Future Combat System (Brigade Combat Team) (FCS (BCT))

18 + 1 + 1 Systems Overview

11 April 2006

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WHITE PAPER

1. **Purpose:** To provide an overview of the Future Combat System (Brigade Combat Team) (FCS (BCT)) program

2. **The Future Operational Environment**. Our nation will continue to be engaged in a "long struggle of continuous, evolving conflict" that (as in Afghanistan and Iraq today) will manifest itself in complex regular and irregular challenges in the future … and will be waged in the human dimension. Future adversaries will:

- Adapt and hone their skills to defeat our current strengths and abilities.
- Attempt to preclude the U.S. from optimizing for one type of challenge.
- Employ dynamic combinations of heavy forces, medium forces, light forces, and irregular forces disbursed dispersed in complex terrain like urban, mountain, and remote areas to deny tactical access in the operational area.
- Employ niche technology to block points of entry, threaten Intermediate Staging Bases and exclude our US and Allied operational maneuver.
- Employ terrorism to disrupt key portions of US /Allied infrastructure to keep the US /Allies at a distance by minimizing the perception that the US /Allies should become involved at all, and maximize the domestic and international perception of risk to preclude US /Allied strategic maneuver.

Failure to invest in and leverage the right capabilities – in our doctrine, organizations, training, materiel, leaders, people, and facilities – will increase risk for your American Soldiers, the Joint Team, and the Nation. Building capabilities for tomorrow requires prudent investment today.

3. **Facts:**

a. The urgent needs of the current fight required that the Army accelerate transformation. The Army is in the midst of an ongoing process of transformation with a broad mandate to change across many domains. FCS (BCT) is the material solution for the future force. FCS (BCT) is the Army's *modernization program* consisting of a family of manned and unmanned systems, connected by a common network, that *enables* the modular force, providing our Soldiers and leaders with leading-edge technologies and capabilities allowing them to dominate in complex environments.
It is a joint (across all the military services) networked (connected via advanced communications) system of systems (one large system made up of 18 individual systems, the network, and most importantly, the Soldier) connected via an advanced network architecture that will enable levels of joint connectivity, situational awareness and understanding, and synchronized operations heretofore unachievable. It will operate as a System of Systems (SoS) that will network existing systems, systems already under development, and systems to be developed to meet the requirements of the Army's Future Force. Specific FCS (BCT) capabilities will be spun out of the FCS (BCT) program to provide enhanced capabilities for the entire modular force. In July 2004, the FCS (BCT) program was restructured to accelerate the fielding of FCS (BCT) capabilities to the force.

b. FCS (BCT) includes 18+1+1 systems consisting of unattended ground sensors (UGS); two unattended munitions, the Non-Line of Sight – Launch System (NLOS-LS) and Intelligent Munitions System (IMS); four classes of unmanned aerial vehicles (UAVs) organic to platoon, company, battalion and Brigade Combat Team (BCT) echelons; three classes of unmanned ground vehicles, the Armed Robotic Vehicle (ARV), Small Unmanned Ground Vehicle (SUGV), and Multifunctional Utility/Logistics and Equipment Vehicle (MULE); and the eight manned ground vehicles (18 individual systems); plus the network (18+1); plus the Soldier (18+1+1).

c. FCS (BCT) is the *fastest* and *surest* way to modernize the Army. The FCS (BCT) will be the Army's future tactical warfighting echelon; a dominant ground combat force that complements the dominant Joint team. Although optimized for offensive operations, the FCS (BCT) will be capable of executing full spectrum operations. The FCS (BCT) will consist of three FCS-equipped Combined Arms Battalions (CABs), a Non-Line-of-Sight (NLOS) Cannon Battalion, a Reconnaissance Surveillance and Target Acquisition (RSTA) Squadron, a Forward Support Battalion (FSB), a Brigade Intelligence and Communications Company (BICC), and a Headquarters Company. The FCS (BCT) will improve the strategic deployability and operational maneuver capability of ground combat formations without sacrificing lethality or survivability.

d. FCS (BCT) will use evolutionary acquisition to develop, field, and upgrade FCS (BCT) throughout its lifecycle. On 22 July 2004, Army officials announced plans to accelerate the delivery of selected FCS (BCT) to the Current Force. The Army will accelerate fielding of select FCS (BCT) capabilities (called Spin-Outs) to reduce operational risk to the Current Force. Just as the emerging FCS (BCT) capabilities enhance the Current Force, the Current Force's operational experience informs the FCS (BCT) program, further mitigating future challenges, force management, and institutional risks. The plan expands the scope of the program's System Development and Demonstration (SDD) phase by adding four discrete "spin outs" of capabilities at two year increments for the Current Forces. Spin Out 1 will begin issuing in Fiscal Year (FY) 2008 and consist of prototypes issued to the Evaluation Brigade Combat Team (BCT) for their use and evaluation. Following successful evaluation, production and fielding of Spin Out 1 will commence to Current Force units in 2010. This process will be repeated for each successive Spin Out. By 2014, the Army force structure will include one Brigade Combat Team (BCT) equipped with all 18 + 1 FCS (BCT) core systems and additional Brigade Combat Teams with embedded FCS (BCT) capability. This is the centerpiece of this adjustment: providing the Current Force with FCS (BCT) capability sooner rather than later. Currently Spin Out 1 is under development, program acquisition controls are in place, and all systems within Spin Out 1 are progressing through key engineering milestones.

e. The FCS (BCT) program is now in the System Development and Demonstration (SDD) phase. The FCS (BCT) acquisition program was approved by the Defense Acquisition Board (DAB) in May 03. The FCS (BCT) program has been designated a Joint Services program with an Army and Marine Joint Program Office (JPO) being established.

