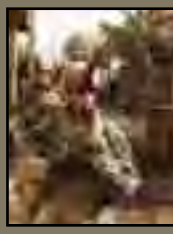
2010 and Beyond

- Warfighter Information Network-Tactical (WIN-T) (completed)—2014
- Joint Tactical Radio System (JTRS) Army Modular Force (AMF)—2011–12
- JTRS Ground Mobile Radio (GMR)/Handheld, Manpack and Small Form Fits (HMS)
- Apache Longbow Block III —2011

Source: Headquarters, Department of the Army







Future Combat Systems and Counterinsurgency

In an actual battle that took place in April 2004 in the complex environment of Sadr City in Iraq, Soldiers went up against a determined opponent, conducted a valiant fight and ultimately accomplished the mission. The operation (which came to be known as "Black Sunday") took place in a city where vegetation is sparse, buildings are one or two stories high, roads are narrow, and irrigation canals and ditches crisscross the landscape. Insurgents wore civilian clothes and used women and children for intelligence collection, for early warning and for preparing obstacles and fighting positions.

Insurgents attacked a platoon providing convoy security, resulting in the deaths of two Soldiers and isolating the rest of the platoon. An Army battalion conducted a rescue operation to reach the platoon. The unit moved a quick-reaction force down streets but encountered numerous obstacles and kill zones. One rescue element even bypassed the platoon, as the unit's precise location was unknown to the rescue force while they were en route. Possessing limited information, the rescuers used brute force to fight their way through obstacles and ambushes to successfully complete the mission, but at a cost in terms of this nation's treasure—the operation required three attempts over three hours, with six additional Soldiers killed and more than 50 wounded.

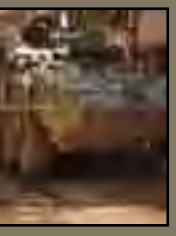
The insurgents fought on complex terrain and generally maneuvered more quickly in their urban areas using interior lines of action against predictable U.S. ground approaches. Future Combat Systems (FCS) counters this advantage with full-spectrum-trained Soldiers and units that avoid encounters when possible by avoiding detection, acquiring the enemy with networked sensors, and using armor and mobility at unmatched speeds.

Soldiers are at risk when they dismount to be the "eyes and ears" of their units. The persistent surveillance capabilities of FCS allow Soldiers to remain in their armored vehicles longer; when they do dismount, they are more knowledgeable about the enemy's location and can rapidly apply combat power sufficient to destroy the enemy while minimizing collateral damage and eliminating unnecessary risk to themselves.

In this case, the enemy attempted to target U.S. forces' vulnerabilities with massed weapons effects—improvised explosive devices (IEDs), rocket propelled grenades and mortars. To stop or limit U.S. forces' maneuver, insurgents used terrain-denial tactics (including placing physical obstacles and exploiting civilians engaged in peaceful protest as human shields) and hid in prepared defenses on ground they chose.

Army analysis shows that FCS armor, mobility, situational awareness and active protection systems give Soldiers a higher probability of defeating threats (including IEDs) through avoidance or by combining networked/synchronized sensors, intelligent munitions, line-of-sight and non-line-of-sight weapons to effectively engage when, where and how the Soldiers choose. In a setting similar to the scenario described above, an FCS-enabled brigade combat team would have been able to locate the stranded unit, select a route clear of active and passive obstacles, maneuver quickly to the unit, collect vital intelligence on insurgent activity and relay it to other units in the area, and return to safe territory with minimal engagement of the enemy. In a recent wargaming simulation of this very scenario, the FCS-enabled unit was able to rescue the platoon in one hour, with no Soldiers killed or wounded.

Source: Headquarters, Department of the Army





Future Combat Systems and Disaster Relief

The importance of possessing the capability for full-spectrum operations—whether disasters are natural or man-made—was made apparent during disaster relief operations after Hurricane Katrina. The scope of the mission required a significant ability to seek, react and provide relief to a large population across a wide area.

After Hurricane Katrina, post-disaster conditions included:

- fear/panic;
- shortages of food, water, utilities and shelter;
- refugee/evacuee movements;
- escalating death and damage from natural causes;
- temporary disruption of government, security, finance and social services;
- opportunistic lawlessness;
- citizen disorder/refusal to obey emergency rules, quarantine or evacuation; and
- the rise of spontaneous, unauthorized protection services.

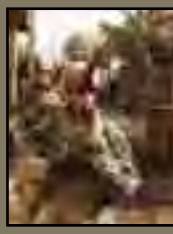
The key requirements for an effective response to natural or man-made disasters are speed and flexibility to adapt to rapidly changing conditions. The Future Combat Systems (FCS)-enabled/full FCS BCT delivers that speed and flexibility in disaster relief and consequence management. FCS capabilities will significantly enhance the Army's effectiveness in civil support operations, and they can be applied in a wide range of crises in the following manner:

- First responders may be military personnel or civilians at the federal, state or local level. FCS can connect all of these entities across the disaster area immediately through its seamless communications network, while augmenting their capabilities with FCS' own complement of manned and unmanned systems.
- Joint, interagency, intergovernmental and multinational decisionmakers must act in a coordinated effort. FCS assets provide the common operating picture (COP) of the disaster area to link civil authorities and national assets to the network.
- Joint aviation assets can focus on rescue missions while FCS-networked unmanned aerial and ground systems locate stranded survivors, record locations and dispatch rescue teams.
- Refugee/evacuee movements, opportunistic lawlessness, and citizen disorder/refusal to obey emergency rules, quarantine or evacuation may occur. Future modular forces with FCS will have the ability to remotely monitor and secure critical areas around the clock, using manned and unmanned systems.
- There is an immediate need to identify where there are shortages of food, water, utilities and housing. The FCS COP of the disaster area allows manned rescue teams and emergency supplies to be delivered to the right place at the right time.

