

# Future Combat Systems and the Unit of Action – An Overview

BG(P) Charles A. Cartwright and Dennis A. Muilenburg

**F**uture Combat Systems (FCS) is the Army's core effort to ensure that we will move, shoot and communicate as a Joint team member better than ever before and better than any opponent we will face in the 21st century – anytime, under any circumstances and anywhere that the Nation needs us.

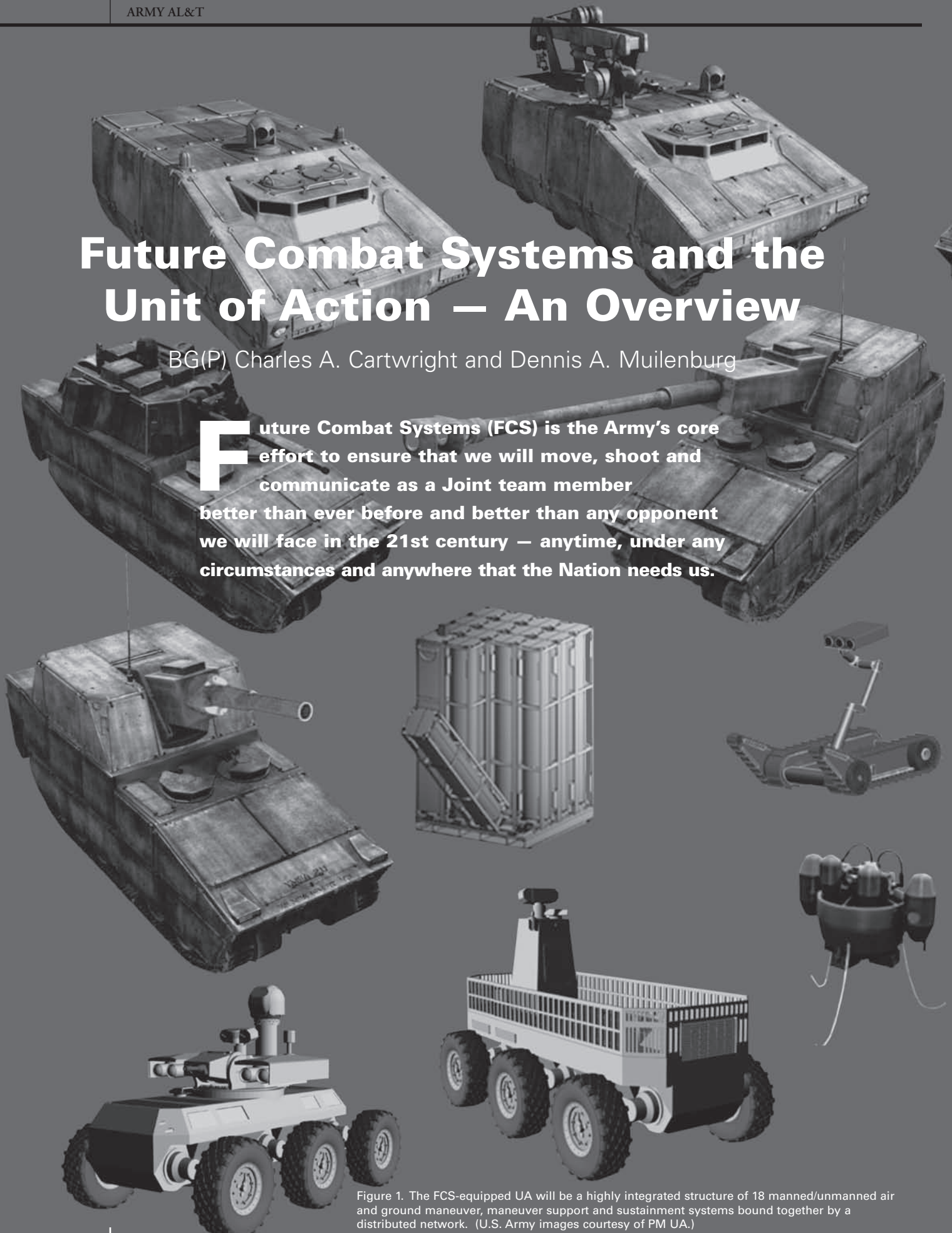


Figure 1. The FCS-equipped UA will be a highly integrated structure of 18 manned/unmanned air and ground maneuver, maneuver support and sustainment systems bound together by a distributed network. (U.S. Army images courtesy of PM UA.)

