Battle Command On-The-Move (BCOTM) Bradley

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Battle Command on the Move (BCOTM) is a revolutionary capability that provides current and future combined arms commanders all the information resident in their command posts, and the required communications necessary to command and control their combined arms team on the move, or at a short halt, from \textit{any vantage point} on the joint battlefield.
**Current Command and Control**

**Division Tactical (DTAC) CP**
- Current fight command
- Small and mobile
- Allows the commander to plan and monitor the battle from a remote location

**Division Main (DMAIN) CP**
- Future planning command
- Establishes priorities
- Coordinates, Integrates, and Synchronizes available assets to support current and future operations
- Monitors the close and rear operations
- Large and not as mobile as the DTAC

**Rear CP**
- Support command
- Handles issues such as fuel and ammunition dumps, field hospitals, fire support, and maintenance

*Technology to the Warfighter Quicker*
The commander leaves the Command Post (CP) once the battle begins, usually with only a Line-of-Sight (LOS) radio, a map, and recently Blue Force Tracking (BFT). The commander needs a better method of tracking and planning while on the battlefield since battles rarely go as planned.
Program Objectives

- BCOTM will have joint interoperability
- Simultaneously host and integrate Battlefield Automated Systems (BAS) while moving
- The BCOTM mission equipment package must be sustainable to perform its mission
Command and Control Vehicle (C2V)

- Mounted on the base of a Multiple Rocket Launcher System (MRLS)
- Housed 4 command stations that could access the Army Battle Command System (ABCS) software
- Currently 15 C2Vs fielded to the army
Mission Equipment package built into one Bradley and one M113 tank

BCV provided the Brigade Commander a jump TAC capability while displaced from the TOC for 4th ID’s Division Capstone Exercise I (DCX)
Objective was to demonstrate a light armored mobile surrogate capability that supports command and control on-the-move.

- Purpose was to participate in the 4th ID DCX II
- First on-the-move system to integrate the Multiprocessor Unit (MPU) and Keyboard-Video-Mouse (KVM) switch
The MEP from the Pandur was moved into two LAVs

Used in an operational environment at the National Training Center (NTC) by 4th ID

The 4th ID wrote the Operational Needs Statement required to build the Bradleys as a result of their experimentation with the LAV
Integrate a suite of equipment and three workstations into 5 Bradley Fire Support Team (BFIST) vehicles to act as a DTAC and allow the commander to be untethered from the command post.

House a suite of equipment which optimizes fielded communications systems and enhances situational awareness (SU) and collaborative planning/execution for the commander.

Complete 4 of the vehicles in time to deploy with 4th ID to Iraq.
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Design and Integration Team

PM Bradley
- United Defense Limited Partnership (UDLP)
  - Project leader
  - A-Kit Engineering and Design
  - Design and drafting
- Fabrication
- Integration
- Environmental Control Unit (ECU) design

PM Platforms
  - B-Kit Mechanical and Electrical engineering and Design
  - Power and Signal Distribution
  - Electromagnetic Interference (EMI)
  - Weight and Balance
  - Co-site Interference
- Lockheed Martin Technology Services Ft. Hood, TX
  - Acquire MEP and ship to San Jose
  - Final setup assembly
  - System Integration
  - Operational testing

Operational testing

United Defense

Technology to the Warfighter Quicker
The Process

- Vehicle experts and equipment integration experts worked together to create one system
- A team from C2D relocated to San Jose, CA for a month and a half in order to work closely with UDLP in the design
- Schedule Driven Program
The Bradley BCOTM vehicle was designed, fabricated, integrated and delivered in just over 2 months.
First step in meeting the Block I requirements of the 6 NOV 02 Operations Requirements Document (ORD)

- Architecture enables the commander to effectively execute battle command while untethered from the command post

- Combination of radios, positioning tools, and Army Battle Command System (ABCS) software
Five software packages embedded in the system

- **Maneuver Control System (MCS)** – Creates a common tactical picture of the battlefield and operation plans
- **All Source Analysis System (ASAS)** – Provides intelligence information for enemy positions
- **Advanced Field Artillery Tactical Data System (AFATDS)** – ammunition information
- **Air and Missile Defense Workstation (AMDWS)** – Integrates different software programs into one source of information
- **Force XXI Battle Command Brigade and Below (FBCB2)** – uses the tactical internet and Ground Positioning System (GPS) to locate friendly forces on the battlefield. Intelligence adds enemy forces to provide full situational awareness.
Key Hardware