Source: Headquarters, Department of the Army







Operational Necessity of Future Combat Systems

Recent Army war-gaming exercises have demonstrated the life-saving capabilities that FCS will provide Soldiers. The Army is conducting simulation exercises that faithfully replay recent military operations in Iraq and Afghanistan. These exercises compare actual battlefield results with the likely outcome had an FCS-enabled BCT been available to combatant commanders. One of four such war-gaming exercises is now complete, and it shows conclusively that the FCS-enabled BCT accomplishes the mission more effectively, more quickly, and with less collateral damage and fewer casualties than the current force.

The two vignettes on pages 18 and 19—one based on a battle in Iraq, the other addressing a Katrina-like homeland disaster—demonstrate how an FCS-enabled BCT would increase Soldier survivability and operational effectiveness. The battle in Iraq is notable because it took three hours and resulted in six U.S. Soldiers dead and 50 wounded. However, an FCS-enabled BCT—with the ability to see first, act first and remain mounted longer in the close fight—would have accomplished that same mission in just one hour with no American casualties. Speed and flexibility are also critical in responding to homeland disasters. Injecting FCS capabilities into a Katrina-like scenario clearly demonstrates a significant increase in command, control, communications and information exchange.

As the Army's Chief of Staff, General Peter J. Schoomaker, stated in his testimony before the Senate Armed Services Committee on 15 February 2007, "[The nation] must remain committed to investing in technologies and equipment that enable our most important asset—the Soldier—to remain ahead of our adversaries who are quickly adapting their methods, tactics and tools of warfare. **Investing sufficiently in our future readiness is a strategic necessity which must be viewed as a matter of priority, not just affordability."** [emphasis added]

Affordability of Future Combat Systems

Current Status

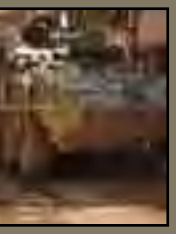
In recent years, the Army has reconciled its modernization imperatives with fiscal and budget constraints. It has cancelled more than 100 programs to free resources to fund FCS. Moreover, as a result of the combined effects of congressional budget cuts during the past three years—totaling $829 million—and fiscal guidance reducing resources programmed for future years, the Army has adjusted both the scope of FCS and the fielding schedule. More recently, $3.4 billion was cut from planned FCS spending for FYs 2008–2013 to accommodate budgetary constraints placed upon the Army.

Recent Adjustments to FCS

Faced with this budget reality, and to ensure the fielding of an affordable system of systems, the Army decided to continue developing the core operational capabilities envisioned for FCS with 14 of the previously planned 18 interconnected systems. Development of two classes of unmanned aerial vehicles was postponed, as was development of one of the unmanned ground vehicles (the Armed Robotic Vehicle, or ARV). Development of an entire class of intelligent munitions was transferred to the Army's Landmine Program.

In addition, the Army will delay the target date to field the first of 15 projected FCS BCTs by five months to 2015, and slow the rate of procurement to one FCS BCT per year rather than 1.5 FCS BCTs per year, taking five years longer—until 2030—to field and employ all 15 FCS BCTs. While changing the total number of spin-outs from four to three, the Army has also accelerated the timeline for fielding FCS technology, intended to improve the capabilities of FCS-enabled BCTs and Soldiers in the current fight.

These changes demonstrate a serious commitment by senior Army leadership to ensure FCS is an affordable program that still meets Soldiers' needs now and in the future. It should be noted, however,





that these changes also place at risk the Army's ability to reach the full tactical and operational potential envisioned for FCS. Taken together, these program adjustments result in a decrease in capabilities available to the joint force, therefore increasing levels of Future Challenges risk as described in the National Defense Strategy.[4] The combined effect of budget reductions and reduced fiscal guidance will delay development, acquisition and delivery of critical new capabilities to Soldiers.

Approach

The Army has adopted an incremental approach to modernization and allocated costs over a two-decade period. This approach ensures that modernization costs in any given year are reasonable, sustainable and well within the Army's budget. For FY 2008, for instance, the Army requested $3.7 billion for FCS modernization and $4.2 billion for aviation modernization. While these are significant amounts of money, they represent just 3.7 percent of the Army's total budget request of $222 billion (the Army's base budget request of $130 billion in addition to the supplemental request of $92 billion needed to fight the Global War on Terror). Moving the fielding of the first fully equipped BCT from 2014 to 2015 alone reduced projected program costs by $700 million.

Commonality Savings

The Army is also saving money by modernizing in an integrated and holistic fashion. A comprehensive approach allows for economies of scale and commonality cost savings. For example, with a common chassis, development costs for all eight FCS Manned Ground Vehicles (MGVs) amount to approximately $6 billion. This is roughly equal to the Army's combined costs to develop three current-force vehicles—the Abrams tank, Bradley fighting vehicle and Multiple Launch Rocket System.

Moreover, the Army estimates that if it were to develop all eight manned FCS vehicles individually, it would cost as much as $12 billion more and take one-third more time. Indeed, without the savings provided by commonality, Army modernization might not be possible. These savings continue after the new systems are delivered and fielded—with more than 70 percent commonality across MGVs, for example, the Army will conserve significant resources in parts, personnel and maintenance tasks needed to maintain these vehicles.

