

NDIA Combat Vehicle Conference

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Current Situation

Issue: Current HBCT platforms are at or **exceeding Space Weight and Power (SWaP)** limitations while the Army continues to add / increase capabilities (CREW III, JTRS, MSS, etc.)

Bradley

Spec Weight: 36.3 tons
Power Available: 11200 watts



Current Weight: 39.25 tons
Power Deficit: - 5506 watts

Abrams

Spec Weight: 70.0 tons
Turret Power Available: 8960 watts



Current Weight: 76.0 tons
Turret Power Deficit: - 2664 watts*
* With GMR

Paladin A6

Spec Weight: 31.8 tons
Power Available: 18200 watts



Current Weight: 33.1 tons
Power Deficit: - 4098 watts



M113
Terminated 2007



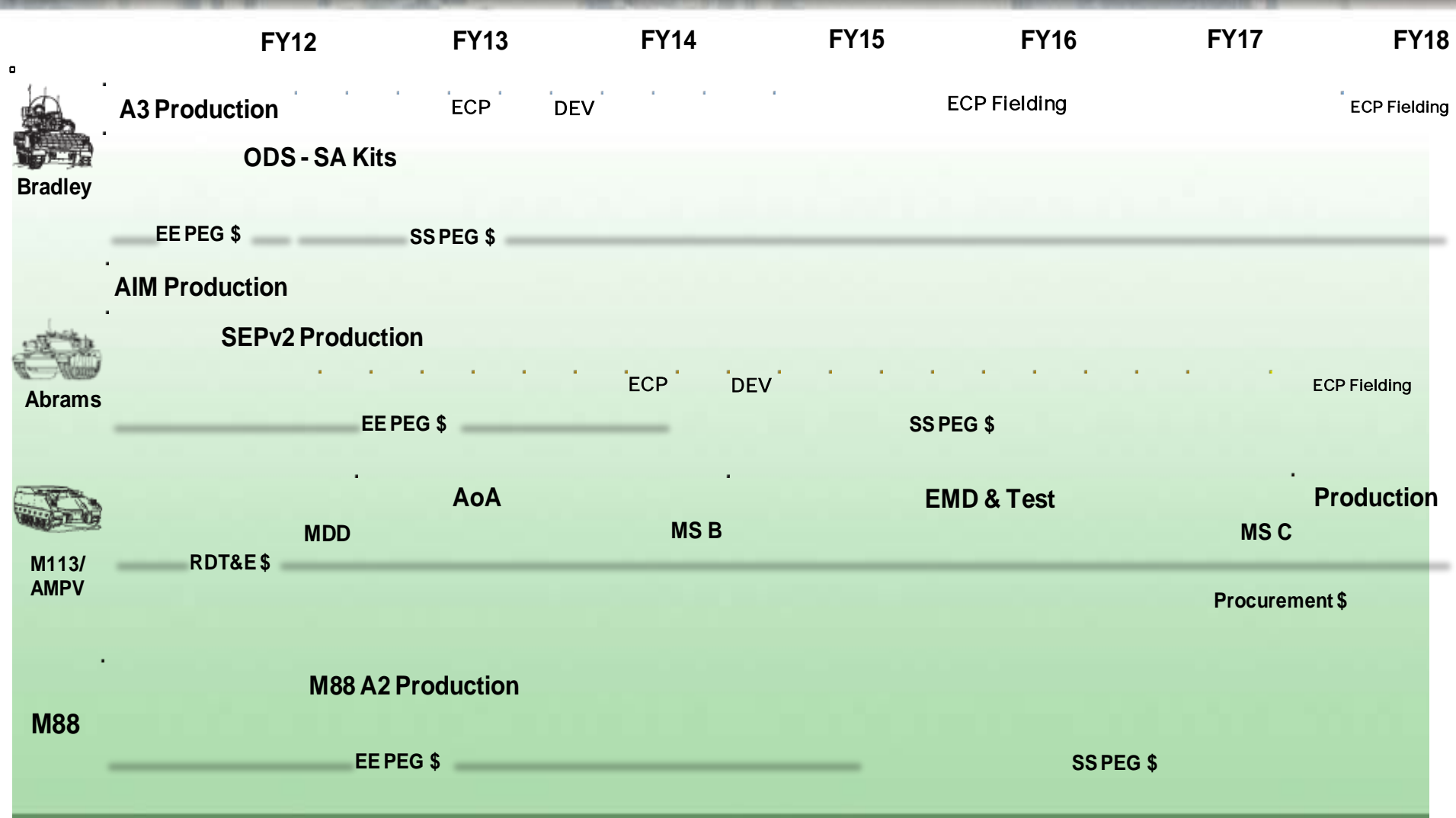
Combat Vehicle Portfolio Modernization Concept of the Operation