Lessons learned in *Operation Iraqi Freedom* and the global war on terrorism have shown that a Joint, combined-arms, network-centric force has the ability to both rapidly defeat an enemy in battle and act as a key element in follow-on peacekeeping efforts. The Army is using these lessons to fundamentally transform into a faster, more agile force with superior situational awareness (SA) and power-projection capability.

### Equipping the Unit of Action (UA)

This force — the Army's FCS-equipped UA — will be part of a Joint team that is decisive in any operation, against any level threat, in any environment. The UA balances the capabilities for battlespace dominance, lethality and survivability with its agility and versatility, deployability and sustainability. Although optimized for offensive operations, the UA can execute stability and support operations as well. The UA's operational hallmark will be the ability to develop situations out of contact, engage the enemy in unexpected ways, maneuver to positions of advantage with speed and agility, engage enemy forces beyond the range of their weapons and destroy enemy forces with enhanced fire and assault at times and places of our choosing. At the same time, the FCS-equipped UA is designed with the durability and stamina to fight battles and engagements for the campaign's duration, while focusing on critical decisive points and centers of gravity.

The FCS-equipped UA's core is a highly integrated structure of 18

A Joint, combined-arms, network-centric force has the ability to both rapidly defeat an enemy in battle and act as a key element in follow-on peacekeeping efforts.

manned and unmanned (MUM) air and ground maneuver, maneuver support and sustainment systems, bound together by a distributed network and supporting the Soldier (18+1+1 systems) acting as a unified combat force in the Joint environment. The network uses a battle command architecture that integrates networked communications, network operations, sensors, battle command system, training and MUM reconnaissance and surveillance capabilities to enable situational understanding and operations at a synchronization level not achievable in current network-centric operations.

MUM systems include:

