



Battle Command On-The-Move (BCOTM) Bradley



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Introduction to Battle Command on the Move

➤ **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 *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**

Rear CP

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

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**





Why Change?

- 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**





Progression of BCOTM



1993
Command and
Control Vehicle
(C2V)

Battle Command
Vehicle (BCV)

2000



PANDUR

2001

Light Armored Vehicle (LAV)



BCOTM
Bradley

2002



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Command and Control Vehicle (C2V)

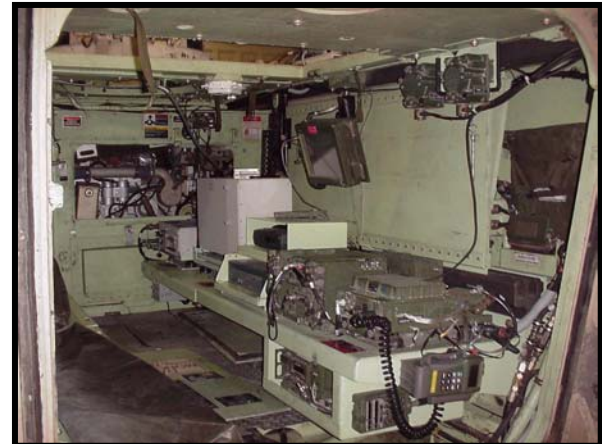
- Mounted on the base of a Multiple Rocket Launcher System (MRLS)
- Housed 4 command stations that could access the Army Battle Command System (ABCS) software
- Currently 15 C2Vs fielded to the army





Battle Command Vehicle (BCV)

- 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)





Pandur



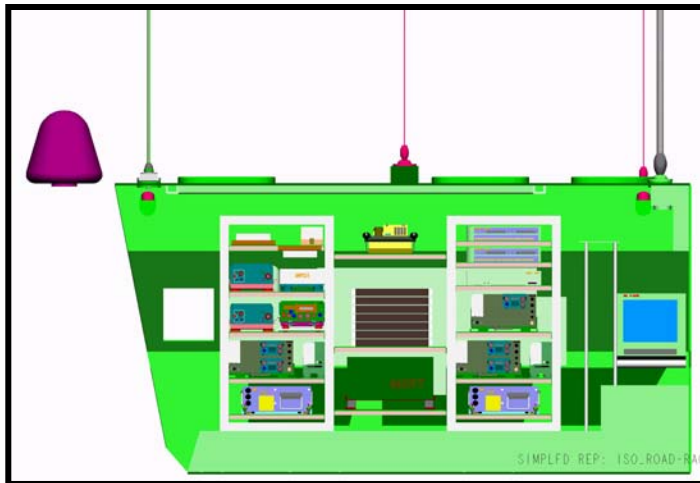
- Objective was to demonstrate a light armored mobile surrogate capability that supports command and control on-the-move
- Purpose was to participate in the 4th ID DCX II
- First on-the-move system to integrate the Multiprocessor Unit (MPU) and Keyboard-Video-Mouse (KVM) switch





Light Armor Vehicle (LAV)