- The Army will execute a two-phased capabilities enhancement initiative across the Combat Vehicle Fleet.
 - Phase I ECP (Near Term): ASARC approved 8 June 2011
 - Abrams and Bradley programs will execute a series of Engineering Change Proposals (ECPs) reestablishing Space, Weight, Power and Cooling (SWAP-C) to facilitate integration of technologies being developed under existing Programs of Record (POR) (PEO/Army Decision).
 - Proposed ECPs will restore lost capability, not to exceed operational envelopes outlined in current requirement documents.
 - Phase II Modernization (Long Term):
 - Combat Vehicle MDD Canceled in Aug 2011. VCSA directed Abrams & Bradley not to execute MS programs. Look to expand ECP efforts.
 - Cost Benefit Analysis needed to determine which technologies to propose additional ECP efforts.
 - GCV enters the Technology Development phase (not included in this briefing).
 - AMPV will be a MS program. Awaiting AoA study guidance approval IOT execute MDD.



Execution



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Focus Area

- 1) **Space Weight and Power (SWaP):**
 - **Must demonstrate how you make the system better by reducing the SWaP burden while adding capability**

- 2) **Commonality:**
 - **Commonality can be achieved at the circuit level or the component level**
 - **Not all “commonality” is good: must provide cost savings**

- 3) **Schedule:**
 - **Time is critical, won't be able to do everything**

- 4) **Cost:**
 - **“Zero Sum”, cost growth in an area will result in reductions in another**



Phase I ECP Technologies



GAP: Network Enabled

Network Compatibility

- Joint Tactical Radio System – Handheld/Manpack/Small Form Fit (JTRS HMS)
- Joint Battle Command – Platform (Block Upgrade)

Power Generation/Distribution

- Battery Monitoring System
- 1000A Alternator
- Slip Ring

Line Replaceable Modules (LRM)

- Improved Commander's Display Unit
- Improved Commander's Electronics Unit
- Improved Hull Mission Processor Unit
- Improved Turret Mission Processor Unit
- Improved Driver's Integrated Display
- Improved Gunner's Control Display Panel
- Analog Input Module
- Improved Fire Control Electronic Unit

GAP: Lethality Ammunition Data Link



GAP: Protection

Integration Kit for Counter Radio-Controlled IED
Electronic Warfare (CREW/Duke 3)

Armor Upgrade

GAP: Sustainment Auxiliary Power Unit (APU)

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Phase I ECP Technologies

- Integration Ready (ECP1)
- Integration Ready (ECP2)



Power Train

- 675 HP Power Pack Upgrade
- 800 HP Transmission Efficiencies
- Cooling System Modification

Electrical System (low)

- Electrical Power Upgrade (600 Amp generator)
- High Speed Slip Ring Upgrade
- 1 G Ethernet Switch
- VHMS, Phase I
- Battery Management
- Begins VICTORY architecture compliance

Suspension & Track

- Extended Life Track
- Heavy Weight Torsion Bars
- Dampers and Road Arms

Enabled Capabilities

- FBCB2, JBC-P
- JTRS
- CREW v3
- Embedded Training
- Gun Shot Detection

Situational Awareness

- Improved FBCB2 Integration
- Common Intelligent Display

Addresses some capability gaps and Army inbound technologies.