4. **Points of Contact:** COL Robert Beckinger, TRADOC System Manager (TSM) FCS, (502) 524-3321, and Mr. Bill White, PM FCS (BCT) Operations Director, (586) 574-8631.

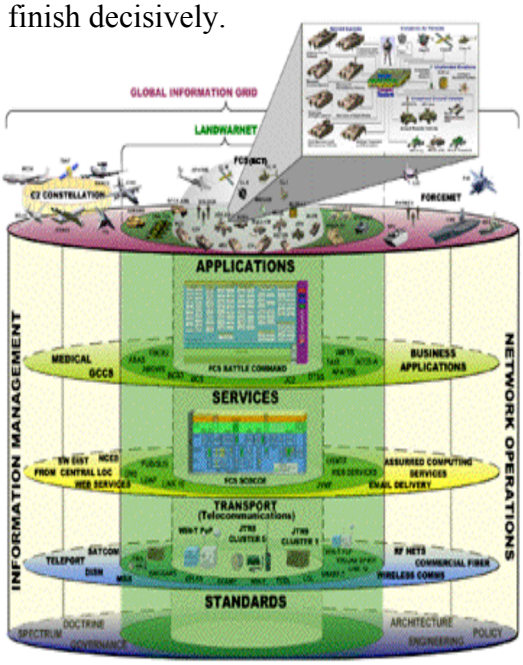
For additional information about the FCS (BCT) program via the Web, refer to http://www.army.mil/fcs/.

OVERVIEW OF THE 18+1+1 FCS (BCT) SYSTEMS

1. The FCS (BCT) Network

The Army's FCS (BCT) network allows the FCS (BCT) Family-of-Systems (FoS) to operate as a cohesive system-of-systems where the whole of its capabilities is greater than the sum of its parts. As the key to the Army's transformation, the network and its logistics and Embedded Training (ET) systems, enable the Army to employ revolutionary operational and organizational concepts. The network enables Soldiers to perceive, comprehend, shape, and dominate the future battlefield at unprecedented levels as defined by the FCS (BCT) Operational Requirements Document (ORD).

The FCS (BCT) network consists of five layers that when combined provides seamless delivery of data: The Standards, Transport, Services, Applications, and Sensors and Platforms Layers. The FCS (BCT) network possesses the adaptability and management functionality required to maintain pertinent services, while the FCS (BCT) fights on a rapidly shifting battlespace giving them the advantage to see first, understand first, act first, and finish decisively.



FCS (BCT) Network Layers

1.1 Standards Layer

The Standards Layer is the foundation of the FCS (BCT) network. It provides the governance for which the other layers are shaped and formed. The FCS (BCT) network will conform to the standards documentation to ensure that the net-centric attributes (flexible, adaptable distributed computing environment) are in place to move into the net-centric environment as part of a service-oriented architecture in the GIG. Information needs, information timeliness, information assurance, and net-ready attributes provide overarching guidance to ensure the technical exchange of information and the end-to-end operational effectiveness. Conformance to these standards permits seamless interoperability with combined and coalition forces for all National Security Systems (NSS) and Information Technology (IT) systems.

DoD Directive 4630.5 and DoD Instruction 4630.8 and DoD 5000 series state that Interoperability is

"the ability to provide and accept data, information, materiel, and services" and further state "….includes both the technical exchange of information and the end-to-end operational effectiveness of that exchange, as required for mission accomplishment." The FCS (BCT) Network will conform to DISA standards that ensure end-to-end interoperability testing – Network Testing. The FCS (BCT) Network will adhere to CJCSI 3170.01D, Capabilities Integration and Development System and CJCSM 3170.01, Operation of the Joint Capabilities Integration and Development System that established Joint Capabilities Integration and Development System (JCIDS) with NR KPP for Capstone Requirements Document (CRD), Capability Development Document (CDD), and Capability Production Document (CPD).

1.2 Transport Layer

The FCS (BCT) Family-of-Systems (FoS) are connected to the command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) network by a multilayered transport layer with unprecedented range, capacity and dependability. The transport layer provides secure, reliable access to information sources over extended distances and complex terrain. The network will support advanced functionalities such as integrated network management, information assurance and information dissemination management to ensure dissemination of critical information among sensors, processors and warfighters both within, and external to the FCS (BCT)-equipped organization.

The FCS (BCT) transport layer does not rely on a large and separate infrastructure because it is primarily embedded in the mobile platforms and moves with the combat formations. This enables the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) network to provide superior Battle Command (BC) on the move to achieve offensive-oriented, high-tempo operations.

The FCS (BCT) transport layer is comprised of several heterogeneous communication systems including the Joint Tactical Radio System (JTRS) and Warfighter Information Network–Tactical (WIN-T). FCS (BCT) leverages all available resources to provide a robust, survivable, scalable and reliable heterogeneous communications network that seamlessly integrates ground, near ground, airborne and space-borne assets for constant connectivity and layered redundancy.

