

## Future Combat Systems (FCS) Overview

Future Combat Systems (FCS) is a networked system-of-systems consisting of 18 individual manned or unmanned systems linked together by an information network. The information network connects FCS via an advanced network architecture that provides joint connectivity and enhances situational awareness, understanding, and synchronized operations. The FCS operates as a system-of-systems and encompasses the FCS program systems as well as other complementary Army and joint systems in order to meet the missions of the Army's FCS Brigade Combat Teams (BCTs).

The Army structured the FCS program to include four different Spin Outs. FCS Spin Outs are a subset of the FCS program focused on providing FCS capabilities to the current force. The Army intends to field a Spin Out 1 capability to Current Force Modular BCTs starting in 2010. Spin Out 1 includes two types of unattended ground sensors, the Non-Line-of-Sight Launch System, the Intelligent Munitions System, and a corresponding information network linking these elements to the BCT. A detailed report on Spin Out 1 is provided following this overview. The Army has not identified the FCS systems for Spin Outs 2-4.



The Army intends the FCS Unmanned Aerial Vehicles (UAVs) to be multi-functional and mission tailorable; operable in varying terrain, including urban environments; and teamed with manned aircraft and ground maneuver forces. A detailed report on FCS UAVs is provided following this overview.

### System

The FCS program 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. A detailed report on this system is provided following this overview.

#### Unmanned Aerial Vehicles (Four variants)

Class	FCS Unit Size	Time on Station	Operational Radius
I	Platoon	50 minutes	8 km
II	Company	2 hours	16 km
III	Battalion	6 hours	40 km
IV	Brigade	24 hours	75 km

#### Unmanned Ground Vehicles (Three Types)

Type	Functions
Small Unmanned Ground Vehicle (SUGV)	<ul style="list-style-type: none"> <li>• Reconnaissance of urban and subterranean battlespace</li> </ul>
Armed Robotic Vehicle (ARV) (two variants): <ul style="list-style-type: none"> <li>• ARV-Reconnaissance, Surveillance, and Target Acquisition</li> <li>• ARV-Assault</li> </ul>	<ul style="list-style-type: none"> <li>• Reconnaissance, surveillance, and target acquisition</li> <li>• Line-of-sight and beyond line-of-sight fires</li> </ul>
Multi-functional Utility/Logistics Equipment (MULE) (three variants): <ul style="list-style-type: none"> <li>• MULE - Transport</li> <li>• MULE - Counter-mine</li> <li>• MULE-ARV - Assault (light)</li> </ul>	<ul style="list-style-type: none"> <li>• Transport of equipment and supplies</li> <li>• Direct fire in support of dismounted infantry</li> <li>• Detection of mines and improvised explosive devices</li> </ul>

The Army plans to equip Unmanned Ground Vehicles (UGVs) with the Autonomous Navigation System. This system is intended to provide the capability to operate all UGVs either in a man-in-the-loop mode or in a semi-autonomous mode.

#### Unattended Munitions (Two Types)

- The Army intends the Non-Line-of-Sight Launch System (NLOS-LS) to provide networked, extended-range

targeting, and precision attack of stationary and moving targets. It consists of a Container Launch Unit (CLU), with self-contained tactical fire control electronics and software for remote and unmanned operations, and the Precision Attack Munition missile. NLOS-LS is intended to be able to fire missiles with the CLU on the ground or mounted on a transport vehicle.

- The Intelligent Munitions System (IMS) is a system of lethal and non-lethal munitions networked with a command and control capability and sensors. IMS is intended to protect soldiers and equipment from ground attacks. The Army plans for IMS to meet the requirements of the 2004 National Landmine Policy.

### Unattended Ground Sensors

FCS Unattended Ground Sensors (UGS) are an array of networked sensors capable of target detection, location, and classification. UGS consist of multiple types of sensors to include acoustic, seismic, magnetic, and electro-optical/infrared sensors. UGS is intended to be employed to provide enhanced threat warning and situational awareness.

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 urban structures.

### Battle Command Network

The Battle Command Network is the information network that links together the FCS BCT system-of-systems. The Battle Command Network consists of hardware and software that is intended to deliver video, still images, voice, data, and network control services throughout the FCS BCTs. It is intended to provide an interconnected set of information capabilities for collecting, processing, displaying, disseminating, storing, and managing information on demand with secure and reliable access by soldiers throughout the FCS BCT. This network is intended to include communications payloads on all FCS ground and air platforms and network management software distributed on all platform computers and communications payloads.

### Mission

The FCS BCT will perform all tactical operations - offensive, defensive, stability, and support – currently conducted by light infantry, Stryker, and heavy mechanized forces. The Army intends for the FCS BCT to provide a measurable improvement over current brigade combat teams in terms of deployability, maneuverability, survivability, lethality, battle command, sustainability, and joint interoperability.