- 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





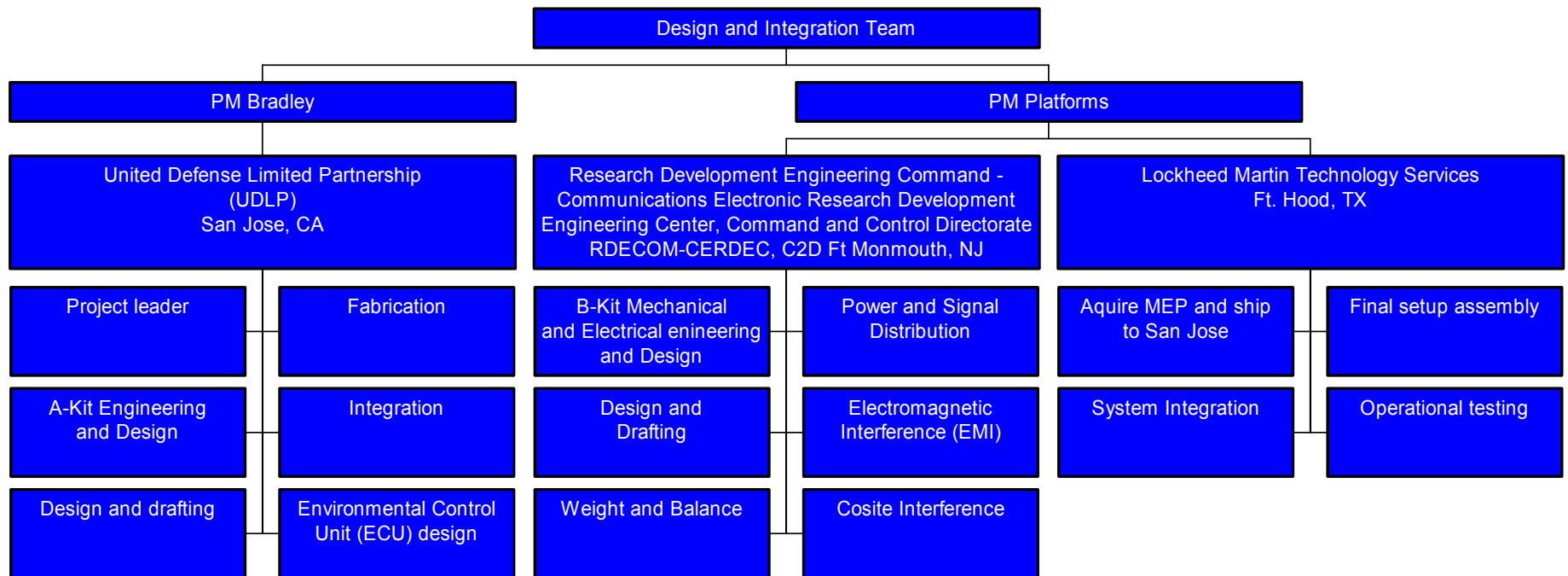
New Concept

- 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





Design and Integration Team





The Process

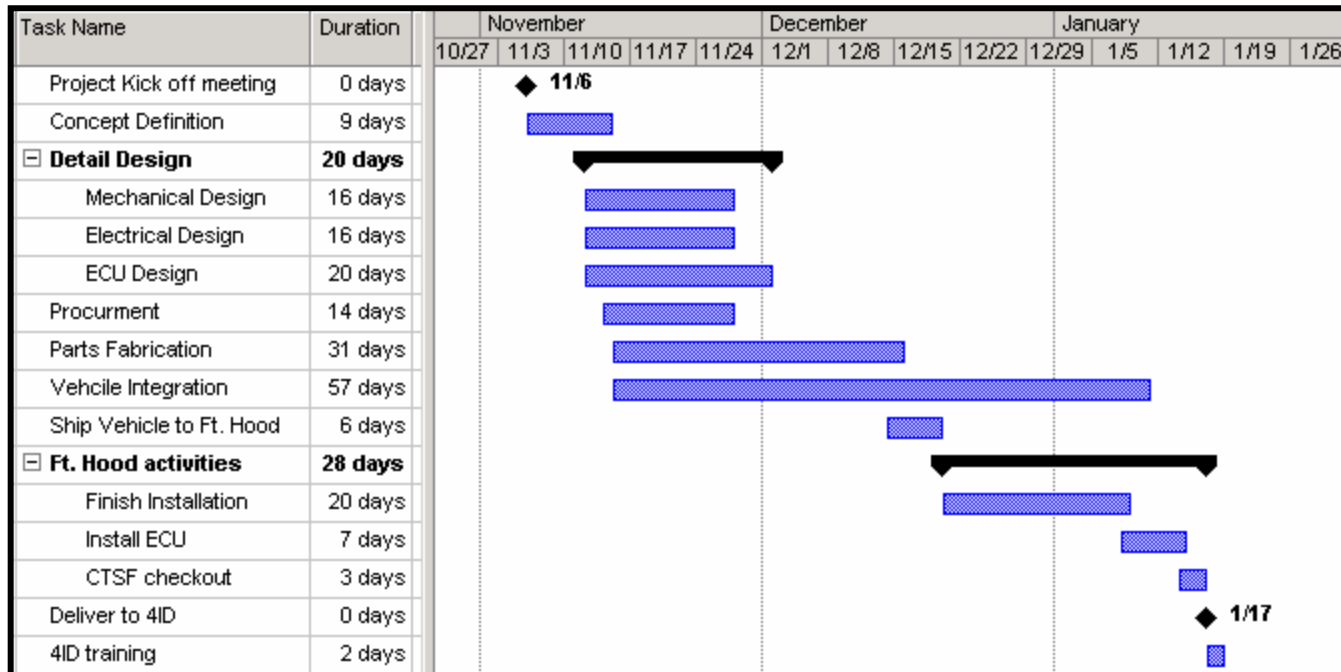
- **Vehicle experts and equipment integration experts worked together to create one system**
- **A team from C2D relocated to San Jose, CA for a month and a half in order to work closely with UDLP in the design**
- **Schedule Driven Program**