The FCS (BCT) Network Management System will be utilized to manage the entire FCS (BCT) network including radios with different waveforms, platform routers, and local area networks (LANs), information assurance elements, and hosts. It provides a full spectrum of management capabilities required during all mission phases, including pre-mission planning, rapid network configuration upon deployment in the area of operations, monitoring the network during mission execution and dynamic adaptation of network policies in response to network performance and failure conditions.

1.3 Services Layer

Central to FCS (BCT) network implementation is the Services Layer, commonly referred to as System-of-Systems Common Operating Environment (SOSCOE), which supports multiple mission-critical applications independently and simultaneously. It is configurable so that any specific instantiation can incorporate only the components that are needed for that instantiation. It enables straightforward integration of separate software packages, independent of their location, connectivity mechanism and the technology used to develop them.

The Services Layer architecture uses commercial off-the-shelf hardware and a Joint Tactical Architecture–Army compliant operating environment to produce a nonproprietary, standards-based component architecture for real-time, near-real-time, and non-real-time applications. The Services Layer also contains administrative applications that provide capabilities including login service, startup, logoff, erase, memory zeroize, alert/emergency restart and monitoring/control. The Services Layer framework allows for integration of critical interoperability services that translate Army, Joint, and coalition formats to native, internal FCS (BCT) message formats using a common format translation service. Because all interoperability services use these common translation services, new external formats will have minimal impact on the FCS (BCT) software baseline. The FCS (BCT) software is supported by application-specific interoperability services that act as proxy agents for each Joint and Army system. The Application Layer can access these interoperability services through applicable program interfaces that provide isolation between the domain applications, thereby facilitating ease of software modifications and upgrades.

The Services Layer is the open architecture middleware of the FCS (BCT) Network; it provides a window to the Situational Awareness Data Base and enables the interactive functioning of the Applications Layer and the Network Manager. In addition, the Services Layer provides message translation services to achieve JIM interoperability.

1.4 Applications Layer

The Applications Layer is responsible for providing the integrated ability to assess, plan, and execute network-centric mission operations using a common interface and a set of non-overlapping functional services that provides the full range of FCS (BCT) Warfighter capabilities to include:

- Integrated On-The-Move Common Operational Picture Real of the 4D Battlespace
- Real-time collaboration among dispersed warfighters
- Real-time assessment and sharing of combat power
- Common display interface for the Soldier based on role, echelon, and permissions
- Automated deconfliction of Blue Forces, air/ground space, & fires
- Automated planning and rehearsal decision making process
- Multi-levels of fusion for situation refinement to the platform
- Decision aiding supporting Command and Control (C2) of multiple unmanned airborne, unattended sensor & munitions, and ground systems
- Dynamic sensor planning, tasking & collection visualization to support Commanders Critical Information Requirements (CCIR) at all levels
- Rapid battlefield damage assessment tied to networked fires
- Execution monitoring and dynamic plan adjustment based on changes in the current situation
- Full control and autonomy of unmanned systems and payloads

The Applications Layer incorporates ten software service packages covering each battle command functional domains. These ten software services packages' combined capabilities enable full interaction among the FCS (BCTs) and will share a common framework to achieve the long-desired goal of an integrated and interoperable system with no hardware, software or information stovepipes.

The Applications Layer will provide the ability for cross Battlefield Functional Area (BFA) problem solving and decision aiding capability for all brigade and below echelons, the ability to allow doctrine and tactics, techniques, and procedures (TTP) to evolve during development and after fielding, the ability to provide rapid reconfiguration of roles and levels of automation during execution, and the

ability to promote development efficiencies prior to fielding and technology refresh and insertion afterwards.

1.4.1 Networked Logistics Systems

The key to the success of the FCS (BCT) is the Networked Logistics Systems integrated through the Family-of-Systems (FOS) to achieve the logistics goals of reducing the logistics footprint, enhancing deployability, increasing operational availability, and reducing total ownership costs. These critical program goals are included in the two logistics Key Performance Parameters (KPP), KPP 4 (Transportability/Deployability) and KPP 5 (Sustainability/Reliability). Inherent to meeting these KPPs is the integration of logistics in the command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) network primarily through the Platform-Soldier Mission Readiness System (PSMRS) and the Logistics Decision Support System (LDSS). These systems provide unprecedented depth and accuracy of logistics information and decision tools to the commanders and logisticians by enabling the distribution system to deliver the right stuff to the right place at the right time reducing O&S costs. The supportability of the FCS (BCT) is further enabled by the reduction of demand designed into the System of Systems. Increased Reliability Availability Maintainability – Test (RAM-T) goals and implementing a Performance Based Logistics (PBL) support concept through extensive up front systems engineering efforts will result in increased Operational Availability and significant decreases in both parts and maintenance personnel while generating increased combat power. The time required to execute a repair is significantly decreased through implementation of "Pit-Stop Engineering" designs for maintenance easing both crew and maintainer burdens.

1.4.2 Embedded Training

The FCS (BCT) network facilitates the Soldier's ability to train anywhere, any time. Technology has matured to a level that supports these requirements. Embedded Training (ET) will be developed as an integral part of the FCS (BCT) manned platform and command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) architectures.