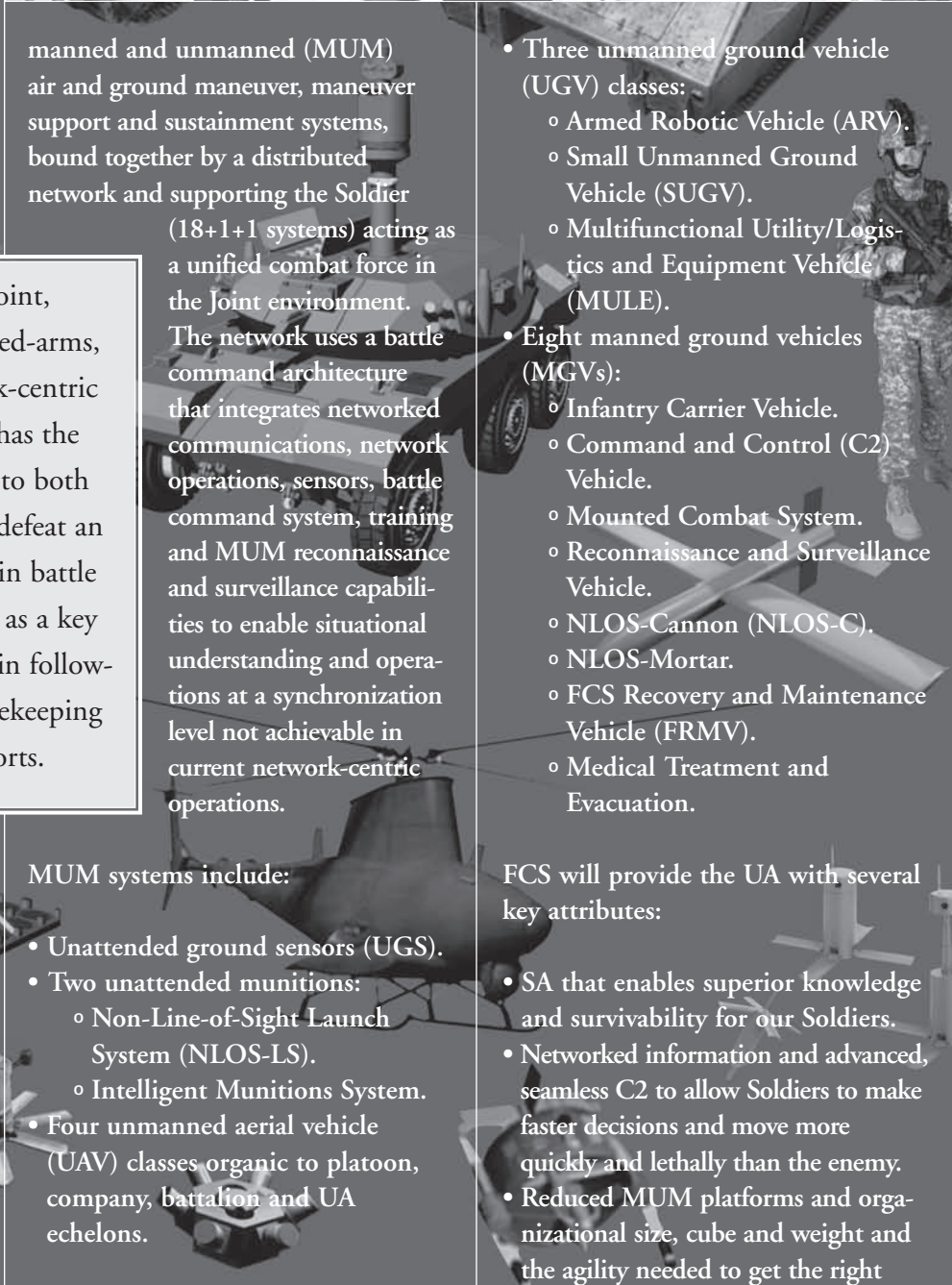
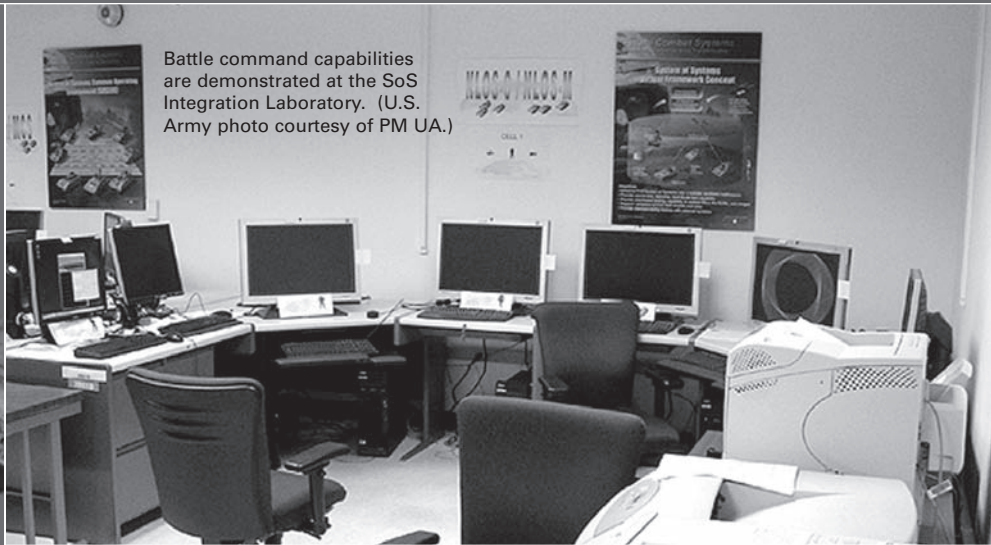
- Unattended ground sensors (UGS).
- Two unattended munitions:
  - Non-Line-of-Sight Launch System (NLOS-LS).
  - Intelligent Munitions System.
- Four unmanned aerial vehicle (UAV) classes organic to platoon, company, battalion and UA echelons.

- Three unmanned ground vehicle (UGV) classes:
  - Armed Robotic Vehicle (ARV).
  - Small Unmanned Ground Vehicle (SUGV).
  - Multifunctional Utility/Logistics and Equipment Vehicle (MULE).
- Eight manned ground vehicles (MGVs):
  - Infantry Carrier Vehicle.
  - Command and Control (C2) Vehicle.
  - Mounted Combat System.
  - Reconnaissance and Surveillance Vehicle.
  - NLOS-Cannon (NLOS-C).
  - NLOS-Mortar.
  - FCS Recovery and Maintenance Vehicle (FRMV).
  - Medical Treatment and Evacuation.