Schedule

- The Bradley BCOTM vehicle was designed, fabricated, integrated and delivered in just over 2 months





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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

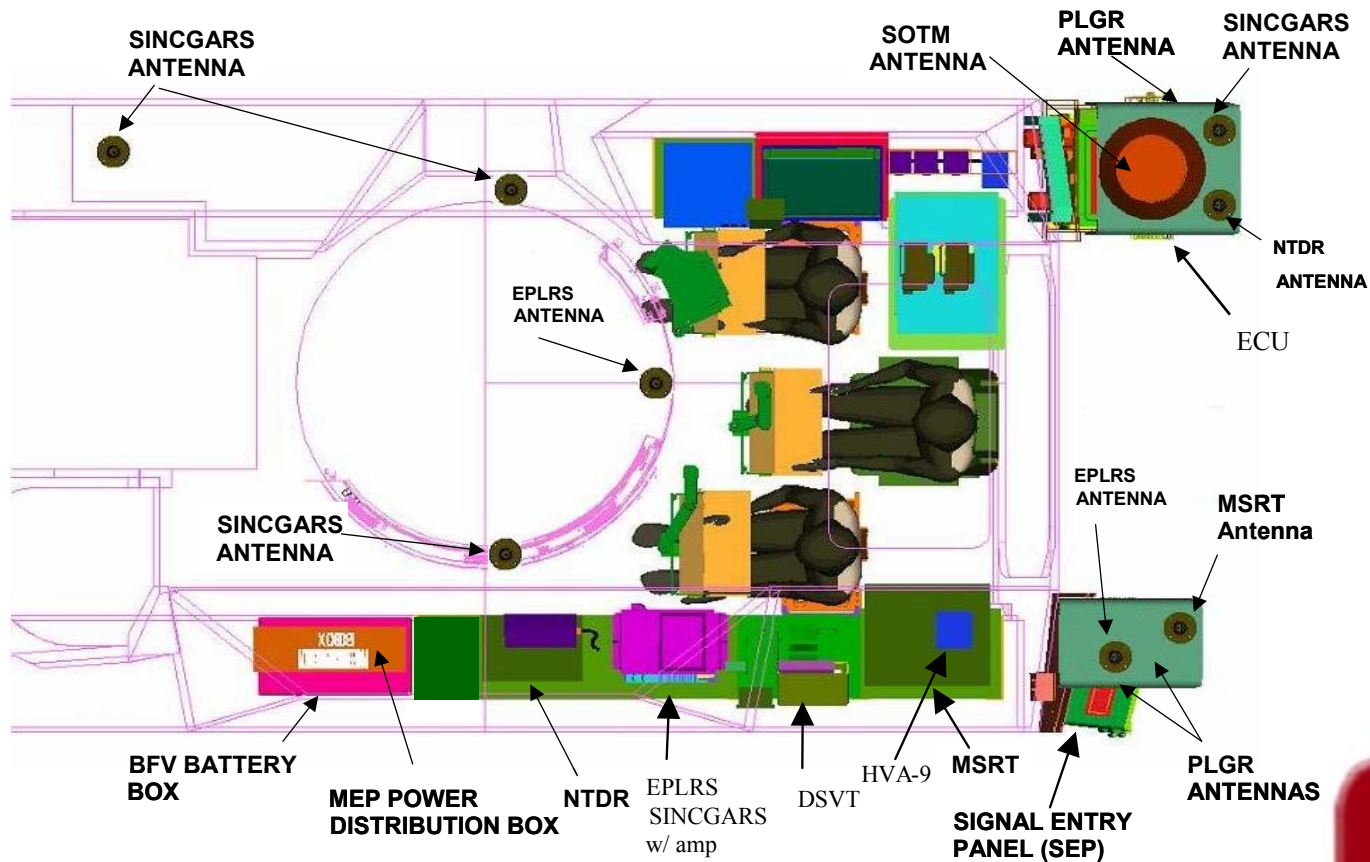
- **Build additional rack for more room and extra support of the MPU**
- **Isolate sensitive equipment**
- **Design an Environmental Control Unit (ECU) to spot cool the most sensitive equipment**
- **Place a majority of the radios on the same side of the vehicle**
- **Place the Mobile Subscriber Radio 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