The Embedded Live-Virtual-Constructive (L-V-C) Multi-mode Training is the cornerstone of the networked Embedded Training (ET) and will satisfy the Key Performance Parameter (KPP#6) which states "The FCS Family of Systems (FoS) must have an embedded individual and collective training capability that supports live, virtual, and constructive training environments." ET must be designed-in at the start of the program to ensure it is developed in conjunction with the other FCS (BCT) System of Systems (SoS) components. Embedding the training capabilities as an inherent part of the operational system mitigates negative training inherent with attempting to replicate operational performance, since an embedded solution stimulates and uses the operational capabilities as an organic part of the solution. To fulfill the Operational and Organizational (O&O) concepts, the SoS must be capable of supporting operations, mission rehearsal and training of separate audiences (soldiers, units, leader/staff teams) simultaneously.

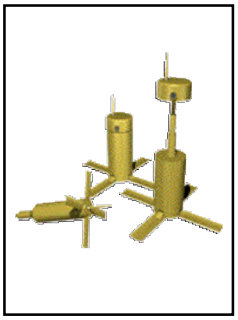
1.5 Sensors and Platforms Layer

The Sensors and Platforms Layer is comprised of a distributed and networked array of multi-spectral sensors that provide the FCS (BCT) with the ability to "see first." Intelligence, Surveillance and Reconnaissance sensors will be integrated onto all manned ground vehicles, all unmanned ground vehicles and all four classes of unmanned aerial vehicles within the FCS (BCT). These sensors will be

capable of accomplishing a variety of collection missions including Wide Area Surveillance (WAS), Reconnaissance, Surveillance and Target Acquisition (RSTA), Mobility and Survivability. In addition to collecting data locally within the FCS (BCT) area of operations, the ISR Layer architecture will facilitate the fusion of Joint, Current Force and national sensor data into the COP through the Distributed Common Ground System – Army (DCGS-A). The sensor data collect from FCS (BCT) internal, Current Force, Joint, and National sensors will provide timely and accurate situational awareness (SA), enhance survivability by avoiding enemy fires, enable precision networked fires, and maintain contact throughout an engagement.

To provide warfighters with current, accurate, and actionable information, the data from the various distributed ISR and other external sensor assets are subject to complex data processing, filtering, correlation, aided target recognition and fusion (level 0 and 1 automated fusion, and levels 2-5 semi-automated fusion). The Sensor Data Management (SDM) software organizes all the sensor data — including detection reports — and tracks information as received from the sensor packages.

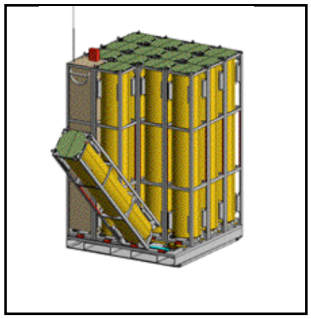
2. Unattended Ground Sensors (UGS)



The FCS (BCT) Unattended Ground Sensors (UGS) program is divided into two major subgroups of sensing systems: Tactical-UGS (T-UGS), which includes Intelligence, Surveillance and Reconnaissance (ISR)-UGS and Chemical, Biological, Radiological and Nuclear (CBRN)-UGS; and Urban-UGS (U-UGS), also known as Urban Military Operations in Urban Terrain (MOUT) Advanced Sensor System (UMASS). The ISR-UGS will be modular and composed of tailorable sensor groups using multiple ground-sensing technologies. An Unattended Ground Sensors (UGS) field will include multimode sensors for target detection, location and classification; and an imaging capability for target identification. A sensor field will also include a gateway node to provide sensor fusion and a long-haul interoperable communications capability for transmitting target or SA information to a remote operator, or the common operating picture through the FCS (BCT) JTRS Network. The UGS can be used to perform mission tasks such as perimeter defense, surveillance, target acquisition and situational awareness (SA), including Chemical, Biological, Radiological and Nuclear (CBRN) early warning.

Urban-Unattended Ground Sensors (U-UGS) will provide a low cost, network-enabled reporting system for SA and force protection in an urban setting, as well as residual protection for cleared areas of Urban Military Operations in Urban Terrain (MOUT) environments. They can be hand-employed by Soldiers or robotic vehicles either inside or outside buildings and structures. U-UGS can support BCT operations by monitoring urban choke points such as corridors and stairwells as well as sewers, culverts and tunnels. U-UGS gateways provide the urban SA data interfaced to JTRS networks.

3. Non Line of Sight – Launch System (NLOS-LS)



The Non-Line-of-Sight – Launch System (NLOS-LS) consists of a family of missiles and a highly deployable, platform-independent Container Launch Unit (C/LU) with self-contained tactical fire control electronics and software for remote and unmanned operations. Each Container Launch Unit (C/LU) will consist of a computer and communications system and 15 missiles [Precision Attack Missiles (PAM)].

Precision Attack Missiles (PAM) is a modular, multimission, guided missile with two trajectories – a direct-fire or fast-attack trajectory, and a boost-glide trajectory. The missile will receive target information prior to launch, and can receive and respond to target location updates during flight. The PAM will support laser-designated, laser-anointed and autonomous operation modes and will be capable of transmitting near-real-time information in the form of target imagery prior to impact. PAM is being designed to defeat heavy armored targets.

4. Intelligent Munitions System

Intelligent Munitions System

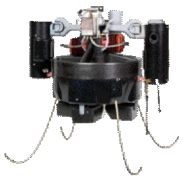
The Intelligent Munitions System (IMS) is an unattended munitions system providing both offensive battlespace shaping and defensive force protection capabilities for the Future Force. The IMS is a system of lethal and nonlethal munitions integrated with robust command and control features, communications devices, sensors and seekers that make it an integral part of the FCS (BCT) network's core systems.