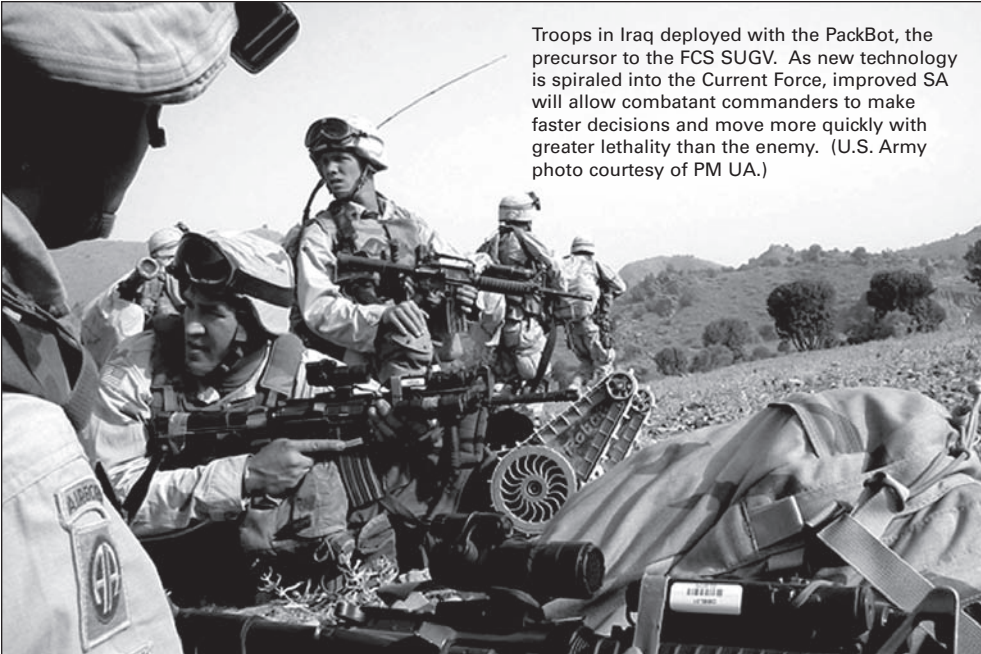
FCS will provide the UA with several key attributes:

- SA that enables superior knowledge and survivability for our Soldiers.
- Networked information and advanced, seamless C2 to allow Soldiers to make faster decisions and move more quickly and lethally than the enemy.
- Reduced MUM platforms and organizational size, cube and weight and the agility needed to get the right

Battle command capabilities are demonstrated at the SoS Integration Laboratory. (U.S. Army photo courtesy of PM UA.)







Troops in Iraq deployed with the PackBot, the precursor to the FCS SUGV. As new technology is spiraled into the Current Force, improved SA will allow combatant commanders to make faster decisions and move more quickly with greater lethality than the enemy. (U.S. Army photo courtesy of PM UA.)

Boeing and Science Applications International Corp. were chosen to execute the FCS LSI role in 2002. They bring a unique combination of systems integration and technical development expertise to this challenge.

Supporting the LSI in a “shared destiny” relationship is an industrial base of 358 One Team Partners (OTPs) that bring the best talent and BOI capabilities within the Nation. Our OTPs will execute most of the systems development and subcomponent integration, such as air and ground sensors, for overall SoS integration for the LSI. Most resources will be released to the LSI, who will execute and manage subcontracts and a significant number of cooperative program interface agreements.

The FCS program has created a “One Team” environment to manage its partners. The One Team’s key elements are:

- Shared destiny — financial instruments to motivate management to work toward a common goal.
- Integrated Master Plans (IMPs) and Integrated Master Schedules (IMSS) that are tiered and fully integrated.

force to the right place at the right time.

- Embedded training and networked support that reduces the traditional logistics footprint for fuel, water, ammunition and repair parts by 30-70 percent.

**FCS Development — An Innovative Way to Do Business**

FCS is one of the most complex systems integration and development programs ever executed by DOD. The program’s scope — developing 18 MUM systems and their integrating network; integrating more than 150 complementary and associated programs; and developing the underlying doctrine, organization, training, facilitation and other functions needed to develop and field a fully functioning UA — requires an innovative approach to complex systems integration. This approach — using a single, accountable Lead Systems Integrator (LSI) to integrate the FCS family of systems — will optimize UA operational capability, maximize competition for systems development, ensure interoperability and maintain commonality to reduce life-cycle costs.