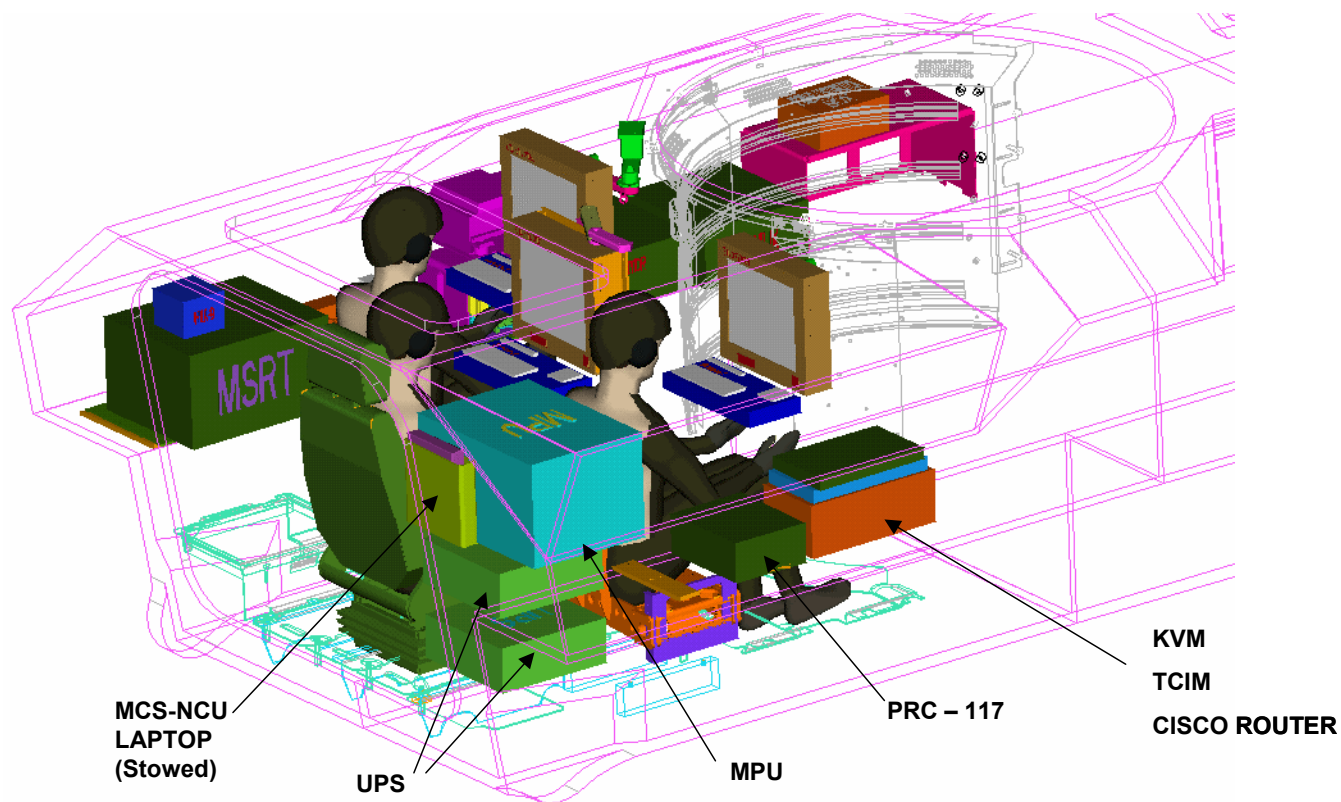
Conceptual Layout of displays, roadside equipment, and antenna placement





Conceptual Design

Conceptual Layout of Curbside



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Detail Design

➤ 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





Detail Design

Weight and CG calculations

- **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**

Item	CG, measured from the back roadside corner				
	Weight	x	y	Wx	Wy
ECU/Antennas	390		90	-10	35100
MPU rack/MPU/UPS	378		87.16	10	32946.48
KVM.Cisco/TCIM	30		102.5	30	3075
PRC-117	65		102.5	50	6662.5
Antennas, roadside	30		15	-5	450
MSRT	90		8.5	15	765
DSVT	14		8.5	30	119
Sincgars+Eplars	115		8.5	50	977.5
NTDR + FHMUX	120		8.5	75	1020
Battery box	150		8.5	120	1275
roadside folddown seat	15		25	25	375
roadside monitor	30		25	52	750
BFIST seat	30		55.5	10	1665
BFIST monitor	30		55.5	37	1665
Curbside folddown seat	15		86	25	1290
Curbside Monitor	30		86	52	2580
Total	1532			90715.48	43680
Xcg	59.21376				
Ycg	28.51175				