IMS provides unmanned terrain dominance, economy of force and risk mitigation for the warfighting commander. Typical missions include:

- Isolating enemy forces, objectives, and areas of decisive operations.
- Creating lucrative targets, and engaging them or cueing other fires.
- Filling gaps in the noncontiguous battlespace.
- Controlling noncombatant movement with its nonlethal capabilities.

With its reduced footprint, IMS can be delivered by various means, and once on the ground, locate itself, organize all of its components and report its location to the Battle Command Mission Execution (BCME). It will be under positive control of the BCME, one of the FCS (BCT) command and control applications. The munition field can be armed, turned off to allow friendly passage, then rearmed to resume its mission. This on-off-on capability allows it to be recoverable, further reducing its logistics footprint. IMS will not become a residual hazard; it will self-destruct on command or at a preset time interval. It will also be tamper resistant.

5. Class I Unmanned Aerial Vehicle (UAV)



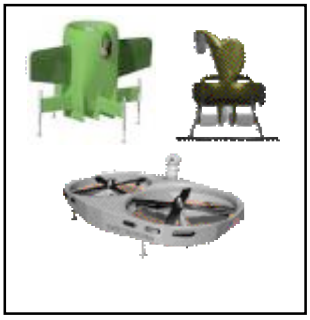
CLASS I UAV

The Class I Unmanned Aerial Vehicle (UAV) provides the dismounted soldier Reconnaissance, Surveillance, and Target Acquisition (RSTA). Estimated to weigh less than 15 pounds, the air vehicle operates in complex urban and jungle terrains with a vertical take-off and landing capability. It is interoperable with selected ground and air platforms and controlled by dismounted soldiers. The Class I uses autonomous flight and navigation, but it will interact with the network and Soldier to dynamically update routes and

target information. It provides dedicated reconnaissance support and early warning to the smallest echelons of the Brigade Combat Team (BCT) in environments not suited to larger assets. It will also perform limited communications relay in restricted terrain, a tremendous deficit in current operations.

The system (which includes two air vehicles, a control device, and ground support equipment) is back-packable and has a weight goal of 35 lbs.

6. Class II Unmanned Aerial Vehicle (UAV)



The Class II Unmanned Aerial Vehicle (UAV) has twice the endurance and a wider range of capabilities than the Class I. It is a multifunctional aerial system possessing the Vertical Take-Off and Landing capability. It supports the Company Commanders with reconnaissance, security/early warning, target acquisition and designation. The Class II Unmanned UAV will be a vehicle-mounted system that provides Line-of-Sight (LOS) enhanced dedicated imagery. The distinguishing capability of this UAV is target designation in day, night, and adverse weather. This provides the Company Commander the ability to shape the battle space by employing a combination of Line-of-Sight (LOS), Beyond-Line-of-Sight (BLOS), and Non-Line-of-Sight (NLOS) fires. It can team with selected ground and air platforms, and provides limited communications relay.

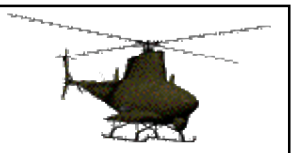
The Class II Unmanned Aerial Vehicle (UAV) can be carried by two male Soldiers.

7. Class III Unmanned Aerial Vehicle (UAV)

CLASS III UAV

The Class III Unmanned Aerial Vehicle (UAV) is a multifunction aerial system that has the range and endurance to support battalion level RSTA within the Brigade Combat Team's (BCT) battle space. The Class III must maximize endurance and payload while minimizing maintenance, fuel, and transportation requirements. It provides the capabilities of the Class I and Class II, but also provides communications relay, mine detection, Chemical, Biological, Radiological and Nuclear (CBRN) detection, and meteorological survey. It allows the Non-Line-of-Sight (NLOS) battalion to deliver precision fires within the BCT area of interest. It operates at survivable altitudes at standoff range during day, night and adverse weather. The Class III must be able to take-off and land without a dedicated air field.

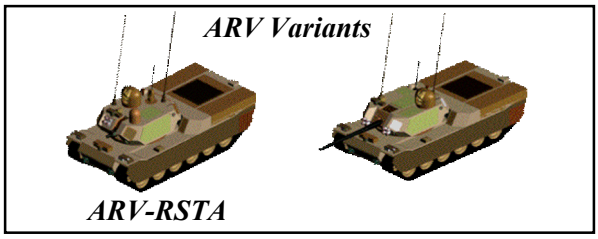
8. Class IV Unmanned Aerial Vehicle (UAV)



CLASS IV UAV

The Class IV Unmanned Aerial Vehicle (UAV) has a range and endurance appropriate for the brigade mission. It supports the Brigade Combat Team (BCT) Commander with communications relay, long endurance persistent stare, and wide area surveillance. Unique missions include dedicated manned and unmanned teaming (MUM) with manned aviation; Emitter Mapping; Wide Band Communications Relay across 150-175 km; and standoff Chemical Biological Radiological, Nuclear, and Energy (CBRNE) detection with on-board processing. Additionally, it has the payload to enhance the RSTA capability by cross-cueing multiple sensors. It operates at survivable altitudes at standoff range at day and night and during adverse weather. Like the Class III, the Class IV must be able to take-off and land without a dedicated air field.