Alternatives

Choices include modernizing now (and spinning out technologies as they become available), resulting in costs that are reasonable and sustainable, or waiting to modernize until global circumstances leave few alternatives—creating costs that will be significant, perhaps exorbitant. Even if the Army entirely eliminated its modernization accounts, this would not simply save the $34.4 billion allocated for Procurement and Research, Development, Test and Evaluation (RDT&E) in FY 2008.[5] It would absorb that cost—in fact, many times that cost—over the duration to sustain and support its less-efficient fleet

[4] 2007 Army Posture Statement, 14 February 2007, p. 11, online at http://www.army.mil/aps/07/index.html.

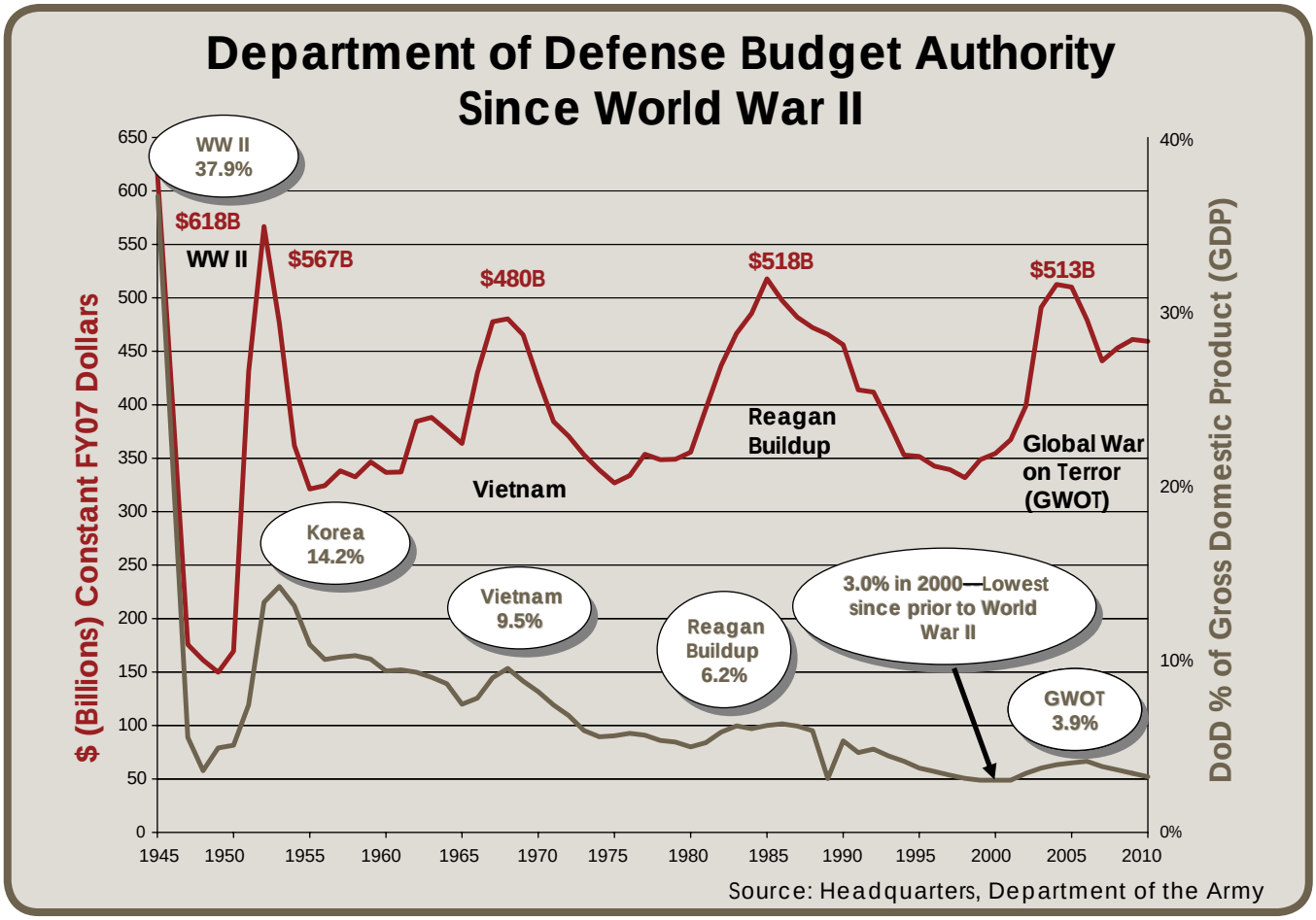
[5] Dollar amount includes $23.8 billion for Procurement and $10.6 billion for RDT&E. Other programs falling under these budget accounts include Stryker, Abrams modification/retrofit, Family of Medium Tactical Vehicles, Apache modification and Chinook modification.

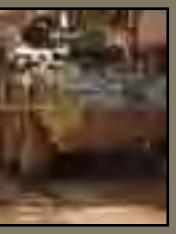




of current-force vehicles and equipment. In short, if the Army is to sustain the current level of operations *and* prepare to face future challenges, it cannot afford *not* to modernize. Consider:

- Modernized equipment leverages advances in computing, networking, materials and fuel use, dramatically reducing logistical support, operating and maintenance costs. The FCS BCT will consume 10 to 30 percent less fuel and operate with 50 percent fewer mechanics than a current-force Heavy BCT. It will have 500 fewer Soldiers but twice as many infantrymen in squads—that is, more "tooth" and less "tail." Manpower costs remain the largest portion of the Army's budget; the more efficient use of human capital afforded by FCS is essential for keeping these costs under control.
- Modernization reduces repair and reset costs in two ways:
  - FCS BCTs are being designed specifically to operate with less wear and tear in both crowded urban neighborhoods and distant, austere environments. Current Army vehicles, by contrast, were designed for a much different environment—the rolling terrain of Cold War Europe. Moreover, intended operation and maintenance costs for these vehicles were calculated in peacetime—current usage rates are five times as high. Accordingly, the cost to reset legacy equipment totals $13.6 billion in FY 2008 alone.
  - FCS BCTs will have a markedly smaller logistical "footprint," with significantly fewer







maintenance personnel, tools and spare parts. The FCS manned ground vehicles, as already mentioned, employ a chassis with more than 70 percent commonality across all variants, with a common 15-piece repair toolkit.