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### Activity

- DOT&E approved an updated FCS Test and Evaluation Master Plan (TEMP) in June 2006. This TEMP further refines the FCS test program and addresses both the core program and Spin Out 1. The Army included in the 2006 TEMP additional operational test events to evaluate FCS systems at the individual system level. These evaluations will precede the IOT&E and will enable the IOT&E to focus on the larger system-of-systems issues.
- The Army selected threat munitions for Live Fire testing to verify that the FCS armor ballistic protection will meet operational requirements and contract specifications.
- The FCS program continues to refine the Manned Ground Vehicles (MGV) design concepts. The contractor has conducted some ballistic testing of evolving armor solutions.
- The Army announced its intent to establish an Evaluation Brigade Combat Team (EBCT) at Fort Bliss, Texas. The EBCT will serve as the test unit for all FCS systems. The EBCT is planned to be available to support FCS activities by June 2007.

### Assessment

- The establishment of the EBCT will be a positive element of the FCS test program by providing a stable, dedicated brigade-size unit to support FCS throughout the course of its developmental and operational testing.

- The updated TEMP adequately addresses the FCS testing and evaluation program. It provides for a series of operational test events culminating in an IOT&E with a fully equipped FCS BCT. This live brigade-size IOT&E is expected to be adequate to assess the operational effectiveness and suitability of the FCS system-of-systems.
- The updated TEMP also provides for an adequate LFT&E program. There is, however, some risk in the manner in which the Army plans to execute the LFT&E strategy. Live Fire prototype testing will not be complete before Milestone C. Therefore, only a limited system-level vulnerability assessment will be available to support the decision or affect vehicle design prior to low-rate initial production. Additionally, test phases that typically occur in sequential order will be executed concurrently, making it difficult to correct any significant design flaw identified in a test phase before the onset of the next test phase.
- The TEMP is scheduled to be updated again in 2008 to further refine the test and evaluation program as the FCS systems continue to mature.
- The FCS program continues to address the challenges imposed on the manned ground vehicles by the C-130 transportability requirement. Since the publication of the FY05 Annual Report, the Army has clarified the C-130 requirement to mean

“emergency transport” only, rather than a routine operational requirement. The focus now is on a primary requirement of three MGVs being able to deploy on a C-17. However, the C-130 requirement remains a design constraint for MGV weight and volume. The effect of air transportability constraints is most evident with regard to MGV ballistic survivability. As the MGV designs for ballistic protection are, as of this writing, not yet complete, it is not clear whether the MGV will provide a level of protection for onboard mission essential equipment which will meet system requirements. Overall platform survivability will also be heavily dependent upon an effective Active Protection System. While Active Protection System technologies are showing some promise, it is not yet clear whether their performance will make up for lesser levels of MGV armor protection than those found in current force combat vehicles such as the Abrams tank and Bradley fighting vehicle.

- The FCS program has focused efforts aimed at synchronizing Joint Tactical Radio System (JTRS) and Warfighting Information Network -Tactical (WIN-T) systems development schedules with those of FCS. While progress is being made in this area, these non-FCS complementary programs remain a significant risk area for the FCS program. The effectiveness of the FCS battle command network will depend upon satisfactory JTRS and WIN-T performance.

## Recommendations

- Status of Previous Recommendations. The updated 2006 TEMP took action on DOT&E’s concerns by adding additional operational testing to address individual system performance. Additionally, the Army has focused on synchronizing the development of key non-FCS programs, such as JTRS, with that of FCS. However, the program’s air transportability

requirements will continue to affect MGV design parameters, particularly as they relate to survivability.

- FY06 Recommendations.
  1. The Army should review all assumptions that underlie current FCS requirements prior to committing to any particular MGV design. This is particularly relevant with regard to vehicle survivability. Recent operational experience should be examined to ensure that optimal design trades are being made to meet competing survivability and transportability requirements. Additionally, current operational experience should be used to re-examine a fundamental hypothesis of the FCS BCT that it will have the capability to “see [the enemy] first.” It is not apparent that this hypothesis will be valid at lower tactical levels, particularly in urban terrain or in combat against irregular forces.
  2. The FCS program should ensure that relevant developmental and operational testing is conducted under robust enemy threat conditions. In particular, the Army should focus on the capability of the FBCT to operate when faced with a sophisticated enemy electronic warfare and computer network attack threat.
  3. MGV survivability is highly dependent upon the MGV’s Hit Avoidance System, including Active Protection Systems. The FCS program should develop a test program for Hit Avoidance System which will adequately assess the performance of this critical subsystem throughout its development.
  4. The Army should continue its effort to ensure key complementary acquisition programs, such as JTRS and WIN-T, are on track to provide their needed capabilities to the FCS program.

# ARMY PROGRAMS