Network Compatibility

▪ Description of Technology

- Integration of the Government Furnished Equipment (GFE) JTRS Handheld, Manpack, and Small Form Fit (HMS) radio and Joint Battle Command – Platform (JBC-P)
- JTRS-HMS replaces the Single Channel Ground and Airborne Radio System (SINCGARS) and Enhanced Position Location Reporting System (EPLRS) capabilities
- JBC-P is the next iteration of the FBCB2 program. It is a joint, digital, family of systems that provides integrated, on-the-move, timely, relevant C2 & SA information to tactical combat, combat support and combat service support commanders, leaders, and key C2 nodes

▪ Description of Capability

- Maintains the ability to disseminate critical information
- Supports the need to establish network readiness and maintain Battle Command and Communications interoperability with future Brigade Combat Teams (BCT)
- JTRS-HMS offers a 2 channel software defined radio that supports both legacy (SINCGARS) and future Soldier Radio Waveform (SRM), and Mobile User Objective System (MUOS) communications waveforms
- JBC-P provides command and control at the platform level across the Services enabling joint situational understanding and battle space awareness. It provides Joint interoperability between Service and SOF platforms operating in the Joint Operations Area
- JBC-P includes Unified Battle Command (UBC) identified upgrades including Chat, Email, Low Bandwidth Imagery, and full NetOps and provides the ability to share imagery data and incorporates Integrated Tactical Ground Reporting (TiGR) capability



Power Generation & Distribution



▪ Description of Technology

- Include the Improved Amperage Alternator, Slip Ring, Hull Power Distribution Unit (HPDU)/Remote Switching Modules (RSMs), and the Battery Monitoring System (BMS)

▪ Description of Capability

- Addresses the power demand growth potential and the need for dissemination of critical information
- The modified Slip Ring will have the capability to pass increased radio frequency (RF) and power to the turret
- Due to the changes to the alternator and the slip ring, upgrades to the HPDU and RSMs are also required
- An increase in vehicle power generation with the Improved Amperage Alternator and improved power distribution with the modified Slip Ring is needed because there is no power margin remaining in the turret of the Abrams or Bradley
- The BMS is required for the user to know the current status of the batteries that are needed for starting and maintaining silent watch capabilities



Battery Monitoring System



■ Description of Technology

- Additional power generated will be distributed to the vehicle hull and turret to support the increased power demands from the implementation of increment 1 technologies
- Provides all vital information on each battery and tell the user what maintenance or when replacement is recommended
- Starts and helps maintain silent watch capabilities and supports power management of the system

■ Description of Capability

- Reduce SWaP (Space, Weight, and Power)
- Regain interior volume for crew and equipment
- Increased energy efficiency
- Reduces O & S costs
- Enables Commonality within the PEO GCS community
- Leverage industry and other services specifications
- Regain growth potential enabling all systems/sub-systems in the vehicle to operate simultaneously, without the need to prioritize and shut down systems/sub-systems



Line Replaceable Modules (LRM) (Abrams is Lead)



▪ Description of Technology

- Cards/Modules are packaged to allow static free handling in vehicle
- Leverage industry standard for single board computers interfaces
- Multiple SBC vendors make these products
- Supports emerging VICTORY Architecture

▪ Description of Capability

- Reduce SWaP (Space, Weight, and Power)
- Regain interior volume for crew and equipment
- Increased energy efficiency
- Reset Obsolescence Clock
- Supports 2 level Maintenance
- Now capable to replace cards in the field
- Supports diagnostics to individual cards
- Supports VHMS/CBM+
- Reduces O & S costs
- Leverage industry and other services specifications
- Enables Commonality within the PEO GCS community

Acronym	M1A2 SEP v2 LRU Nomenclature
ICDU	Improved Commander's Display Unit
ICEU	Improved Commander's Electronics Unit
IHMPU	Improved Hull Mission Processor Unit
ITMPU	Improved Turret Mission Processor Unit
IDID	Improved Driver's Integrated Display
IGCDP	Improved Gunner's Control Display Panel
AIM	Analog Input Module
IFCEU	Improved Fire Control Electronic Unit