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Detail Design

Tracking the parts

MECHANICAL PARTS						Engineering				Manufacturing			
#	Part number	Part Name	#	Description	Part Status	Person Working	Design	Draft	Released/EO	Procure/Fab Status	Qty/Veh	Total Qty	Installation Status
1		Left Side Jump Seat	1	Use old BFV A2 Jump seat	Existing	NA	NA	NA	X	On-Hand	1	5	In Progress
2		Right Side Jump Seat	2	Use old BFV A2 Jump seat	Existing	NA	NA	NA	X	On-Hand	1	5	In Progress
3		BFIST Seat	3	Use current BFIST Seat	Existing	NA	NA	NA	X	On-Hand	1	5	In Progress
4		Seat Mounting Tracks	4	Weld on mounts for Jump Seats	Existing	NA	NA	NA	X	In Fab	2	10	
5	W82MP3008	Bar, Metal, M7 Seat, Pedestal	5	Weld on mounts for BFIST Seat	Existing	NA	NA	NA	X	In Fab	2	10	
6		Seat belt with Shoulder Harness	6	3 point seat belt harness for all seats	Existing	NA	NA	NA	X	On Order	3	15	
7			7										
8	W82ME0016	MPU and UPS Mounting Rack	8	Rack for mounting UPS and MPU	New design	Done	X	X	X	Released to Shop	1	5	
9	W82MP3005	MPU and UPS Mounting Blocks	9	blocks to be welded onto floor to support MPU rack	New design	Done	X	X	X	Released to Shop	2	10	
	W82MP3006	MPU /UPS Mounting block	10	blocks to be welded onto floor to support MPU rack	New design	Done	X	X	X	Released to Shop	2	10	
10	W82ME0017	Bracket, Angle	11	Brackets to mount MPU rack to welded mounts	New design	Done	X	X	X	Released to Shop	4	20	
11	W82ME0018	Bracket, Rack, UPS	12	To be bolted to MPU rack	New design	Done	X	X	X	Released to Shop	1	5	
12	W82MP3002	Sponson Welded Plate	13	tapped hole spacers for welding onto sponson	New design	Done	X	X	X	Released to Shop	8	40	
13	W82ME0019	Plate, KVM	14	mounting plate for KVM shelf mounts	New design	Done	X	X	X	Released to Shop	1	5	
14	W82ME0020	Plate, DSVT	15	mounting plate for DSVTshelf mounts	New design	Done	X	X	X	Released to Shop	1	5	
15	W82ME0021	Plate, MSRT	16	mounting plate for MSRTshelf mounts	New design	Done	X	X	X	Released to Shop	1	5	
16	W82ME0022	Plate, NTDR	17	mounting plate for NTDR shelf mounts	New design	Done	X	X	X	Released to Shop	1	5	
17	W82ME0023	Plate, SINCGARS	18	mounting plate for SINCGARS shelf mounts	New design	Done	X	X	X	Released to Shop	1	5	
18			19										





Detail Design

- **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



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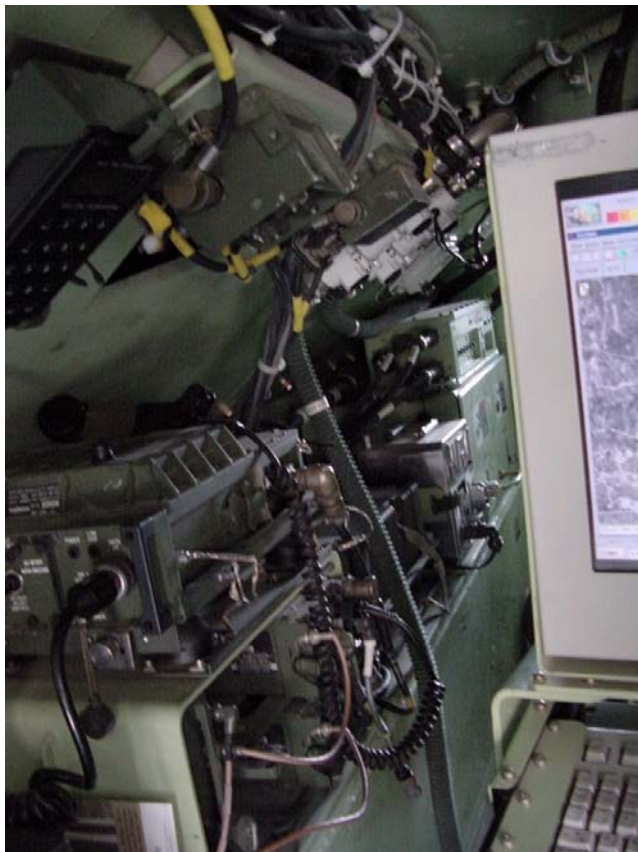


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The Finished Product

Roadside



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The Finished Product

Curbside



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The Finished Product

ECU and Antennas



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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**





Future Possibilities

- 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**



Questions



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