Context

FCS program changes for FYs 2008–2013 will save roughly $3.4 billion during that period. Total FCS program costs are estimated at $162 billion, not counting $2 billion for facility construction, through 2030.[6] Included in the total is the cost of RDT&E plus Procurement for 15 FCS BCTs over the next two decades—averaging out to $5.8 billion per year, with the bulk of the costs coming only *after* FCS technologies have been proven useful and reliable. In addition,

- FCS is the only Army program that ranks among the Department of Defense's 10 most expensive weapons programs, and that list does not include the considerable investment in missile defense. **Four of the 10 most expensive weapons programs, by contrast, are fighter jets and other aircraft.**
- The FCS program has met all Army cost, schedule and performance criteria. Indeed, unlike other major defense acquisition programs, FCS has experienced *no* cost overruns. FCS costs increased in 2004 only because the Army increased the size and scope of the program. This 2004 Army-led restructuring was to accelerate the delivery of modern capabilities to Soldiers in harm's way. **The FCS program remains on budget and on schedule in accordance with Army plans.**

- The Army is bearing the brunt of the burden for the Global War on Terror but receives the smallest share of the defense budget. In the past, the Air Force typically received 30 percent of the budget; the Navy (and Marine Corps) 30 percent, and the Army 24 percent. The FY 2008 base budget request reflects current conditions more closely, with the Army receiving 27 percent, the Air Force 28 percent and the Navy/Marine Corps 29 percent. Yet **despite the increases, in both absolute and relative terms, the Army has still had to cut or scale back needed modernization programs to meet its current obligations.**
- The United States spends just 3.9 percent of its Gross Domestic Product (GDP) on national defense—a historic low during a time of war. But during another long war—the Cold War—defense spending was typically well above 5 percent of GDP and, in many years, closer to 10 percent of GDP. Moreover, **during World War II, the United States spent more than one-third of its GDP on national defense.**

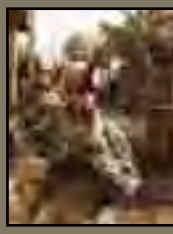
Trends

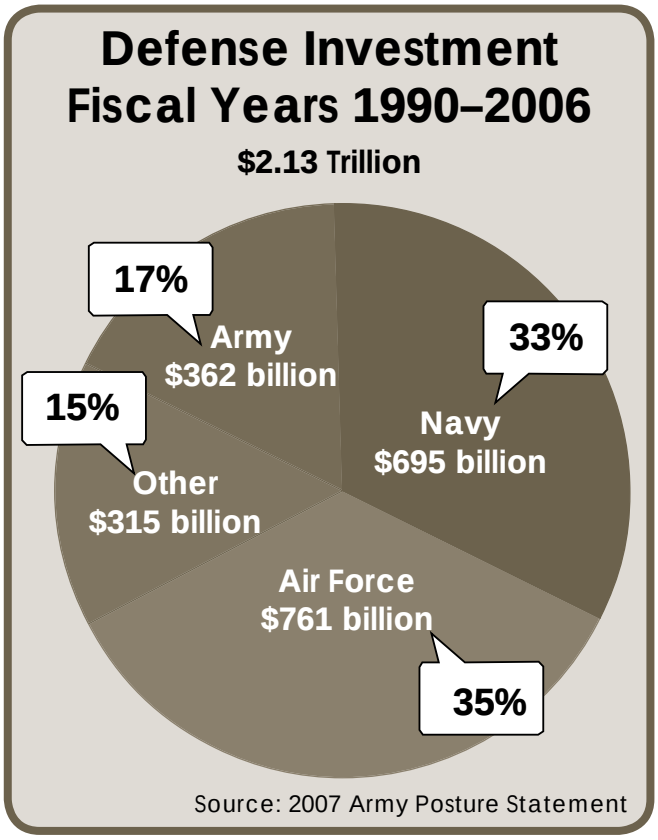
Since 1990, the Army's share of investment dollars has been considerably smaller than that of the other military services—the Army has received less than one-fifth, while each of the other departments has received approximately one-third. Consequently, the Army has been less able to invest in the capabilities needed to sustain a rising operational tempo and to prepare for emerging threats. Supplemental funding has sustanied the Army's capability to meet the operational demands

[6] Fred W. Baker III, "Future Combat Systems Restructuring a 'Balancing Act,'" ARMY.MIL/NEWS, 8 February 2007, available at http://www.army.mil/-news/2007/02/09/1779-future-combat-systems-restructuring-a-balancing-act/.









of the war on terror and replace essential weapons and equipment worn or lost during battle. However, supplemental funding by its very nature is not predictable enough to enable the long-term research and development required to prepare for the future.