9. Armed Robotic Vehicle (ARV)



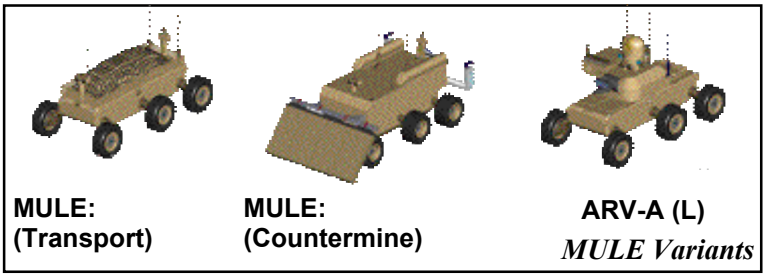
The Armed Robotic Vehicle (ARV) comes in two variants: the Assault variant and the Reconnaissance, Surveillance and Target Acquisition (RSTA) variant. The two variants share a common chassis. The Assault variant will support the mounted and dismounted forces in the assault with direct fire and anti-tank (AT) weapons providing LOS, BLOS and overwatching fires; remotely occupies key terrain providing ISR/TA reconnaissance capability in MOUT and other battlespace; deploy sensors; locate or by-pass threat obstacles; assess battle damage, and acts as a communications relay.

The RSTA version will remotely provide reconnaissance capability supporting Recon and MCS platoons in Urban Military Operations in Urban Terrain (MOUT) and other battlespace providing RSTA ISR/TA capability; deploy sensors, locate or by-pass threat obstacles; acts as a communications relay; and remotely assess and report battle damage assessment (BDA).

10. Small Unmanned Ground Vehicle (SUGV)

The Small Unmanned Ground Vehicle (SUGV) is a small, lightweight, manportable UGV capable of conducting military operations in urban terrain tunnels, sewers, and caves. The SUGV is an aid in enabling the performance of manpower intensive or high-risk functions (i.e. urban Intelligence, Surveillance, and Reconnaissance (ISR) missions, chemical/Toxic Industrial Chemicals (TIC)/Toxic Industrial Materials (TIM), reconnaissance, etc.) without exposing Soldiers directly to the hazard. The SUGV modular design allows multiple payloads to be integrated in a plug-and-play fashion. Weighing less than 30 pounds, it is capable of carrying up to six pounds of payload weight.

11. Multifunctional Utility/Logistics and Equipment (MULE) Vehicle



The Multifunctional Utility/Logistics and Equipment (MULE) Vehicle is a 2.5-ton Unmanned Ground Vehicle (UGV) that will support dismounted operations. It consists of four major components:

- Mobility platform or common chassis.
- Autonomous Navigation System (ANS). The ANS is the mission payload package that will be integrated on both the MULE Vehicle and Armed Robotic Vehicles (ARVs) to provide a robotic semiautonomous capability, and also on the family of Manned Ground Vehicles (MGVs) to provide a leader-follower capability.
- Dismounted Control Device (DCD).
- Three Mission equipment packages/variants.

The Multifunctional Utility/Logistics and Equipment (MULE) Vehicle is sling-loadable under military rotorcraft. The MULE Vehicle has three variants sharing a common chassis: transport, countermine

and the Armed Robotic Vehicle (ARV)-Assault-Light (ARV-A-L). The Transport MULE Vehicle (MULE-T) will carry 1,900-2,400 pounds of equipment and rucksacks for dismounted infantry squads with the mobility needed to follow squads in complex terrain. The Countermine MULE Vehicle (MULE-CM) will provide the capability to detect, mark and neutralize anti-tank mines by integrating a mine detection mission equipment package from the Ground Standoff Mine Detection System (GSTAMIDS) FCS (BCT) program. The ARV-Assault-Light (ARV-A-L) MULE Vehicle is a mobility platform with an integrated weapons and reconnaissance, surveillance and target acquisition (RSTA) package to support the dismounted infantry's efforts to locate and destroy enemy platforms and positions. The MULE Vehicle platform's centerpiece is superior mobility built around an articulated suspension system to negotiate obstacles and gaps that a dismounted squad might encounter.

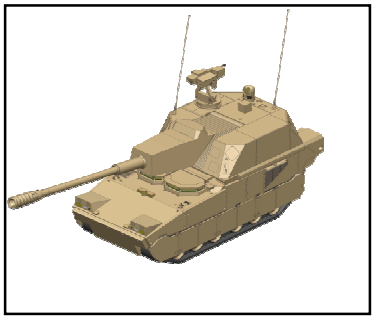
12. Mounted Combat System (MCS)

The Mounted Combat System (MCS) provides direct and Beyond-Line-of-Sight (BLOS) offensive firepower capability allowing BCTs to close with and destroy enemy forces. The MCS delivers precision fires at a rapid rate to destroy multiple targets at standoff ranges quickly and complements the fires of other systems in the BCT. It is highly mobile and maneuvers out of contact to positions of advantage. It is capable of providing direct support to the dismounted infantry in an assault, defeating bunkers, and breaching walls during the tactical assault. The MCS also provides Beyond-Line-of-Sight (BLOS) fires through the integrated sensor network. Beyond Line-of-Sight (BLOS) fires from a MCS provide in-depth destruction of point targets up to 8 kilometers away from the target. This capability significantly increases the options available to the BCT commander for the destruction of point targets through the integrated fires network enhancing SoS lethality. MCS will consist of the common Manned Ground Vehicle (MGV) chassis and an autoloading line of sight and BLOS capabilities.