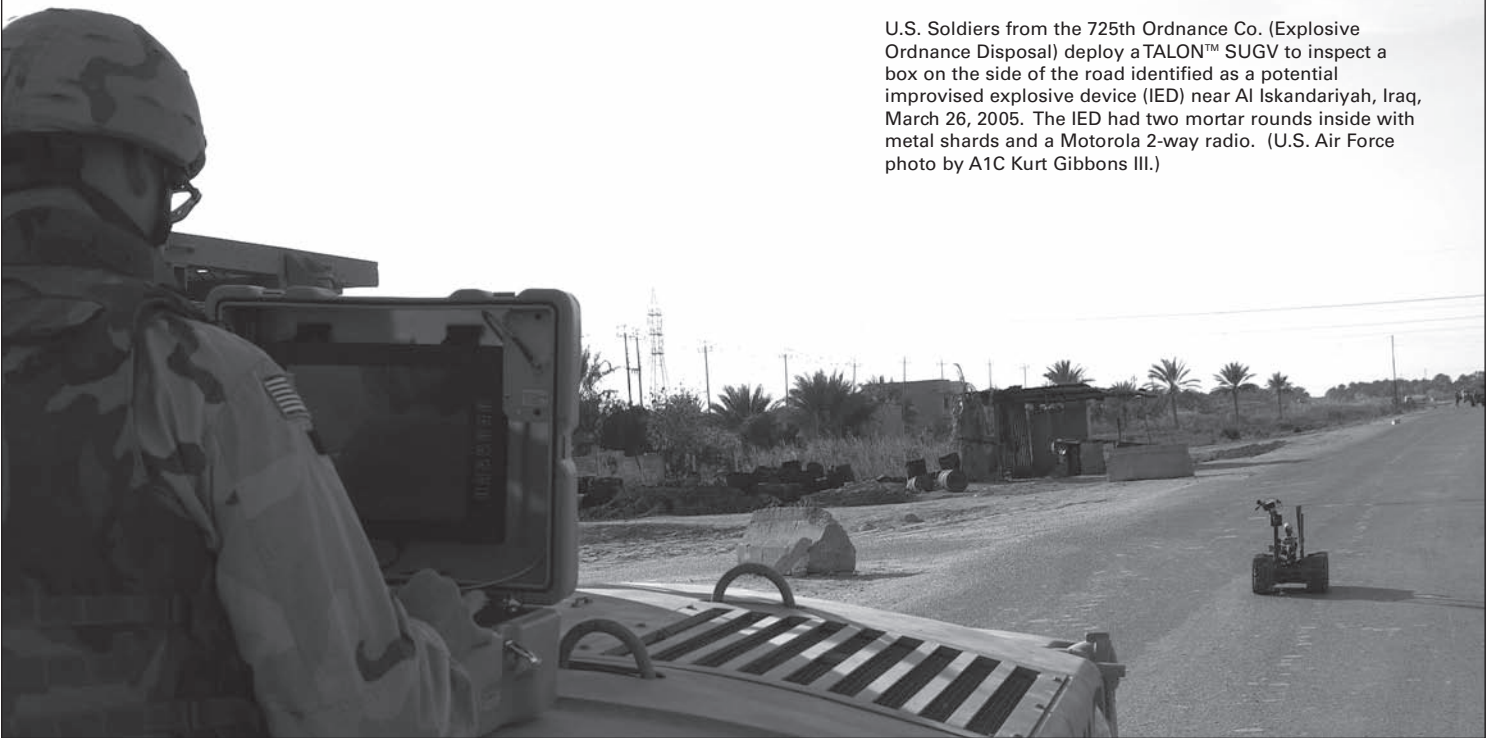
The LSI executes total system-of-systems (SoS) engineering, integration, simulation and testing and acts as a “general contractor” for resource allocation, subcontract implementation, coordination and programmatic responsibilities. Likewise, the LSI provides the vital link to:

- “Best of industry” (BOI), including domestic/foreign contractors.
- Government programs/labs.
- Educational institutions.
- Other government agencies as required.



Field course evaluation of the Autonomous Navigation System takes an ARV through a field test. (U.S. Army photo courtesy of PM UA.)

U.S. Soldiers from the 725th Ordnance Co. (Explosive Ordnance Disposal) deploy a TALON™ SUGV to inspect a box on the side of the road identified as a potential improvised explosive device (IED) near Al Iskandariyah, Iraq, March 26, 2005. The IED had two mortar rounds inside with metal shards and a Motorola 2-way radio. (U.S. Air Force photo by A1C Kurt Gibbons III.)



The OTPs' statements of work, work breakdown structures and IMPs/IMSs are directly linked to the master LSI IMP/IMS.