The Army is building 14 air and ground systems concurrently and integrating those systems via an advanced information network. This is an enormously complex and challenging undertaking. Nonetheless, the Army thus far has taken delivery of more than five million lines of software code and several prototypes on cost and on schedule. This success is the product of concerted, deliberate long-term planning and engineering expertise by a "Best of Industry" team that includes more than 600 companies in 42 states. This team has developed an innovative and cost-effective acquisition and procurement plan that is fundamentally different from past procurement efforts.

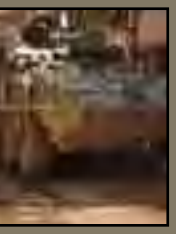
The financial costs of Army modernization are significant but certainly less than the costs of not modernizing. The absolute dollar cost of FCS modernization—$3.5 billion in FY 2009—represents just 3 percent of the Army's total base budget. In sum, investing sufficiently in modernization is a strategic necessity that meets a compelling operational need now and in the future. It must be viewed as a matter of national priority, not simply as a matter of affordability. **The cost of modernization is measured in dollars; the cost of *failing* to modernize is measured in *lives*.**

Acquisition and Technological Feasibility of Future Combat Systems

General

The Army has adopted an innovative process for developing FCS as a *single* system of systems to ensure that the program is technologically feasible. This holistic approach allows unprecedented design efficiencies that will minimize the development risk that has driven past cost overruns. Past acquisition practices often resulted in systems being fielded with obsolete technologies that had been fixed in the initial program design phase. With FCS, the Army is not waiting decades to field new systems; modern technologies are being spun out much more rapidly, as they mature—and the new systems are designed to accommodate later technological upgrades on a "plug-and-play" basis whenever they become available.

Furthermore, the Army is exploiting advances in information technology to dramatically speed up the acquisition and procurement process. New engineering design tools, aided by computer simulation, permit design efficiencies that simply were not available 10 or 20 years ago. These new computer-based engineering tools permit greater design experimentation, innovation and turn-around time, shaving years off the procurement process; equipment can be redesigned at minimal time and expense via computer—doing so with real hardware is more problematic, costly and time-consuming. Thus, **the Army is using 21st century design technologies to minimize development risk and maximize operational utility.**





The Army Evaluation Task Force

The Army is also minimizing development risk by making Soldiers an integral part of the acquisition and procurement process. This is being effected through a special Army Evaluation Task Force (AETF), which will test, refine and validate FCS technologies before they are fielded. The AETF will take delivery of the first FCS spin-out technologies in 2008. AETF Soldiers will employ these new technologies in a simulated operational environment to evaluate what works and what needs improving. They will recommend changes, modifications and improvements with the goal of helping to develop new doctrine and tactics, techniques and procedures (TTPs).

The AETF is using robust field experimentation at Fort Bliss, Texas, to spin out FCS technologies in a way that more fully and faithfully addresses Soldiers' requirements in the current fight while paving the way for fully equipped FCS BCTs. Following successful evaluation, the prototypes will enter full production and be distributed to operational units. This process will be repeated for each successive spin-out. By 2012, the AETF will be equipped with all of the FCS core systems, while current-force BCTs (Infantry, Heavy, Stryker) will have received select embedded FCS technologies (including sensors, unmanned ground and aerial vehicles and fully up-to-date networking capabilities).

The Army is assisted in its plan to integrate all 14 FCS systems into a dynamic whole by a Lead Systems Integrator (LSI). The LSI functions much as a general contractor, who hires various subcontractors for particular projects but is accountable for bottom-line results and project completion. The LSI, likewise, hires various subcontractors for particular technologies and components but is responsible for delivering FCS spin-outs as scheduled and, ultimately, the first FCS BCT by the year 2015. By employing an LSI, the Army can acquire myriad combat systems and an integrated network more quickly and at less cost than it would through a traditional, single-system, stove-pipe acquisition and procurement process.

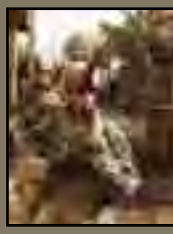
The Army and the FCS LSI recently completed a live-fire exercise that could lead to the early adoption of key FCS technologies. This exercise was the culmination of the eight-month Experiment 1.1 that concluded in February 2007. Experiment 1.1 was a significant milestone for Army modernization: for the first time, Soldiers collectively used FCS in a live training environment. The exercise demonstrated how FCS capabilities would benefit Soldiers in a real-world operation.

Networked Force

The power of FCS derives from its robust information network. The Army is building its suite of interdependent systems around a network that will make Soldiers much more operationally effective than they are now in solitary, stand-alone systems. The network will make it possible for field-level commanders to select the best unit capabilities for a given task in real time, without requiring the rest of the unit take part in operations for which they may be ill suited. Early iterations of the network, in the form of Force XXI Battle Command Brigade and Below (FBCB2) and Blue Force Tracker, have already







Soldiers Like FCS Test Systems So Much, They Don't Want to Return Them

By Fred W. Baker III
American Forces Press Service

WASHINGTON, Feb. 13, 2007 – Testing for some of the systems slated for the first "spin out" of the Army's Future Combat Systems program has gone well, except for one minor glitch: the soldiers testing them don't want to give the prototypes back.

"They won't give me back my stuff," joked Army Maj. Gen. Charles A. Cartwright, program manager for the Future Combat Systems Brigade Combat Team, as he briefed reporters on the progress of the program at the Pentagon last week.

The FCS is a "family" of a variety of manned and unmanned vehicles, sensors, launch systems and unmanned aerial vehicles. All are connected by a common network with the soldier. Some systems within the family are marked for an early fielding in an effort to get the technologies to the soldier as early as fiscal 2008.