Auxiliary Power Unit (APU) (Abrams Only)

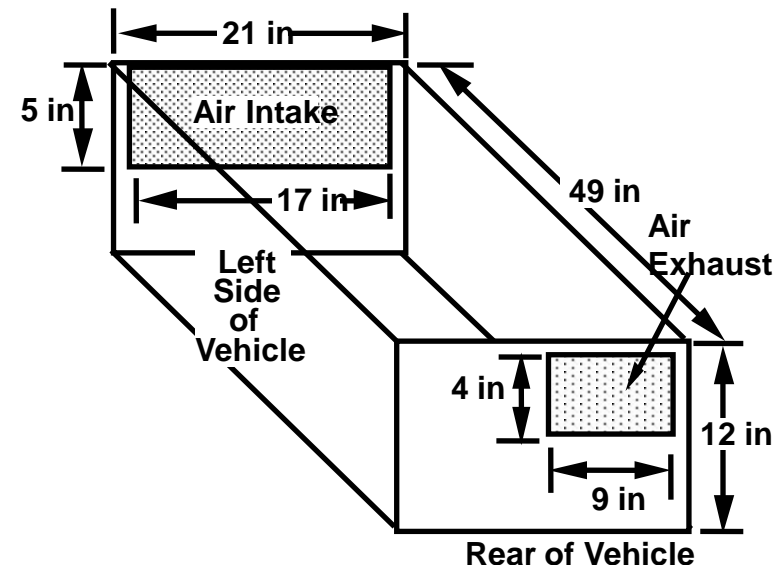


■ Description of Technology

- A minimum of a 10kW auxiliary power generating unit using conventional mature technologies (diesel/turbine) to power on-board systems with a reduced noise signature
- The unit will be integrated in the left sponson of the hull, and will be under armor
- Mounting and interface including shock mounts, shall reside within the APU space claim
- It will have full operator interface for operation control, monitoring critical parameters, and health and fault signals

■ Description of Capability

- Provides capability to operate on-board systems with a reduced probability of detection during main engine off, or silent watch operation
- More cost effective and fuel efficient than the main engine to support operation of key systems for a duration of 12 hours (T) from a stationary tank, and provide power to start the vehicle
- Extends current M1A2 SEP v2 capability to support power demands of future inbound technologies





Commonality



- **As part of the Heavy Brigade, PM Abrams and Bradley are focusing on areas of Commonality across the fleet.**
 - ECP effort will include
 - Scope to collaborate and foster commonality
 - Collaborative system engineering to look for common solutions
 - Commonality as a key criteria for trade studies

- **Developing areas of commonality are:**
 - HBCT Common Environmental Specification for design of new components
 - VICTORY 1.0 Standard Architecture Specification for new components



Phase I ECP Summary



- **The Abrams Tank and Bradley Fighting Vehicles will continue to evolve**
- **Current Bradley Fleet cannot host current in-bound technologies**
- **Upgrades/modifications will be applied through an ECP or multiple ECPs**
- **Requirements trace is to the current ORD**
 - Phase 1 technologies are confirmed
 - Analyzing potential Phase 2 technologies
- **Updates for the M1A1 Fleet being considered**
 - Ammunition Data Link
 - Network Upgrades

“Sustain the current fleet.... Modernize for the future.”