- Performance and quality processes, best practices and metrics are flowed down through the procurement packages and negotiated in the contract terms and conditions.
- A One Team Earned Value Management System using a single software package and process to plan, monitor and manage the program.
- The use of our Advanced Collaboration Environment for information gathering, reporting and managing geographically dispersed partners.
- Rigorous configuration management and change processes have been implemented to maintain control of the physical and logical interfaces and technical baseline.
- Management across the program using cost-as-an-independent-variable process.

The FCS-equipped UA's core is a highly integrated structure of 18 MUM air and ground maneuver, maneuver support and sustainment systems, bound together by a distributed network.

The result is an integrated industry team, in partnership with the Army, that will ensure a collaborative allocation of human, financial and technological resources to efficiently develop and field the FCS.

Independent reviews by the Government Accountability Office and the Institute for Defense Analysis support the LSI/BOI approach.

on FCS-equipped UA development

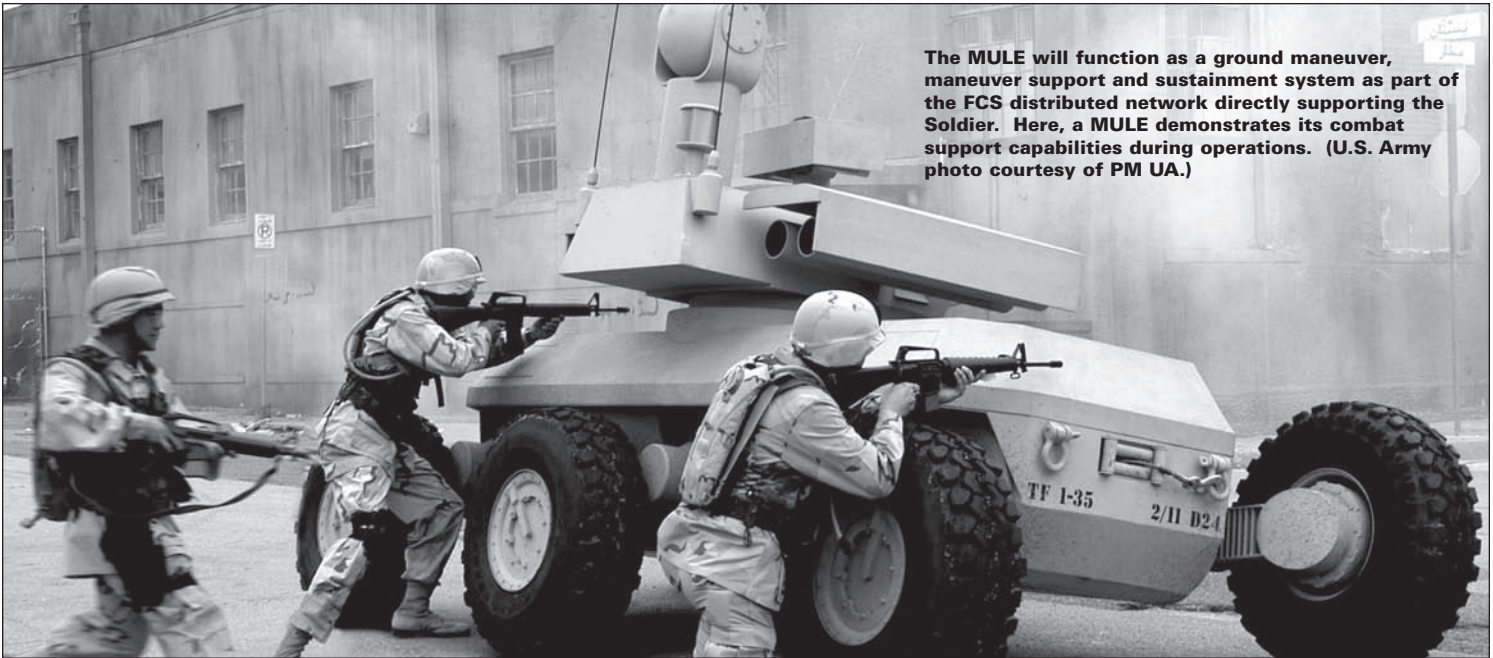
**On Schedule, On Cost and Executing to Plan**

The FCS System Development and Demonstration (SDD) program has been ongoing since May 2003. In July 2004, the Army identified and announced adjustments to strengthen the FCS program and simultaneously improve the Current Force through early delivery of selected FCS capabilities. The adjustments maintain the Army focus

and substantially reduce program risk. The adjustments to the FCS program acquisition strategy fall into these primary categories:

- The five previously deferred FCS core systems — UAV Class II, UAV III, ARV (Assault and Reconnaissance), FRMV and integration for the Intelligent Munitions System — have been fully funded and will be fielded with the first FCS-equipped UA, allowing UA fielding of the complete 18+1 FCS core systems to begin delivery to the Army in 2014.
- The SDD program was restructured into a series of integration phases (IPs) that will cyclically develop, build and test FCS components and systems. These IPs incorporate robust experimentation, evaluation and technology maturation efforts to prove out revolutionary concepts, mature the architecture and components and assist in spin-out (SO) development.
- A series of SO packages, associated with IPs, will begin in 2008 and continue every 2 years through 2014 to evaluate and insert FCS capability into the Modular UAs consisting of





**The MULE will function as a ground maneuver, maneuver support and sustainment system as part of the FCS distributed network directly supporting the Soldier. Here, a MULE demonstrates its combat support capabilities during operations. (U.S. Army photo courtesy of PM UA.)**

mixed current fleet systems. These Modular UAs will have enhanced capability over Current Force units and become the stepping stones to full Future Force capability.

The FCS core program will use the Evaluation Brigade Combat Team (BCT) concept — a Current Force BCT equipped with a mix of combat and tactical vehicles — to evaluate the SO systems and identify necessary technical changes for the FCS-equipped UA prior to Milestone (MS) C. SOs will bring FCS benefits to Soldiers more quickly and allow

technology maturation based on field-tested applications.

The adjusted program schedule will use an iterative development, integration and verification process to demonstrate readiness to move into low-rate initial production and provide FCS SO capabilities to the Current Force. The SDD phase will lead to an FCS MS C decision in 2012, an initial operational capability in 2014 and a full operational capability FCS-equipped UA BCT in 2016.

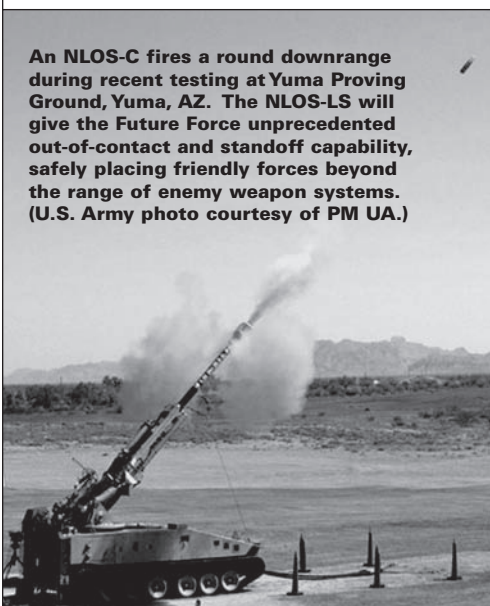
The past year has been a critical and successful one for the FCS program. The Army, LSI and OTPs have flawlessly executed and completed 2005's goals while simultaneously pursuing SoS engineering, subcomponent and software development and requirements development, along with completing the program adjustments previously described. This culminated in a successful Office of the Secretary of Defense program review and the SoS functional review in August, which set the initial program functional baseline.

The next year has even greater challenges, including system-level

functional reviews and an initial SoS preliminary design review. The first year of integration Phase I — including initial hardware prototype and software development — will result in delivery and integration and verification testing, continued technology maturation and initial experimentation. The result: an integrated capability for the 21st-century Soldier that is faster and cheaper than individual system procurements and will ensure the Joint force has the essential capabilities to dominate across the full range of military operations.

**BG(P) CHARLES A. CARTWRIGHT** is the UA Program Manager. He holds a B.S. in personnel management and administration from Florida Southern College, an M.S. in procurement and contract management from the Florida Institute of Technology and has completed the Army War College.

**DENNIS A. MUILENBURG** is the Boeing Integrated Defense Systems PM FCS. He has a B.S. in aerospace engineering from Iowa State University and an M.S. in aeronautics and astronautics from the University of Washington.



**An NLOS-C fires a round downrange during recent testing at Yuma Proving Ground, Yuma, AZ. The NLOS-LS will give the Future Force unprecedented out-of-contact and standoff capability, safely placing friendly forces beyond the range of enemy weapon systems. (U.S. Army photo courtesy of PM UA.)**