Dubbed Experiment 1.1, the testing ran in three phases, starting in July 2006 and finishing this month. Already, some of the systems are garnering rave reviews from the combat veterans testing them. It was the first time that soldiers collectively employed FCS systems in "live" training and used the system's computer-based training support package, officials said.

"They loved it," said Col. Charles C. Bush, FCS division chief. "What the FCS spin-out is all about is getting information down to the soldier level so they can use it. Experiment 1.1 was designed to test the tools that will get them more tactical information on the battlefield."

Soldiers tested the initial version of the network operating system, the joint tactical radio system, the tactical and urban unattended ground sensors, the small unmanned ground vehicle, the Class I unmanned aerial vehicle and the non-line-of-sight launch system.

Officials taped responses from the soldiers testing the equipment and played them at the briefing. The common theme among the mix of commissioned and noncommissioned officers was that using the new systems will save lives in combat. The systems worked together to increase efficiency and mitigate risks to the soldier. The combat veterans extolled the usefulness of the equipment, giving examples of actual fights in Iraq where they could have used the systems.

"I became a big believer," one NCO said.

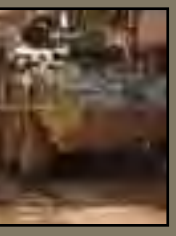
"All they need to do is get it out to the soldier and start training on it," another said. . . .

Robots can be sent into buildings instead of soldiers to identify booby traps and insurgents. Unmanned aerial vehicles can be flown over hills and walls, allowing soldiers to see what is on the other side. The sensors can be placed on flanks and in buildings to detect enemy movement. All are tied to a network that the soldier can monitor on a screen mounted in his Humvee.

"It's about seeing the enemy before he sees you," Bush said.

"Instead of sending [a soldier] in the room to see if there is a booby trap, you send a robot in there," Bush said. "From a tactical perspective, giving the soldier the ability to see inside a room is pretty powerful."

Two soldiers testing the robot vehicle agreed.





"It would have saved our lives," one said, referring to a booby trap discovered by the robot vehicle during the testing.

Bush said nothing like the tactical and urban sensors currently is fielded at the soldier level. . . . An earlier prototype of the small unmanned ground vehicle is being used in Iraq to investigate tunnels and possible improvised explosive devices, he said.

The [prototype] Class I unmanned aerial vehicle was [assessed] in Hawaii by some 25th Infantry Division soldiers working through a mission readiness exercise. . . .

Its effectiveness was problematic for the trainers, though, because the soldiers were finding all of the "planted" roadside bombs and taking alternative routes. As a result, they were missing out on intentional training on how to react to an IED [improvised explosive device].

"It gives them ability to see the enemy before they run into them, and lets them maneuver more effectively," Bush said.

The FCS systems will also help soldiers make better, faster decisions on the battlefield.

A sensor will let them know, for example, that a vehicle is approaching. Video from the sensor will let the soldier know if it is a suspicious vehicle.

"It will put capabilities into the hands of soldiers that they don't have now," Bush said.

"It's tough in that kind of environment to identify one individual from another individual—who's the terrorist," he said. "The more tools you give the soldier the easier it is."

The bottom line for the combat veterans testing the new systems was that robots and sensors and information on the battlefield translate to more troops coming home alive. . . .

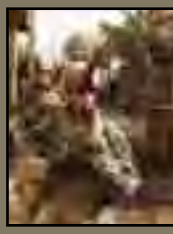
One combat commander said if his unit [had] had the systems in Iraq, it would have saved an NCO's life, his squad leader's legs and his team leader's hand.

The initial version of the network operating system, the joint tactical radio system, the tactical and urban unattended ground sensors and the non-line-of-sight launch system are funded for the first spin-out of FCS systems starting in fiscal 2008.

There is no funding currently for the small unmanned ground vehicle and the Class I unmanned aerial vehicle for the first spin-out. They are slated as options in spin-out 2, if funding is available.







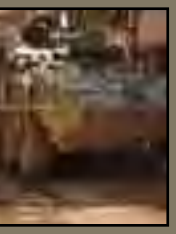
demonstrated the usefulness of network-centric operations in Afghanistan and Iraq. The FCS network, WIN-T, will take network-centric operations to the next level as Soldiers use embedded sensors to see and hear the entire battlespace in near real-time. In essence, **the network serves as the nervous system of FCS, allowing rapid decisions based on sound information.** Such programmatic flexibility is made possible because the Army is building all the FCS systems, including the network, simultaneously and with the input of both Soldiers and the LSI.

The intent of the Army's modernization strategy is to develop and field an integrated modular BCT, not disparate units. The Army does not merely require new vehicles; it requires *networked* vehicles that *empower Soldiers*. It is prudent, in terms of both cost and technological feasibility, to build networked capability into the vehicle during the design phase rather than after the vehicle is built and fielded. Testing in an environment that more closely approximates current and future conditions, while employing Soldiers in modular formations designed specifically to maximize the potential of new systems, is the surest path to a successful modernization effort.

Exploiting Future Capabilities Today

Modernizing the force using the FCS system of systems is fundamentally different from past military modernization efforts. In the past, the Army developed and fielded solitary platforms—for example, a tank, an artillery system or a helicopter. Soldiers employed these platforms for the first time only *after* they had been developed. This gave the Army limited ability to correct deficiencies discovered by Soldiers in real-world settings, because the platforms had already been developed and delivered, and financial constraints precluded redevelopment. As a practical matter, Soldiers lived with whatever deficiencies they discovered and adapted accordingly.