AMPV



Distribution Statement A: Approved for public release; distribution is unlimited



Disclaimer

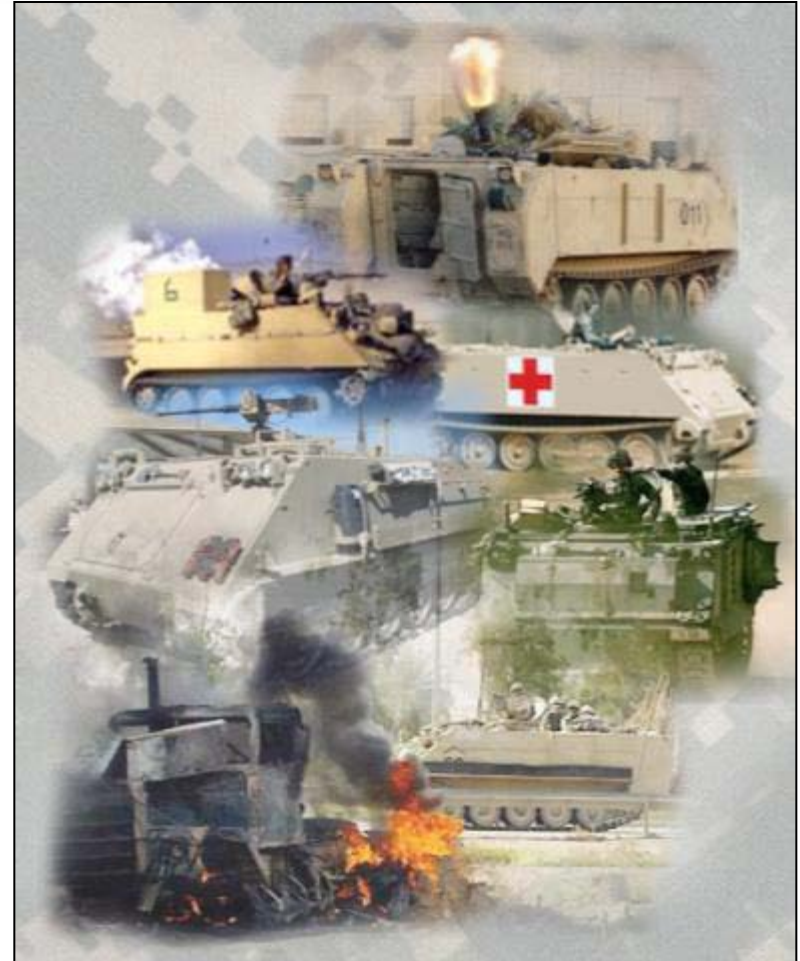
- **The Armored Multi-Purpose Vehicle (AMPV) Program is the proposed Army program for replacement of the M113 Family of Vehicles within the Heavy Brigade Combat Team.**
- **This program is still pending an FY12 Materiel Development Decision (MDD) that will define the program, to be followed by an Analysis of Alternatives (AoA) that will confirm the system or systems that will replace the M113.**
- **The Army will consider existing or programmed solutions which may include, but are not limited to, derivatives of the Bradley Fighting Vehicle, Stryker variants, Mine-Resistant Ambush Protected (MRAP) vehicles, variants of the Ground Combat Vehicle, or other systems.**
- **No activity to identify or select a systems contractor or contractors will begin until after the MDD decision is made and the AoA is complete.**



Mission Roles of the M113 FOV

AMPV focuses here

1. **Command and Control**
 - Maneuver
 - Fires
 - Engineer
2. **Medical**
 - Evacuation
 - Aid Stations
3. **Fire Support**
 - Mortar Carriers
 - Fire Direction Centers
4. **First Sergeant**
 - Primary Vehicle
5. **Mobility/Counter Mobility**
 - Sapper Companies
 - Mobility Augmentation Companies
 - Volcano
6. **CS/CSS**
 - Maintenance Vehicle
7. **Chemical**
 - Smoke Vehicle