13. Infantry Carrier Vehicle (ICV)

The Infantry Carrier Vehicle (ICV) consists of four platform versions: a Company Commander; a Platoon Leader; a Rifle Squad; and a Weapons Squad. All four platform versions appear to be identical from the exterior to prevent targeting of a specific Infantry Carrier Vehicle (ICV) variant type (e.g., Platoon Leader). The Infantry Platoon includes an ICV Platoon Leader variant; three ICV Rifle Squad variants; and an ICV Weapons Squad variant. The ICV Rifle Squad variant and ICV Weapons Squad variant each deliver 9-person infantry squads to a location from which they will conduct a close assault. The ICV will effectively employ weapon systems and rapidly maneuver during blackout, day and night operations, inclement weather, and limited visibility periods. The ICV will deliver the dismounted force to the close battle and support the squad by providing self-defense and supporting fires. The ICV carries the majority of equipment freeing the individual Soldier to focus on mission. The squad will have access to Army and Joint fire delivery systems from external sources to provide extended range, networked responsive precision or volume fires on demand in support of tactical maneuvers. The ICV can move, shoot, communicate, detect threats, and protect crew and critical components under most land-surface environments. Data transfer with other components of the BCT permits constant update of the common operational picture and rapid identification of targets.

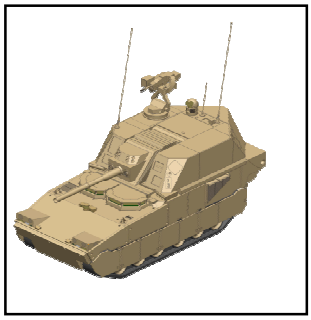
14. Non-Line-of-Sight Cannon (NLOS-C)



The Non-Line of Sight Cannon (NLOS-C) is an indirect fire support component of the System of Systems (SoS) of the FCS (BCT). It will be organic to and provide networked, extended-range, responsive and sustained precision attack of point and area targets in support of the FCS (BCT). It fires a suite of munitions that include special purpose capabilities to provide a variety of effects on demand including precision guided munitions including Excalibur. NLOS-C will provide close support and destructive fires for tactical standoff engagement during both offensive and defensive operations in concert with line-of-sight, beyond-line-of-sight, other NLOS, external and joint capabilities in combat scenarios spanning the spectrum of ground combat and threats.

The NLOS-C will be a self propelled howitzer with a two man crew. It will have a 155 mm, Zone 4, 38 caliber cannon, fully automated armament system and a high level of commonality with other MGV variants. It will mount the XM-307 25mm Advanced Crew Served Weapon (ACSW) as its secondary armament and will incorporate a suite of protection measures to enhance crew and platform survivability. The NLOS-C will be deployable worldwide and will operate in a wide range of natural environmental conditions. The cannon will be able to move rapidly, stop quickly, and deliver lethal first round effects on target in record time. The NLOS Cannon will have a multiple round-simultaneous impact (MRSI) capability. The multiple round-simultaneous impact (MRSI) capability, coupled with the NLOS-C superior sustained rate of fire, will provide record effects on target from a smaller number of systems. The cannon, like all Manned Ground Vehicle (MGV) variants, can rapidly rearm and refuel, and its system weight makes it uniquely deployable. Fully automated handling, loading, and firing will be another centerpiece of the NLOS-C. The NLOS-C balances deployability and sustainability with responsiveness, lethality, survivability, agility, and versatility. The NLOS-C will be designed to minimize its logistic and maintenance footprint in the theater of operation and to employ advanced maintenance approaches to increase availability and to support sustainability.

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



The Non-Line of Sight Mortar (NLOS-M) is the short-to-mid-range indirect fire support component of the System of Systems (SoS) of the FCS (BCT). It will be organic to and provide networked, responsive and sustained indirect fire support to the Combined Arms Maneuver Battalion in the Brigade Combat Team (FBCT). It fires a suite of 120mm munitions that include special purpose capabilities to provide a variety of fires on demand including precision guided munitions such as precision guided mortar munitions (PGMM). NLOS-M will provide close support and destructive fires for tactical standoff engagement during both offensive and defensive operations in concert with line-of-sight, beyond-line-of-sight, other NLOS, external and joint capabilities in combat scenarios spanning the spectrum of ground combat and threats.

The NLOS-M will be a turreted, self propelled mortar with a four man crew. It will have a fully automated fire control system and manually-assisted, semi-automated ammunition loading system. The Section Chief and Driver will occupy the vehicle's Common Crew Station while the remaining two crew members will sit immediately to the rear. The current design has these crewmen facing forward during movement and turning their seats rearward when the NLOS-M is emplaced and ready

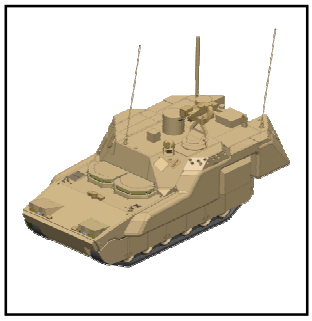
to fire. The primary duties of the rear crewmen are to stow ammunition during rearms, prepare the 120mm mortar rounds for firing by removing and stowing unneeded propellant charges and setting the fuze, and inserting the prepared round into the loading device. The semi-automated ammunition handling on the NLOS-M will present the proper round from the magazines to the crewman and, after the crew has prepared the round for firing and put it in the loading elevator, load and fire the round. The automated fire control will compute firing data and point the tube.