With FCS modernization, a wholly different dynamic is at work. The Army is exploiting advances in information technology to build 14 integrated air and ground systems, all connected to one another and to





the joint warfighting effort by an advanced information network. Soldiers will test, evaluate and refine these systems before they are fully developed and fielded. This gives the Army the ability to correct deficiencies *before* full-scale production begins. The new systems are being developed not as solitary platforms but as coherent parts of an integrated whole. Furthermore, the Army is organizing itself to maximize the network-enabled capabilities of these units. Meanwhile, new technologies are being procured incrementally and delivered to Soldiers as soon as they are ready. This process is enabling Soldiers in the current fight to exploit future-force capabilities today—and doing so in a cost-effective manner. The Army has in place a process—the AETF—to effectively and efficiently test, refine and validate FCS technologies.

What is Needed

To be able to execute the National Defense and Military Strategies, the Army must maintain readiness to fulfill current requirements while developing the capabilities to be ready for future challenges. Now, five years after the September 2001 terrorist attacks, the Army continues to fight the long war with high levels of force deployment. The combined effects of continuing high levels of strategic demand for Army forces, at home and abroad, compounded by long-standing deficits in equipment, modernization and infrastructure investment, place current and future readiness at risk.

Budget and program reductions introduce additional risk by delaying the development and delivery of this much needed capability. To mitigate these risks, the Army must accelerate the fielding of advanced technologies to Soldiers *today*. **The Army has created an effective, affordable and technologically feasible modernization strategy—with FCS as its focal point—to complement the modular force conversion and leverage a variety of technologies to maintain the strategic overmatch of U.S. landpower.** The plan—a system of systems—is holistic in its approach, drawing strength from the blending of complementary capabilities. In addition, it meets the needs of the current force and future force in innovative ways.

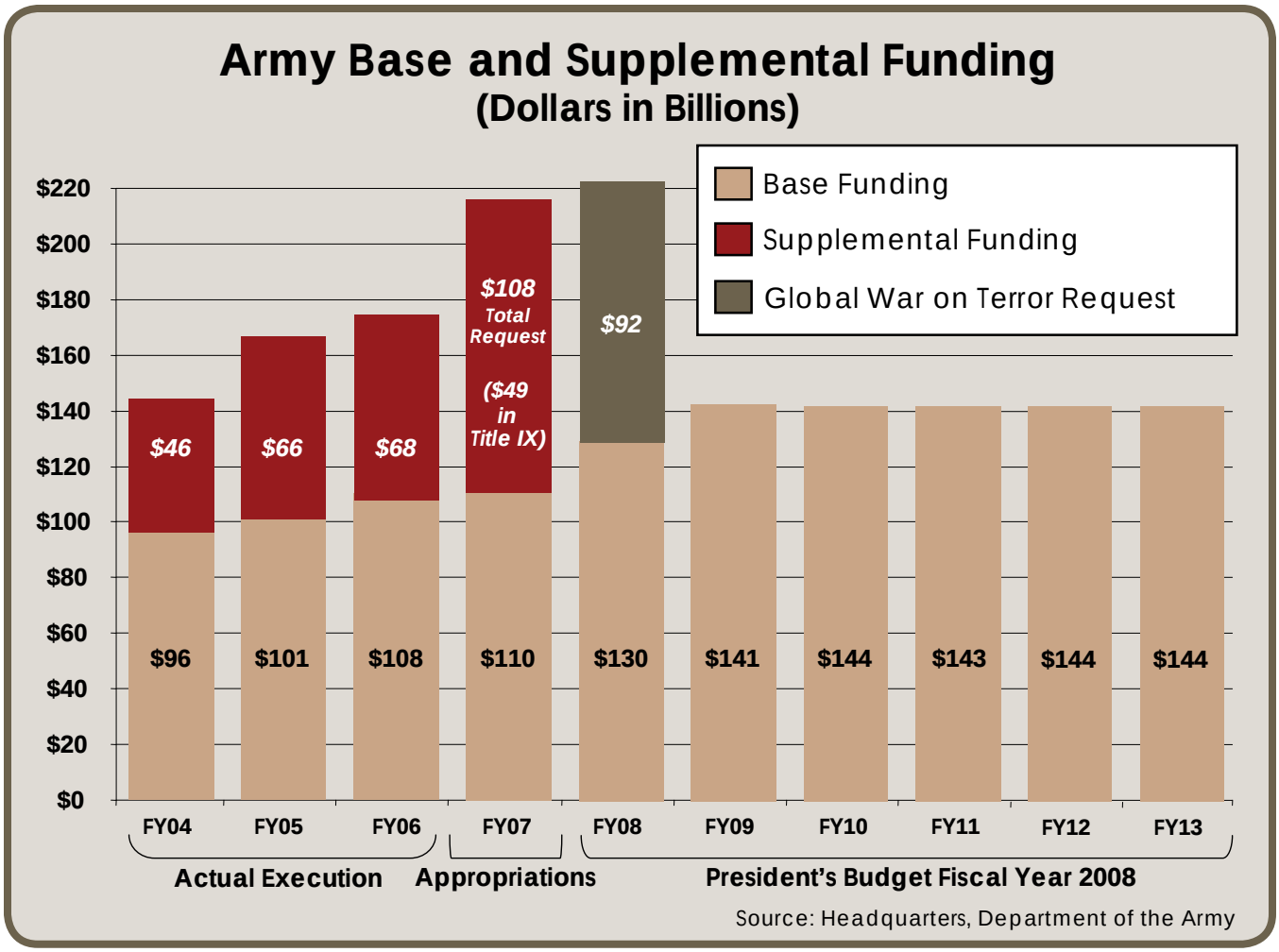
What is needed are the resources and support necessary to effectively execute this most comprehensive modernization strategy in concert with modular conversion. Specifically, the Army needs balanced funding that addresses both current and future force requirements; steady, consistent and continuous modernization over a sustained period of time; and retention of its innovative procurement approach, which allows for program flexibility and adaptability.