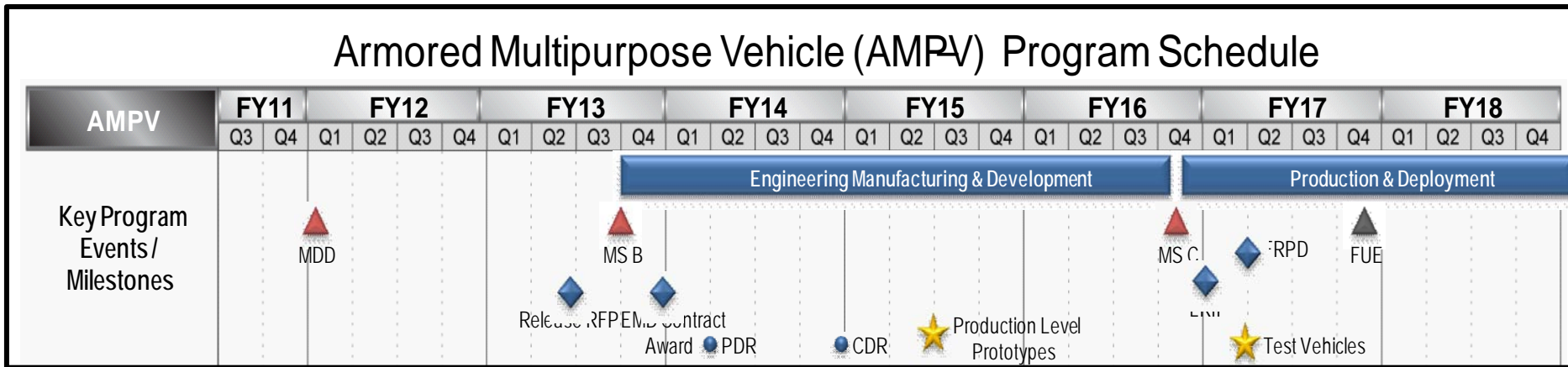


AMPV Projected Schedule

assumes Bradley Derivatives



Armored Multipurpose Vehicle (AMPV) Program Schedule



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Bradley Derivatives Proposed Technologies



GAP: Protection

- Existing Bradley Capabilities
 - Belly Armor Kit
 - Reactive Armor Tile Provisioning
 - Bradley Urban Survivability Kit (includes mine/IED seating)
 - Drivers Vision Enhancement (part of CM/ED)
- Gunner protection kit
- CREW v3 A-kit
- Roof armor (former turret area)
- COTS Litter Kit and Medical MEP
- Environmental Cooling System (Medical variants)

GAP: Network Enabled

- Smart Display Unit/FBCB2 Display
- SINCGARS Radio A-kit integration
- Provision for future C4ISR power requirements
- M1068 C2 communications/C4ISR A-kits

GAP: Mobility

- Use of Bradley A3 Hull configuration
- BFV A3 600hp powertrain
- Chassis Modernization w/ Embedded Diagnostics and DV
- BFV A3 Suspension and T157 Track
- External Fuel Tanks
- TC Hatch



Red = Current Bradley

GAP: Lethality

- Flexible mounted crew-served Weapon
- M1064 Mortar Mission Equipment Package

TDP not 100% complete



MEP Definitions (Draft – Pre-AoA)



- **General Purpose Vehicle will:**

- Have a crew of 2 with up to 6 passengers
- Integrate WIN-T

- **Command Vehicle will:**

- Host common C4 Mission Equipment Packages (MEP) and Government Furnished Equipment (GFE) including shelter.
- Provide for a minimum of two (2) workstations with an operator per workstation
- Integrate SINCGARS, BFT2, WIN-T, JTRS GMR, JTRS HMS, MFCS, AFATDS, other ABCS systems, etc



MEP Definitions (Draft - Pre-AoA)



- **Mortar Carrier Vehicle will:**

- Accommodate a smoothbore 120mm Mortar system, which must be capable of firing: HE, illumination, IR illumination, smoke, precision munitions, and the Family of Extended Range Munitions (FERA).
- Integrate the current M95 Mortar Fire Control System-mounted and carry current ground mounting and firing equipment as utilized on the M1064 Mortar Carrier
- Accommodate four Soldiers



MEP Definitions (Draft - Pre-AoA)



- **Medical Treatment and Medical Evacuation Vehicles will integrate:**
 - Litter lift system
 - Ambulatory seating
 - Mounting brackets for the Mission Equipment Package (MEP)
 - ECU and heating
 - Medical grade power for the MEP sets
 - Storage for medical items
 - Locked cabinets for controlled substances
 - IV holders
 - Lighting



Closing Remarks

- **Out years are lean - Cost & Schedule will be critical**
- **ECP efforts are not STS**
- **Ensure you know the vehicle requirements and specifications**