The NLOS-M will mount the XM-307 25mm Advanced Crew Served Weapon (ACSW) as its secondary armament and will incorporate a suite of protection measures to enhance crew and platform survivability. The NLOS-M will be deployable worldwide and will operate in a wide range of climatic conditions. The NLOS-M will have a high level of commonality with other MGV variants and will be designed to minimize its logistic and maintenance footprint in the theater of operation and to employ advanced maintenance approaches to increase availability and support sustainability.

16. Reconnaissance and Surveillance Vehicle (RSV)

Reconnaissance and Surveillance Vehicles (RSVs) feature a suite of advanced sensors to detect, locate, track, classify and automatically identify targets from increased standoff ranges under all climatic conditions, day or night. Included in this suite are a mast-mounted, long-range electro-optic infrared sensor, an emitter mapping sensor for radio frequency (RF) intercept and direction finding, remote chemical detection, and a multifunction RF sensor. RSVs also feature the onboard capability to conduct automatic target detection, aided target recognition and level one sensor fusion. To further enhance the scout's capabilities, RSVs are also equipped with unattended ground sensors (UGS), a Small Unmanned Ground Vehicle (SUGV) with various payloads and two unmanned aerial vehicles (UAVs).

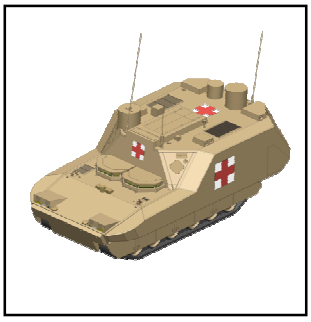
17. Command and Control Vehicle (C2V)



The Command and Control Vehicle (C2V) is part of the family of manned ground vehicles and is the hub of battlefield command and control. The C2V platform provides the tools for commanders to synchronize their knowledge of combat power with the human dimension of leadership. It is located within the headquarters sections at each echelon of the BCT down to the company level, and with the integrated command, control, communications, computers, intelligence, surveillance and reconnaissance (C4ISR) suite of equipment, the C2V provides commanders with the ability to command and control on the move.

Via mission workstations, C2Vs contain the interfaces that allow commanders and their staffs to access Battle Command mission applications including: mission planning and preparation, situation understanding, Battle Command and mission execution, and warfighter-machine interface. These applications enable commanders and their staffs to perform tasks such as fusing friendly, enemy, civilian, weather and terrain situations and distributing this information via a common operating picture. Commanders also utilize the C2V's integrated C4ISR suite (communication, computers and sensor systems) to receive, analyze and transmit tactical information both inside and outside the BCT. The Command and Control Vehicle (C2V) can also employ unmanned systems, such as unmanned aerial vehicles to enhance situational awareness throughout the BCT.

18. Medical Vehicle – Treatment (MV-T) and Evacuation (MV-E)



The Medical Vehicle is designed to provide advanced trauma life support within one hour to critically injured Soldiers. The Medical Vehicle serves as the primary medical system within the Brigade Combat Team (BCT) and will have two mission modules: Evacuation and Treatment. The time-sensitive nature of treating critically injured soldiers requires an immediately responsive force health protection system with an expedient field evacuation system. The Medical Vehicle-Evacuation (MV-E) vehicle allows trauma specialists, maneuvering with combat forces, to be closer to the casualty's point-of-injury and is used for casualty evacuation. The Medical Vehicle -Treatment (MV-T) vehicle enhances the ability to provide Advanced Trauma Management (ATM)/Advanced Trauma Life Support (ATLS) treatments and procedures forward for more rapid casualty interventions and clearance of the battlespace. Both Medical Vehicle mission modules will be capable of conducting medical procedures and treatments using installed networked telemedicine interfaces, Medical Communications for Combat Casualty Care (MC4) and the Theater Medical Information Program (TMIP).

19. FCS (BCT) Recovery and Maintenance Vehicle (FRMV)

The FRMV is the recovery and maintenance system for employment within both the Brigade Combat Team (BCT) and divisions and contributes to sustaining and generating combat power to the Future Force structure. Each BCT will have a small number of 2-3 man Combat Repair Teams within the organic Forward Support Battalion (FSB) to perform field maintenance requirements beyond the capabilities of the crew chief/crew, more in-depth Battle Damage Assessment Repair (BDAR), and limited recovery operations. The FRMV is designed to hold a crew of three with additional space for two additional recovered crew members. The weapon system for the FRMV is the Close Combat Armament System (CCAS).

20. The Soldier

The Soldier

All Soldiers in the Brigade Combat Team (BCT) are part of the Soldier as a System (SaaS) overarching requirement encompassing everything the Soldier wears, carries, and consumes to include unit radios, crew served weapons, and unit specific equipment in the execution of tasks and duties. All Soldiers systems will be treated as an integrated System of Systems (SoS). The Soldier, as defined by Soldier as a System (SaaS), meets the need to improve the current capability of all Soldiers, regardless of Military Occupational Specialty (MOS), to perform Army Warrior Tasks and functions more efficiently and effectively. Soldier as a System (SaaS) establishes a baseline for core Soldier requirements, and establishes the foundation for specific or mission unique Soldier Programs (Ground, Mounted, and Air). It will present a fully integrated modular Soldier that provides a balance of tasks, and mission equipment in support of the Soldier Team, the Current, and the Future Force.