What Must Be Done

Modernization, coupled with Army transformation, will significantly enhance America's ability to project landpower, put "boots on the ground" and conduct full-spectrum, joint operations. Together, the capabilities provided in these areas are unique and profound. They will provide Soldiers with significant tactical and operational advantages. The Army must continue to transform and modernize to retain the edge over the nation's adversaries. To realize the full potential



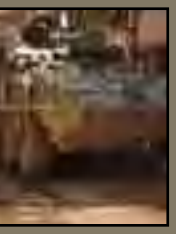




of the Army's modernization program, Congress and the Department of Defense (DoD) must:

- increase base defense budget funding well beyond 4 percent of the Gross Domestic Product;
- increase the Army share of the DoD base budget to at least 28 percent;
- provide full, timely and predictable funding of the Army' FY 2008 President's Budget request and supplemental appropriations required to:
  - build readiness (through transformation to a modular force) to execute the National Defense Strategy; and
  - pay for the costs of the war now and throughout the Future Years Defense Program (FYDP);
- fully fund the Army's comprehensive modernization strategy—which includes FCS, aviation and other key supporting programs—as part of an integrated transformation plan;
- provide timely funding for modernization initiatives to coincide with reset operations when opportunities exist to enhance equipment with improved capabilities (i.e., resetting equipment forward, not backward to legacy design capability); and
- fully fund Advanced Technology Development focusing on maturing critical future modular force technology enablers such as FCS.

A transformed and modernized U.S. Army is a national imperative.





Torchbearer Message

America is at war and continues to be engaged in a long, evolving conflict against learning and adaptive adversaries, requiring Soldiers to conduct military operations worldwide, ranging from humanitarian assistance to major combat. The nation continues to face traditional threats posed by nation-states involving large-scale conventional military forces in more regular forms of warfare as well as the transnational, dispersed, non-state extremist movements and organizations that are waging irregular warfare.

The U.S. Army is modernizing to enable Soldiers and leaders, as part of a joint force, to dominate in any environment against current and emerging threats. **The evolving threat environment and changing operational requirements demand not only the completion of transformation to a modular force but also the comprehensive modernization of the force.** Transformation and modernization are two parts of an inseparable whole. The innovative Army modernization strategy is to provide the best equipment currently available to Soldiers fighting the Global War on Terror while simultaneously developing new capabilities essential for future operations.

Future Combat Systems, the centerpiece of Army modernization, is a system of systems—an integrated combat suite of multiple, interdependent systems that leverage common designs. All of these systems are connected by an advanced information network to give Soldiers unprecedented situational awareness for close combat. The Army is already incorporating lessons learned from current operations into FCS and Army modernization as a whole. Early versions of FCS technologies and equipment—the PackBot tactical robot, for example, clearing caves, searching buildings, crossing minefields—are saving Soldiers' lives. Recent war games have proved the effectiveness of FCS in a counterinsurgency environment. Modeling simulation exercises using an actual combat battle substituted an FCS-enabled brigade combat team (BCT) for the actual rescue battalion and found that it was able to accomplish the mission in one hour rather than three and with no casualties. By spinning out FCS technologies into formations as soon as the capabilities are ready, the Army is strengthening its current force and working to stay ahead of enemies who are constantly adapting their methods.

When BCTs are fielded with the full complement of FCS technologies, these units will contain more fighting vehicles and more infantry squads than today's units. FCS provides more efficient use of fuel and supplies, reduces other logistical support requirements and improves the ability of BCTs to operate as self-sufficient, independent formations. Current plans call for the Army to field 15 fully equipped FCS BCTs, the first in 2015.

In recent years the Army has cancelled more than 100 programs to free resources to fund FCS. It reduced from 18 to 14 the number of platforms upon which FCS technologies would be used, reduced the number of spin-outs and slowed the pace at which FCS BCTs are fielded. Most recently, $3.4 billion was cut from planned FCS spending for Fiscal Years 2008–2013 to accommodate budgetary constraints placed on the Army. The newly created Army Evaluation Task Force—designed to test, refine and validate FCS technologies—is helping minimize development costs in terms of time and money, maximize operational utility and bring Soldiers much earlier into the procurement process.

The Army's FCS program is an operational necessity—innovative, affordable, technologically feasible, on schedule and on budget. As the centerpiece of the Army's first comprehensive modernization in decades, FCS will ensure the Army retains the combat advantage in critical capabilities—net-centricity, mobility and a more efficient use of materiel and personnel—for the foreseeable future.

Full, timely and predictable investment in Army transformation (building a modular force) and modernization (fielding of Future Combat Systems technologies) is a national imperative.

[Future Combat Systems] . . . enables the entire force, not just the 15 FCS brigades. Robotics, precision, situational awareness, [unmanned aerial vehicles], sensors—all of these kinds of things—enable all the other brigades in the Army as we spin this out [into the current force]. If we don't continue pursuing this . . . strategy of modernization . . . we will be trying to upgrade legacy [systems] beyond their ability to keep up with the adaptations that are taking place on the battlefield today.

Army Chief of Staff General Peter J. Schoomaker
in testimony before the House Armed Services Committee,
14 February 2007

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