

Future Combat Systems (FCS) Overview

Executive Summary

Future Combat Systems (FCS) are a joint networked system-of-systems (one large system made up of 18 individual systems, the network, and most importantly, the Soldier). Future Combat Systems are connected via an advanced network architecture that facilitates joint connectivity, situational awareness, understanding, and synchronized operations. FCS will operate as a system-of-systems that will network existing systems, systems already under development, and systems yet to be developed to meet the requirements of the Army's FCS Brigade Combat Teams.

FCS Brigade Combat Teams perform all tactical operations - offensive, defensive, stability, and support - conducted by the current light infantry, Stryker, and heavy mechanized forces. FCS is expected to provide a measurable improvement to deployability, maneuverability, survivability, lethality, battle command, sustainability, interoperability, networking, and training.

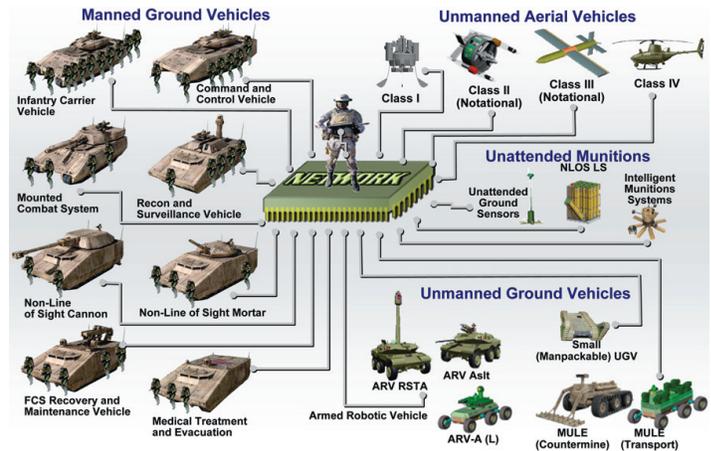
The Army restructured the FCS program to include four different Spin Outs. FCS Spin Outs are a subset of the FCS program focused on providing capabilities to the current force. The Army intends to field Spin Out 1 capabilities to Current Force Modular Brigade Combat Teams in 2010. The Army has not defined the FCS systems for Spin Outs 2-4.

The FCS Brigade Combat Teams will be the Army's future tactical war fighting units. FCS consists of manned and unmanned platforms that include:

Manned Ground Vehicles (Eight variants)

- Combat vehicles (Six variants):
 - Command and Control Vehicle
 - Infantry Carrier Vehicle
 - Non-Line-of-Sight Cannon
 - Non-Line-of-Sight Mortar
 - Mounted Combat System
 - Reconnaissance and Surveillance Vehicle
- Maneuver sustainment vehicles (Two variants):
 - Medical Vehicle (Treatment and Evacuation variants)
 - Recovery and Maintenance Vehicle

The Non-Line-of-Sight Cannon (NLOS-C) is the lead vehicle in the development of Manned Ground Vehicles. The Army is conducting extensive NLOS-C developmental test firings at Yuma Proving Ground, Arizona. A detailed report on this system is provided.



Unmanned Aerial Vehicles (Four variants)

Class	FCS Unit Size	Weight	Time on Station	Operational Radius
I	Platoon	5-10 lbs	50 minutes	8 km
II	Company	150 lbs	2 hours	12 km
III	Battalion	300-500 lbs	6 hours	40 km
IV	Brigade	< 3,000 lbs	24 hours	75 km

FCS Unmanned Aerial Vehicles (UAVs) are systems capable of being multifunctional and tailorable; operable in varying terrain, including urban environments; and teamed with manned aircraft and ground maneuver forces.

Unmanned Ground Vehicles (Three types)

Type	Weight	Operational Range
Small Unmanned Ground Vehicle (SUGV)	30 lbs	1,000 m
Armed Robotic Vehicle (ARV) (two variants): <ul style="list-style-type: none"> • ARV-Reconnaissance, Surveillance, and Target Acquisition • ARV-Assault 	8.5 tons	To Be Determined
Multi-functional Utility/Logistics Equipment (MULE) (three variants): <ul style="list-style-type: none"> • MULE-Transport • MULE-Counter Mine • MULE-ARV-Assault (Light) 	5,000 lbs	To Be Determined

The Autonomous Navigation System provides the capability to operate all UGVs in a tele-operated mode, semi-autonomous mode, and/or semi-autonomous route following mode.

Unattended Munitions (Two types)

Both of these systems are part of Spin Out 1.