- Keyboard-Video-Mouse Switch (KVM)
  - Allows the all three operators to toggle between and share information from the Army Battle Command System (ABCS) software suite

- Six-slice Multiprocessor Unit (MPU)
  - Configurable platform that consolidates six hard drives into one chassis
  - The five software packages were burned onto the hard drives
Configuration Challenges

- Spatial Constraints
- Vehicle Vibration
- Heat Dissipation
- Equipment Interfaces
- The needs of the commander and soldiers
- Three workstations facing forward while allowing enough room for ingress and egress
- Antenna placement that minimizes cosite interference
Possible Solutions

- Build additional rack for more room and extra support of the MPU
- Isolate sensitive equipment
- Design an Environmental Control Unit (ECU) to spot cool the most sensitive equipment
- Place a majority of the radios on the same side of the vehicle
- Place the Mobile Subscriber Radio Terminal (MSRT) and the Digital Secure/Subscriber Voice Terminal (DSVT) within reach of the commander
- Design a mount for the monitors that can be moved aside for egress and ingress
Conceptual Design

Conceptual Layout of displays, roadside equipment, and antenna placement.
Conceptual Layout of Curbside

- PRC – 117
- UPS
- KVM
- TCIM
- CISCO ROUTER

MCS-NCU

LAPTOP (Stowed)

MPU

PRC – 117

KVM

TCIM

CISCO ROUTER

United Defense
Teamwork
- UDLP and C2D worked together in San Jose 12 hours a day, 7 days a week
- Lockheed Martin worked closely with the team in San Jose by sending equipment, connectors, cables, and other long lead items they stored

Rapid Response
- High upper management involvement
- Engineering, design, fabrication, and integration efforts all worked in parallel
- Once a drawing was complete it was immediately sent for fabrication
Engineering and Design

- Vibration analysis on MPU and other sensitive equipment
- Design brackets and racks for equipment
- Heat analysis for ECU design
- Monitor and Keyboard mount design
- Weight and Center of Gravity (CG) analysis
- Antenna placement and cosite interference analysis

Weight and CG calculations

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<th>y</th>
<th>Wx</th>
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Xcg = 59.21376
Ycg = 28.51175
### Technology to the Warfighter Quicker

**Detail Design**

**Tracking the parts**

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Completing the system

- Four vehicles shipped to Ft. Hood on December 14th with a majority of the brackets installed
- Lockheed Martin finished installing the equipment, cabling, and testing the vehicle to ensure operation.
- A team from C2D and UDLP traveled to Ft. Hood to assist Lockheed Martin and install the ECU

- Four vehicles delivered to 4th ID on January 17th, 2003
- The fifth vehicle was completed at UDLP and sent to Yuma, AZ for testing
The Finished Product

Displays
The Finished Product

Roadside
The Finished Product

Curbside
The Finished Product

ECU and Antennas

Technology to the Warfighter Quicker
Training

- Training needed on the layout of the equipment
- 90% to 95% of components are comprised of Commercial Off The Shelf (COTS), therefore the soldiers already went through formal training for these items
- Integrated Contractor Support (ICS) was utilized to assist the units in maintaining and performing any repairs they may have
Project Success

- Huge success and well received by the user
- Few equipment failures despite limited testing
- 4th ID was forced to use the BCOTM without proper testing, the system worked perfectly and completed a successful mission
Lessons learned

- Redesign the monitor mounts to minimize screen vibration
- Redesign ECU, blew dust into the MPU and the belt kept breaking
- Replace the Mobile Subscriber Radio Terminal (MSRT) and Digital Secure/Subscriber Voice Terminal (DSVT) with the IRIDIUM cell phone, which is a satellite phone that takes less space claim
- Add the International Marine/Maritime Satellite (INMARSAT), which provides non-line of sight communications
BCOTM became the Mounted Battle Command on the Move (MBCOTM) program, the MEP was installed into a HMMWV and a Stryker and showcased at AUSA in Ft. Lauderdale in March 2004.
Future Possibilities

- Use the latest technologies as they develop, such as multi-band antennas to minimize cosite interference and the number of antennas placed on the vehicle.
- Improve the architecture to include Secure Wireless Lan (SWLAN), Land Warrior, Unmanned Aerial Vehicle (UAV) feed.