- The Non-Line-of-Sight Launch System (NLOS-LS) consists of a family of missiles and a deployable, platform-independent Container Launch Unit with self-contained tactical fire control electronics and software for remote and unmanned operations. A detailed report on this system is provided.
- The Intelligent Munitions System is a system of lethal and non-lethal munitions integrated with command and control features, communications devices, a sensor, and seekers. The Army plans for IMS to meet the requirements of the 2004 National Landmine Policy, and to be a component of FCS. The program completed concept and technology development and plans to transition IMS to System Development and Demonstration in December 2005.

Unattended Ground Sensor (2 types)

FCS Unattended Ground Sensors (UGS) are an array of networked sensors capable of target detection, location, tracking, and classification. The Army intends the UGSs to be small, low cost, robust sensors capable of operating in the field for extended periods of time.

The FCS UGS program is developing two major sensor subgroups:

- Tactical-UGS (two variants):

- Intelligence, Surveillance, and Reconnaissance-UGS
- Chemical, Biological, Radiological, and Nuclear-UGS
- Urban-UGS is an array of small, lightweight sensors emplaced in buildings.

Early versions will be hand emplaced. Later versions plan to have these sensors emplaced from FCS Unmanned Ground Vehicles. Both Unattended Ground Sensor subgroups are part of Spin Out 1.

Battle Command Network

The Battle Command Network is critical to FCS. It enables soldiers of a FCS Brigade Combat Team to conduct Network Centric Warfare. The network will support the FCS Brigade Combat Team by providing advance functionalities such as integrated network management, information assurance, and information dissemination to ensure dissemination of critical information among sensors, processors, and warfighters within and external to the FCS Brigade Combat Team.

The Battle Command Network consists of:

- Communications payloads (radios, cabling, and antennas) for every soldier installed on FCS ground and air platform
- Network management software distributed on platform computers
- Communications payloads on unmanned aerial vehicles

The FCS Battle Command Network is the primary means in which FCS Brigade Combat Teams will move information and data.

Activity

- The Army restructured the FCS program to include four different Spin Outs. FCS Spin Outs are a subset of the FCS program focused on providing technologies/capabilities to the Current Force to address specific capability gaps.
- The major focus for 2005 was revising the FCS Test and Evaluation Master Plan and tailoring the test program to the restructured FCS Spin Out strategy.

Assessment

- DOT&E is concerned about the Army's commitment to provide adequate resources to the U.S. Army Test and Evaluation Command (ATEC) to conduct 13 FCS operational test events between the years 2008 and 2016. This will be the most complex series of operational tests events ever conducted by the Army. Funding, civilian personnel, and military personnel test and evaluation authorizations continue to be cut by the Army. Additional pending cuts by the Army will severely impact ATEC's ability to accomplish its mission
- Combat experience in Afghanistan and Iraq has demonstrated the utility of small Unmanned Ground Vehicles for tunnel surveillance and explosive device detection/destruction.

- The Army plans to have an approved FCS Test and Evaluation Master Plan in 2006. Major DOT&E focus areas for the updated Test and Evaluation Master Plan are:
 - Developing operational and live fire testing on individual systems in addition to system-of-system level testing.
 - Testing a fully equipped Brigade Combat Team during the IOT&E, to include an operational deployment of a portion of the FCS Brigade Combat Team via Air Force cargo aircraft.
 - Ensuring adequate numbers and types of units, equipped with production representative prototypes, are available for operational and LFT&E.
 - Monitoring critical technologies associated with the Battle Command Network. The Army has identified 13 critical technologies; nine of these critical technologies are network related.
 - Ensuring the program conducts a separate Battle Command Network test.
 - Ensuring that the more than 140 complementary programs, of which 52 are essential in meeting key performance parameters, are integrated.

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- Understanding the role of modeling and simulation in operational test events.
- Additionally, in accordance with the 2005 Base Realignment and Closure Commission's report to Congress, ATEC is scheduled to relocate in the midst of these operational test events. Experience has shown that approximately 80 percent of the workforce does not want to move when an organization relocates. Losing key and essential test and evaluation personnel during this critical period in the FCS program is high risk.

Recommendations

1. The Army is planning to conduct the FCS IOT&E as a system-of-systems test. The Army should conduct FCS operational tests at the system-level first in order to evaluate the operational capabilities of each system before conducting the overall FCS system-of-systems test.
2. Review the relevance of key requirements, particularly C-130 transportability of manned ground vehicles. Design trades necessary to meet this requirement are significant and have consequences in terms of operational effectiveness, lethality, survivability, tactical mobility, and sustainability.
3. The FCS program is highly dependent on the following non-FCS programs:
 - Joint Tactical Radio System
 - Joint Network Node
 - Warfighter Information Network-Tactical
 - Distributed Common Ground System-Army
 - Ground Soldier System
4. Several of these programs are high risk in that they are not synchronized with the FCS program. The Department should consider a risk management alternative and understand the cost and performance implications of that alternative.

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